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80 micro

the #1 magazine for Tandy users

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THE MODEL 600
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A DIFFERENT ANGLE
How to Rotate Hi-Res Graphics

DAVE'S MS-DOS COLUMN:
What You Should Know About Interrupts

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Meet the disk-based Tandy 600.

A breakthrough in portable computing power and versatility.

Get a portable that matches the performance of a desktop computer. The amazing Tandy 600 features a 16-bit microprocessor, an 80-character by 16-line display, a built-in 3½" disk drive that stores 360K of data and 32K RAM (expandable to 224K*).

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* RAM upgrades are in banks of 96K (26-3910, $399.95 each). Prices apply at Radio Shack Computer Centers and participating stores and dealers. Multiplan and MS-Word/TM Microsoft Corp

APPLICATIONS/BUSINESS

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(MSDOS Ver.)	$294.50
TFC BBS	$ 99.50
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POWERMAIL PLUS w/Txt Merge	$124.50
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LESCRIPT CP/M	$149.50
LESCRIPT MS/DOS	$149.50
ZORLOF II	$ 49.50
MSCRIPT	$ 52.50
LAZYWRITER	$ 99.50
TYPEITALL	$ 99.50
PowerScript (New Version)	$ 34.50
PowerDriver	$ 24.50
Electric Pencil	$ 74.50
Electric Pencil w / Spell Check	$139.50
EDX Text Editor (Mod I/III)	$ 24.50
TEXTPRESS	$ 39.50
ELECTRIC WEBSTER	$129.50
E.W. Options (each)	$ 38.50
E.W. MS/DOS (Includes options)	$149.50
Datagraph with Pie Option	$109.50
Graphit	$ 34.50
PowerDraw	$ 34.50
Mumford's Disk Indexer	$ 34.50
Howe's System Diagnostic	$ 89.50
J & M's Disk Drive Analyzer - I	$ 84.50
J & M's Disk Driver Analyzer - III	$ 74.50
ENBASE Data Base Manager	$ 64.50
EDIT (Models I/III)	$ 18.50
AFM (Auto File Manager	$ 94.50
Home Accountant (Model III)	$ 54.50
VersaLedger II (Models I/III)	$134.50
Versa Series (Models I/III) each	$ 89.50
TAS's ZMAIL Mail List	$ 24.50
Macro Typing Tutor	$ 24.50
Lazycomm Terminal	$ 29.50
Disk Term Terminal	$ 59.50
MTERM Smart Terminal	$ 59.50
DOSPLUS 3.5 (Models I/III)	$ 54.50
DOSPLUS IVA (Model 4/4P)	$114.50

GAMES

SUPREME RULER PLUS	$26.50
FLIGHT SIMULATOR	$29.50
NUCLIEX	$14.50
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SIFTER SHIFTER	$ 8.50
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WARRIORS AND WARLOCKS (D&D ADV.)	$39.50
THE ADVENTURE SYSTEM	$34.50
FOOTBALL STRATEGY	$29.50

THE BOOKSHELF

Using Super Utility	$14.50
ROM RDUTINES Documented	$16.50
Model III Assembly Language	$15.50
The C Programming Language	$17.50
Programmer's Guide to TRSDOS 6	$14.50
TRS-80 Disk and Other Mysteries	$16.50
Basic Decoded and Other Mysteries	$23.50
TRSDOS 2.3 Decoded	$23.50
Machine Language Disk I/O	$23.50
The Custom TRS-80	$23.50
How To Do It On the TRS-80	$23.50
Basic Faster and Better	$23.50
DFBLIB or BFBDEM Disks each	$17.50
Basic Disk I/D	$23.50
DFBLDAD Disk	$23.50

INFOCOM

Better be careful out there... Infocom's latest adventure seems to be the phasing out of their TRS-80 line. We will do our best to keep these popular games in stock, but once they run out, they are gone for good. Hitchhiker's Guide is our first casualty!

"Standard Level" ..... Each $34.50

PLANET FALL	WITNESS
ENCHANTER	CUTTHROATS

"Intermediate Level" ..... Each $39.50

ZORK II	ZORK III
SORCERER	INFIDEL

"Very Difficult Level" ..... Each $42.50

DEADLINE	STARCROSS
SUSPENDED	

UTILITIES

Alcor C Compiler	$ 82.50
Alcor Multi-Basic Compiler	$ 82.50
Super Utility 4/4P	$ 69.50
Super Utility 3.2	$ 59.50
Super Utility MSDOS	$ 79.50
Supercross XT	$ 89.50
Supercross XT w/CnvBasic	$ 99.50
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PRONTO (Model 4/4P)	$ 54.50
Other MISOSYS Utilities each	$ 28.50
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Howe's Monitor #5	$ 19.50
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TOOLBOX for LDOS	$ 39.50
TRAKCESS (Mod I)	$ 19.50
TRAKCESS (Mod III)	$ 24.50
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6.2 Plus Enhancements	$ 36.50
Impakt Utility	$ 29.50
NEW8ASIC w/Analyst	$ 34.50
Analyst only	$ 19.50
ALE - Assembly Language Editor	$ 39.50
M-ZAL Macro Assembler (Model III)	$ 79.50
Mumford's Instant Assembler	$ 44.50
Instant Assembler (Model 4/4P)	$ 59.50
2EN Assembler	$ 34.50
PASCAL 80 Compiler	$ 59.50
PASCAL 80 for CP/M	$ 36.50
LC / PRO-LC Compiler	$114.50
S8E Compiler	$ 46.50
ACCEL 3/4 Compiler	$ 44.50
Z8ASIC Compiler	$ 79.50
HartFORTH/PRO-HartFORTH	$ 69.50
Backrest Utility	$ 84.50
MULTIDOS Version 1.7	$ 79.50
MULTIDOS (Model 4/4P)	$ 89.50

ELECTRONIC NOTEBOOKS

KSOFT

SUPERLOG 4	$99.50
SUPERLOG 3 (I/III)	$99.50
LOG (Model I)	$44.50
LOG (Model III)	$44.50

MONTHLY SPOTLIGHT

AFM

The brand new data base manager from PowerSoft. The key-word of this program is "FLEXIBLE". Free-form entry system allows you to enter your data any way you please. Consists of three modules: AFM (Auto File Manager), AFR (Auto File Reporter), and AFU (Auto File Utility). Features fully sorted output by all fields, fully relational form letter output, relational lookup, mail labels, and much more. Probably the best Data Base Manager available for the TRS-80!

$94.50

CONVERSION PROGRAMS

8ASIC 3 TO 4 CONVERT Model 4/4P ONLY (list $49.95)	$39.50
8ASIC 4 TO 3 CONVERT Model I/III (list $49.95)	$39.50
8ASIC GW CONVERT Model 4/4P ONLY (list $99.95)	$89.50
CONVERT BASIC Models I/III and 4 (list $29.95)	$27.50

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We accept orders by phone or mail. Specify your TRS-80 Model, exact program(s) wanted, and method of payment. We accept VISA, MasterCard, Check, and Money Orders. C.O.D. orders add $2.50 and Gov't Purchase Orders add $5.00. Electric Webster orders please specify Word Processor. Free shipping to continental U.S. and Canada. All prices are in U.S. Funds. Prices subject to change without notice.

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Features

Departments

LOAD 80

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

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

Using Load 80 is simple. If you own a tape system, load the Load 80 tape as per the instructions provided. If you own a Model I or III disk system, you boot the Load 80 disk and transfer the files to a TRSDOS system disk according to simple on-screen directions. If you own a Model 4, copy the Model 4 programs from the Load 80 disk to your TRSDOS 6.X disk using the COPY command.

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

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

Directory

Data Base
Article: To Each His Own (p. 34).
System: Model 4, 64K RAM.

General-purpose data base manager.
Language: Basic.
Cassette filespecs: B, C, D, E, F, G, H.
Disk filespecs: MAIN/BAS, DEFINE/OVL, ADD/OVL, READ/OVL, SELECT/OVL, INDEX/OVL, REPORT/OVL.

DOS Utilities
Article: The Disappearing DOS (p. 56).
System: Models I and III, 32K RAM; Apparat editor/assembler.

Access Model I/III, system functions from DOS Ready.
Language: Assembly.
Cassette filespecs: POKE (SRC), POKE (CMD).
Disk filespec: POKE/SCR, POKE/CMD.

Rotation
Article: Points of View (p. 48).
System: Models III and 4, 48K RAM; hi-res board.

Create two- and three-dimensional images for your programs.
Language: BasicG.
Cassette filespecs: I, J, K, L, M, N, O, P, Q, R.
Disk filespecs: LINE/BAS, SPIRAL/BAS, POLYGON/BAS, RADAR/SUB, SPOKES/BAS, BOX/BAS, SPIN/BAS, CUBE/DAT, FACE/DAT, BLKHOLE/DAT.

Sort
Article: Out of Sorts? Try This One (p. 84).
System: Model 4, 64K RAM; EDAS editor/assembler.

A fast Model 4 sort.
Language: Basic.
Cassette filespecs: SORT (CMD), S.
Disk filespecs: SORT/SRC, SORT/CMD, TEST/BAS.

BAS, OVL, SUB, DAT = Basic SRC = source code CMD = object code

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There Is Joy In Mudville

Fort Worth was a restless town a little more than a year ago. The Model 2000 had bombed. The Model 4 was living on Geritol. Sales of the Color Computer were down. Expectations for the Model 100 remained unfulfilled. The Model 1000 was still an unknown quantity. Before the dust had settled, Tandy's profits for fiscal 1985 had dropped 33 percent over the previous year.

But by the 1985 holiday season, Tandy executives were smiling once again. The Model 1000 was a success, becoming the workhorse of the Tandy line and vying with Compaq for king of the compatibles hill. Sales in Radio Shack Computer Centers were up. Third-quarter revenues were up. Analysts on Wall Street were up. The dark, roiling thunderclouds had scattered, and a warm sun bathed the Texas soil.

The people in Fort Worth certainly deserve a bit of cheer. Whatever Tandy's faults might be, the company has tried to correct them. It has increased its support of third-party vendors. Customer service—one of Tandy's biggest strengths, though maligned by some—has improved. Marketing efforts, if still a tad unsophisticated, have increased. And Tandy computers continue to offer some of the best price-performance ratios in the industry.

Tandy supporters are often frustrated by this plodding, frightfully dull computer retailer. It is a conservative company in a volatile industry, and it responds slowly to market conditions. Fortunately, Tandy has the brute force to afford a wait-and-see game. Its corporate philosophy is that good things come to those who wait. Tandy's patience has paid off.

Magazine Massacre

1985 wasn't a good year for computer magazines. Several of the big ones dropped off the edge of the earth, most notably *Computers & Electronics*, *Creative Computing*, and *Popular Computing*.

I was most saddened by the demise of *C & E*, which practically launched the microcomputer in 1975. A lot of history went down the tubes there. *Creative Computing* never appealed to me; it felt too much like a comic book. I never understood what *PopCom* was all about, or who it was written for. Gossip around Peterborough—homes for both *80 Micro* and *PopCom*—is that it tried to be a business magazine when its readers were mostly home users.

Basic Computing (80 Northwest Publishing)
Business Computing (Penwell)
Computers and Peripherals (CAP Magazine)
Color Computer Magazine (Ziff-Davis)
Color Computer News (REMarkable Software)
Compute!'s PC & PCjr (ABC/Compute!)
ComputerFun (Viare)
Computers & Electronics (Ziff-Davis)
Core (Softkey)
Creative Computing (Ziff-Davis)
Databar (Databar)
Educational Computer (EC)
HOT CoCo (CW Communications)
jr (CW Communications)
K-Power (Scholastic)
Microcomputing (CW Communications)
Microkids (Cloverdale/Warner)
Microsystems (Ziff-Davis)
PC Consumer (Van Data)
PCjr (Ziff-Davis)
Peelings II (Peelings II)
Personal Computer Age (PCA)
Personal Software (Hayden)
Popular Computing (McGraw-Hill)
Small Business Computers (SBC)
Softalk (Softalk)
Softalk IBM (Softalk)
St. Game (Softalk)
St. Mac (Softalk)
Timex-Sinclair User (Computer Communications)
Microcomputer News (Tandy)
Whole Earth Software (Point)

Table. Defunct computer magazines.

The Table is a list of magazines you might have read once that are no longer with us. Some passed away in 1985, others in 1984. The names of the publishers appear in parentheses.

Microcomputer magazines are like bullfighters, living hard and dying young. By my count, only two that started before 1980 are still around—*Dr. Dobb's Journal* and *Byte*. (*80 Micro*'s first issue was January 1980.)

The lesson behind all of this: Don't get a lifetime subscription to a microcomputer magazine.

By the way, if you used to read *Basic Computing*, its publisher, Irv Schmidt, has launched a new magazine called *CodeWorks* (3838 S. Warner St., Tacoma, WA 98409). It's a modest little bimonthly consisting almost entirely of Basic programs for MS-DOS and TRS-DOS machines.

If you like to program in Basic, *CodeWorks* is worth checking out. Subscription is $24.95 a year.

HOT CoCo Debuts

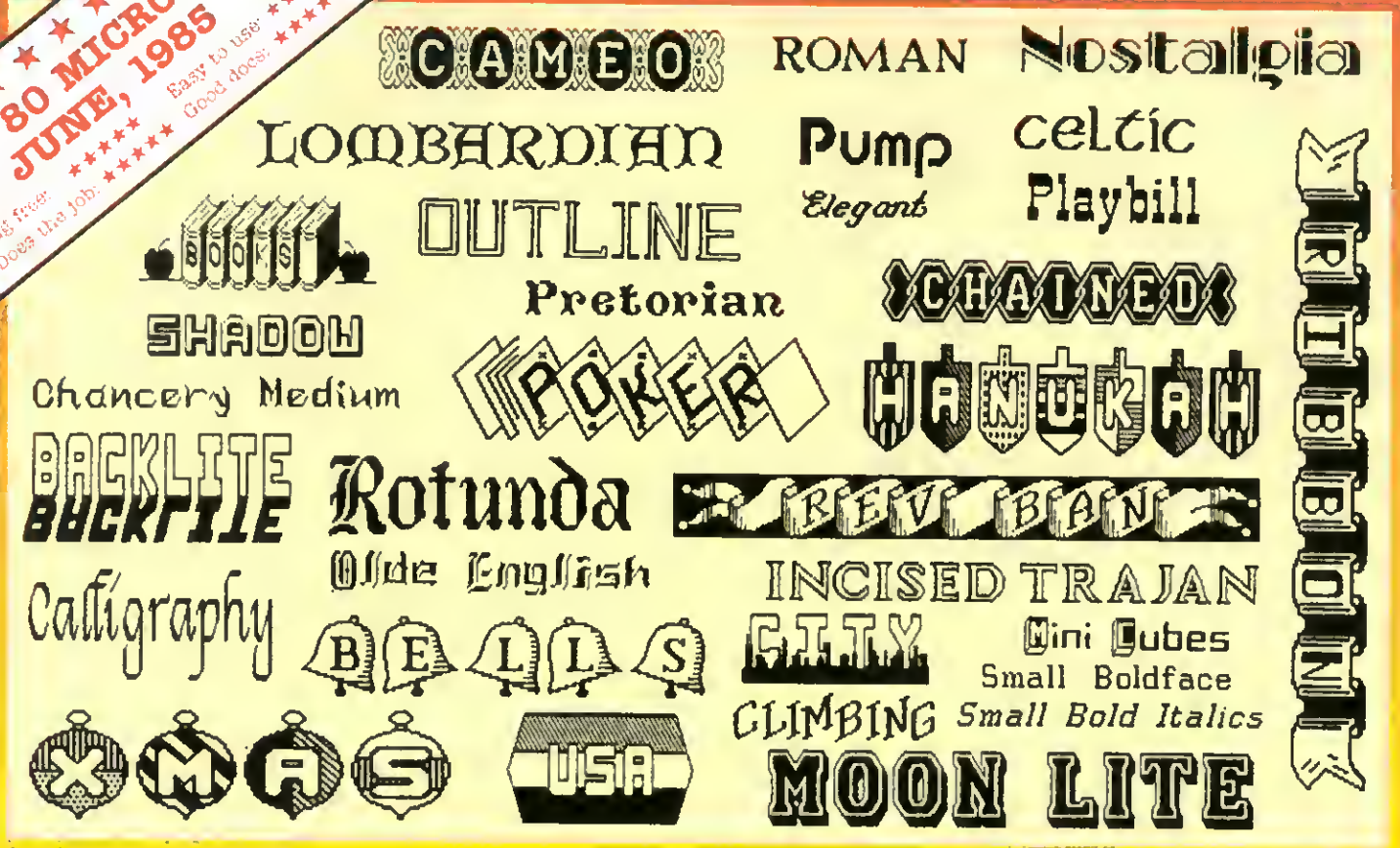
Beginning this month, *80 Micro* will incorporate features from *HOT CoCo* magazine in a special section to be called, appropriately enough, *HOT CoCo*.

The new section will include two of *HOT CoCo*'s monthly columns—Doctor ASCII and Scott Norman's Color Monitor (formerly The Computer Room)—as well as programs and tutorials. In addition, we'll be including CoCo product information in our regular New Products section.

We welcome *HOT CoCo*'s subscribers and hope they continue to enjoy *HOT CoCo* in its new form, as well as the many other columns and articles in *80 Micro*.

By the way, the *HOT CoCo* section will be in addition to our regular coverage, and will not replace any I/III/4 or MS-DOS material.■

Photograph by Frank Cordelle



Circle 91 on Reader Service card

DOTWRITER printed these on on Epson MX-80.

See What You Can Do With DOTWRITER!

DOTWRITER lets you create spectacular, eye-catching signs, invitations, letterheads, large sideways banners, catalogs, or even books. It is just what you need to turn your dot-matrix printer into a versatile typesetting machine. And it is available for your TRS-80 Model 4/4P (yes, in native mode), as well as for the Models I and III.

WHAT IS DOTWRITER?

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

DOTWRITER includes the printing program, complete documentation, and fourteen useful typefaces (60 to 90 characters per typeface). We will include the 170-page Letterset Reference summary at half-price ($10.00) with your order.

To use DOTWRITER, just write your text with any popular TRS-80 Word Processor (such as ALLWRITE or SuperScripsit), add the necessary formatting commands, and DOTWRITER will do the rest.

36 more letterset disks are available separately. Each has 3–12 complete typefaces. The disks costs less than $25 each and you may purchase them at ony time.

80 readers' choice micro 1983

SIDEWAYS SPREADSHEETS

If your VisiCalc spreadsheets are too wide for your printer, our "LONGVIEW" option may be just what you need. It is an add-on thot turns spreadsheets sideways so that DOTWRITER can print them down the page instead of across. LONGVIEW comes with three additional lonts.

EQUIPMENT REQUIREMENTS

DOTWRITER needs a TRS-80 I, III, 4 or 4P with 2 disk drives and 48K of memory. Separate versions of DOTWRITER support EPSON MX-80 with Graftrax, MX-100 with Graftrax-Plus, and FX, JX, RX; C.ITOH 8510/1550; MICROLINE 84-2/92/93; RADIO SHACK DMP 110-2100/CGP-220; GEMINI 10X/15X and other STAR printers.

We printed our samples on an Epson; sizes may vary on other printers. Many of the fonts shown above are available at extra cost.

Send for free print samples! We've only shown you a few of the 240 DOTWRITER fonts. For the best in TRS-80 graphics printing, we suggest you order DOTWRITER today, toll-free.

Please specify Printer and Computer when ordering.

DOTWRITER	$99.95
LONGVIEW	29.95
Additional Letterset disks (3–12 lonts/disk)	24.95
	3 lor 49.95
Letterset Reference Book	20.00

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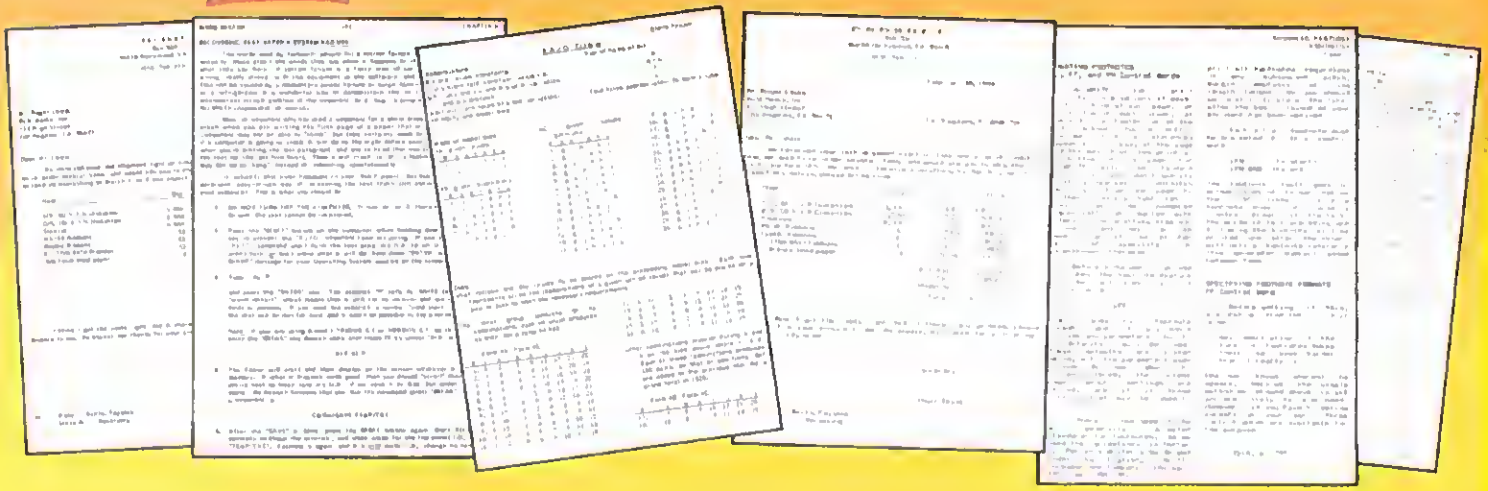

These were printed by ALLWRITE; shown 20% actual size.

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

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

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will skip bad sectors, read the rest of the file, and then show you where the lost text belongs. This advanced error recovery turns a disaster into a feeling of profound relief.

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

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

ALLWRITE Is Easy To Learn

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

ALLWRITE's superb documentation will get you started quickly. Portions of it are designed for beginners, with every feature clearly explained in step-by-step tutorial style. Since you won't always be a beginner, other parts of the book offer advanced topics. There is a cross-reference summary chapter, a 14-page comprehensive index, and a detailed Table of Contents. We've been developing computer programs and manuals for over 23 years, and understand the importance of good documentation.

ALLWRITE works with all major DOS's on Models 1, 3, and 4/4P.

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Perhaps the best reason of all for having ALLWRITE is the continuing support we offer you: friendly, expert, direct support that is unsurpassed in the micro-computer industry.

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"ALLWRITE is a professional system that sets a new standard in word processing. It's powerful and easy to learn and use."
80 MICRO, Nov., 1984

Customer Comments

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

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

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

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ProSoft Protest

I appreciate the effort Dave Dalton gave to covering eight different products in his word processor overview ("Prose and Cons: Advanced Model 4 Word Processing," November 1985, p. 37).

There were two kinds of errors in the review. The first occurs on page 38, where Dalton says that "Routine jobs like inserting, deleting, moving blocks, or simply scrolling all seem faster and more efficient with LeScript." Inserting and deleting are essentially instantaneous in both Allwrite and LeScript, and it takes the same number of keystrokes, or one fewer keystroke, in Allwrite than it does in LeScript.

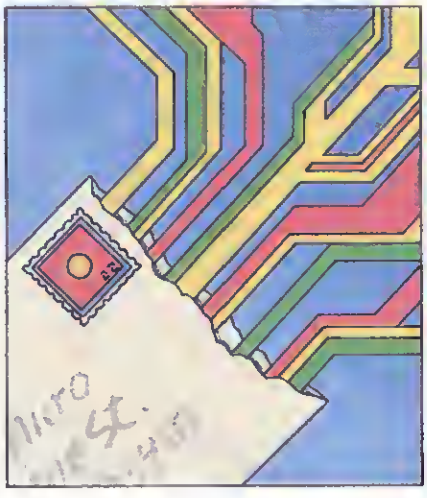
Regarding "faster," here are timings done on a 32K Model 4 using floppy disks (the disk I/O would be twice as fast for Allwrite with a hard drive, but the other timings aren't affected by disk I/O):

Operation	Allwrite	LeScript
	(in seconds)	
Read 32K file into memory from disk	3.8	30
Search for "xxx" (not found)	1.8	13
Globally replace all "e" by "***"	2.9	22
Block move about 2K bytes	0.5	8
Scroll 10 screens downward	1.5	9
Resave file to same disk	25	about 60

In all cases, Allwrite is several times faster than LeScript. It's possible that there's a later, much faster version of LeScript, and if so, please let me know what the current timings should be.

The second error affects Allwrite, Lazywriter, and LeScript. The chart on page 38 indicates that only SuperScripsit can do something with files bigger than memory. That is false. All three of the other listed word processors can chain files together to allow the user to at least print something that's bigger than memory, as indicated later in the chart.

Allwrite goes quite a bit further than this: The chains are used by the editor during text preparation, so the user can go forward and backward from one segment to another by pressing just two keys. Search-and-replace arguments are retained when this chaining occurs, so it's possible to scan through the entire 650,000 characters of the Allwrite manual (from a hard drive) in less than 10 minutes. SuperScripsit can't handle a file of that size on floppies, but Allwrite allows the user to change disks as often as necessary (it would take about 20 minutes to do the scan from floppies.)



Allwrite's structured file approach forces the user into good work habits by limiting each file to about 33–35K, but allowing the user to chain the files together, and even to keep three files in memory at once (for a total of 99K, if the extra 9K matters). To scan through the three files comprising 90K will take about 45 seconds, including reading all three from disk, searching through all three, and saving the one changed file back to disk.

Chuck Tesler
ProSoft
N. Hollywood, CA

What's Mr. Tesler complaining about? You'd think I accused Allwrite of being slow. In fact, I like Allwrite very much, and I think my comments reflected that. I said this about Allwrite: "The editor is fast, powerful, and friendly." When I said that LeScript's editor is fast and efficient, the comparison was not with Allwrite alone but with the Model 4 word processors as a group. For example, inserting with SuperScripsit is a pain.

Project 80, Roger C. Alford's monthly column, will return in the April issue.

80 Micro's BBS is open 24 hours a day. It offers programs you can up- and download, special-interest groups, and a classified section. You can reach the board at 603-924-6985; UART settings are 300/1,200 baud, 8-bit words, 1 stop bit, no parity.

Tesler apparently misunderstands what is meant by files bigger than memory. Perhaps I should send him a disk containing a 140K text file (long text files do exist, good work habits notwithstanding) and ask him what word processor he'd like to read it with. SuperScripsit, obviously.

I pointed out that SuperScripsit's ability to handle long files reduces its speed and efficiency. I pointed out in the table that Allwrite can chain files together for printing, and I praised in the text of the article Allwrite's ability to link disk files, even across disks. These are more or less the same points that Tesler makes. He refers to my comments as errors. In fact, they're quite accurate.

—David Dalton

Model 4 Lament

I bought a Model 4 in August 1985 from a local Radio Shack. I now have a $799-plus computer sitting in my living room. Next to it I have two game disks that I also bought from Radio Shack, a few game and household programs that I've written myself, and a few more that I can use on the TRS-80 that I found in different books and magazines.

I have a subscription to *80 Micro* and read every word of every issue, but most of it is just too much for me. Likewise, I've read all of the literature that came with my Model 4 several times, but again most of it is over my head.

Since I bought my computer, I met a guy at work who owns a Commodore and a whole line of equipment and programs for it. He has two disk drives, two printers, two monitors, one hard disk, and nearly 200 programs. He bought his original system for about the same price I paid for the Model 4, but it's much less now. Most of the programs he got for free, due to Commodore's greater popularity and "user support."

All I ever hear from him is what a bad choice I made in buying my "Trash-80." I ask you, can I really tell him that he's wrong and have any ground to stand on?!

Paul R. Withun
El Paso, TX

Do any of our readers have a response for Paul?

—Eds.

Send your correspondence to Input, 80 Micro, 80 Pine St., Peterborough, NH 03458. We reserve the right to edit letters.

Illustration by Mark Fisher

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Q: I have a Model III and a DMP-400 printer. As I sit and write to you, the cursor on my SuperScripsit 1.02.08 (with all the patches sent from Radio Shack) sets up a blink when I pause to think what I want to write. With the hours I spend writing, it's not long before I'm hypnotized, cross-eyed, and cross!

I've tried POKE 16412,1 in DOS and then calling Scripsit, but suppose Scripsit "resets" with the DOS in it (now you know I know just enough about machine-language to be dangerous!). I called Radio Shack Consumer Service and they know of no "turn-off-the-blinker" patches.

It seems that somewhere between Model III Basic DEC. CHR$(code) and SuperScripsit USR systems DEF FN key and DEF FN printer code there should be a solution. I am frankly unable to understand the instructions given in the SuperScripsit manual for programming the code sequences if an instruction doesn't start with a printer width code. I've taken off all other printer utilities and the help file on my working copy. *(Marjorie Wootton, Roswell, NM)*

A: The function-key definitions SuperScripsit uses are only for manipulating text and sending special codes to the printer. Sorry, but that isn't the way to do it.

Unfortunately, I don't know of a way to disable the blinking cursor. The problem is that SuperScripsit uses its own video display routine to control the cursor. Can anyone else help?

Q: I have a 128K Model 4 with two disk drives. I'm interested in plotting graphs of three-dimensional equations of the form Z-F(x,7). Can you tell me the differences between Radio Shack's high-resolution board and the one called the Grafyx Solution from Micro-Labs Inc.? I'm interested in the price/performance ratio, documentation, commands, programs available for each, and the feasibility of my installing the Radio Shack version. Also, should I be concerned with the possibility of overheating? Are there any other boards I should consider?

Finally, can you please explain the differences between TRSDOS 6.1 and 6.2? Thanks. *(Douglas E. McMonigle, Fortuna, CA)*

A: Never having worked with either high-resolution graphics board, I can't really tell you their differences. Installing the Grafyx Solution board is easier; it does add more Basic commands so you can control the board, but beyond that I'm not sure (see the November 1985 issue of *80 Micro*, p. 119, for a review of the Grafyx Solution board). Do any readers have comments on the two boards?

Yes, you can install the Radio Shack board, but such installation isn't for the electronics novice. If you decide to install the board yourself, make sure you also get the installation instructions with it (unless you specifically order them with the board, they aren't sent). Radio Shack National Parts Division (900 E. Northside Drive, Fort Worth, TX 76102, 817-870-5662) can ship the board directly to you.

Overheating problems depend on where you are. In the Southwest, for example, computer overheating is always a factor to consider in a non-air-conditioned room. If you're worried, it's easy to install a small muffin fan at the rear of the computer to combat the heat.

Most of the differences between 6.1 and 6.2 are hidden in the interior—a few sections have been rewritten to increase the speed and response of the DOS. There are also fewer bugs to contend with. If you're currently using 6.1, you'll find it advantageous to switch to the newer version.

Q: My 4K Model I is in excellent condition. I'd like to upgrade it as economically as possible.

What are the limits of the highest feasible upgrade? What are the approximate costs? Can I do part or all of the work myself? *(Harold B. Harrington, New Castle, PA)*

A: For the Model I the limits are fairly low: 64K RAM, internal RS-232 board, parallel printer port, and double-density disk drives. You can, of course, install a hard disk drive, but that's simply plugging a cable into the correct connector. The biggest system I've heard of had 64K RAM and four 80-track, double-sided disk drives.

The costs depend on where you get the materials. Upgrading the RAM is cheap—you can buy the 16K chips for about $10 per set of eight. The Expansion Interface can run anywhere from $100 to $400 depending on what's in it and where you buy it. You can buy the disk drives for about $100 each with case and power supply. The double-density adapter will cost you another $100. And then there's the RS-232 board, another $100 if you can find one for your Expansion Interface.

The upgrades are fairly simple to do yourself, whether you're electronically inclined or not. The biggest prerequisite is attention to detail. Never start an upgrade if you don't understand every detail involved. If you're a meticulous person and can use a soldering iron, the upgrades can be simple and fun. If not, you probably shouldn't do the job yourself.

I'd suggest getting a used Model III or 4 (adding drives to those machines costs about the same as adding them to the Model I, but the end result is more attractive). You should be able to pick up a used Model III for the same price you'd pay to upgrade your Model I.

Q: I have a Model III, a DMP-200, and disk SuperScripsit. Where can I get the necessary patches to take full advantage of the DMP-200 with Scripsit? *(Ronald R. Oglesby, Denver, CO)*

A: The later versions of SuperScripsit include drivers for all the Radio Shack printers. If your copy doesn't have one for the DMP-200, check with your local Radio Shack store about getting one added to your disk. With the correct driver installed and the printer control functions available in SuperScripsit, you should be all set.

Q: I have a two-drive Model III and use TRSDOS 1.3. I have about 1,850 names and addresses on my run

Illustration by Mark Fisher

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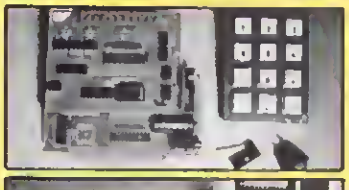

A-BUS new Isolated Input Card: IN-141...$49

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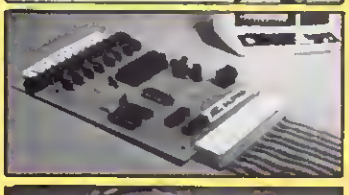

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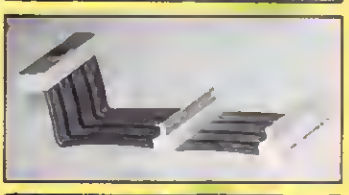

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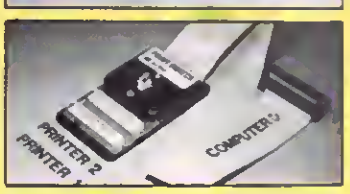

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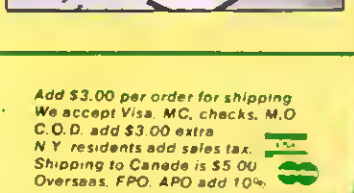

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time and data disks. I need to use Scripsit with this mailing list.

Can I transfer all these names and addresses to Scripsit so I wouldn't have to type them in again? Can I use any other DOS system besides 1.3? *(Vernon Shirley, Moultoon, IL)*

A: I assume that what you want to do is merely transfer the names to a format your word processor can read. That's simple enough for a Basic programmer. If you aren't familiar enough with Basic to do it yourself, check with a local TRS-80 user's group to see if anyone might be interested in helping you.

What you want is a program that will read the mailing-list file into a new set of files, each of which is small enough to load into your word processor. The task is fairly simple, but time-consuming while it's working. If the data file is random-access, your program will need to read each name/address and send it out to the new file with carriage returns inserted at the proper places so the entry looks like a normal name and address instead of having all the information on one line. The program can also remove any of the mailing-list auxiliary information kept with each name/address entry (for example, the sorting codes, which you might not want to fool with).

If you want a way to merge the mailing list with letters, the task becomes more difficult, and could be impossible to implement depending on the word processor and mailing-list program you're using.

You don't have to use TRSDOS 1.3 (you can use NEWDOS/80, DOSPLUS, MULTIDOS, or LDOS for the task), but you should talk with the manufacturers before buying any of them. Depending on what you want to do, you might find some DOSes harder to work with than others. And only MULTIDOS makes it easy to switch back and forth between itself and TRSDOS 1.3.

Q: Recently I installed two disk drives in my Model III by myself. Unfortunately I didn't use Tandon drives but bought TEAC FDD-50A drives on sale.

After buying TRSDOS 1.3, I noticed that the DOS hung up in an "auto function engaged" operation right after I input the month/day/year and time. I couldn't proceed with the DOS. I encountered no problems when I replaced my TEAC drives with a friend's Tandon drives.

I believe the stepping rate required for my TEAC drives is slower than Tandon's. To use my drives I want to increase the stepping rate within TRSDOS 1.3. Can you suggest how I can modify my TRSDOS? *(Ed Filipczak, Sycamore, IL)*

A: If you'll check the August 1985 issue of *80 Micro* (p.75), you'll find a patch that lets you modify the stepping rate used by TRSDOS 1.3 with the disk drives. I believe that the TEACs use a stepping rate of 12 milliseconds (ms), whereas TRSDOS assumes your drives can step at 6 ms.

Q: One of the most useful commands on my Model I Level II Basic is PRINT CHR$(31), which clears the screen from the current cursor position to the end of the screen. I'm currently converting to a Tandy 1000, which doesn't have the PRINT CHR$(31) command. The equivalent command on the Tandy 1000 is control-Z.

How do I execute a control-Z from a Basic program? *(Joseph Molacria, Yonkers, NY)*

A: Control-Z is just CHR$(26). Try putting that after a Print command in your Basic program.

Q: I have a 128K Model 4 with two disk drives and a Line Printer VI currently running under TRSDOS 6.2. In the accompanying manuals, I read that one can program up to 12 multitasking routines with varying priorities.

Is it possible to hook up a dumb terminal to my Model 4, have it access the upper 64K of memory while the 4 runs on the lower 64K, and do all this through the multitasking SVCs? If this isn't feasible, is there another way to do it? Are there any software packages available to do this for me? If this can be done, how much programming would be required? Would I need to make any hardware modifications? *(Paul H. Butler, Greenwich, NY)*

A: Be careful how you use the word multitasking. It has several meanings and a lot depends on your definition. For example, TRSDOS 6.2 is already running in a multitasking environment: It steals time away from your programs in order to keep the clock properly updated. Some applications that access a disk will turn off this multitasking before they begin to prevent system crashes and other unpleasant results.

In fact, if you examine your manual under the System command, you'll see the Smooth option explained. This option makes it possible for you to continue typing while the DOS accesses the disk drives, without losing characters. Its drawback is that some drives might lose characters every once in a great while when transferring data to the CPU.

Perhaps you misunderstand what the manual means by multitasking. This refers to minor chores that need to be done at periodic intervals, or when the CPU receives certain priority signals. These tasks are given priorities: The CPU ignores a low-order demand until it completes a higher-order task. If the CPU is executing a high-order task when a higher priority demand is made, it stops the lower task and puts it aside until it finishes the higher one. This is known as time-sharing the CPU, where two or more tasks have equal access to and demand for it.

You want to have two programs executing simultaneously. In that situation, the Z80 slows down by over 50 percent. The CPU has to divide its time into "slices." During time slice A the CPU services one task, during slice B the other. In between these two slices the CPU must stop what it's doing, save all its registers and temporary memory areas, and reload all the data it saved from the previous time-slice switch into the proper places.

The end result is that the computer takes almost three times as long to run a program as it does with only one task. When one of the two tasks accesses a disk drive, the other is locked out until the disk drives finish transferring all the data. In that time, anything you type in is ignored. Using the TRSDOS 6.X SVCs won't deliver what you want; you'd find one or the other of you locked out and forced to wait.

If it were practical to time-share on the Models III and 4, someone would have done so long ago. Unfortunately, the drawbacks are too costly.

Q: Do you know of any multifunction boards to fit the Tandy 1000? At minimum I'd like clock/calendar, serial port, and memory. *(Honk Fritze, Renton, WA)*

A: Computer Plus (P.O. Box 1094, 480 King St., Littleton, MA 01469, 800-343-8124) has several boards listed in their advertisement but no details on their features. Micro Mainframe (11285-E Sunrise Gold Circle, Rancho Cordova, CA 95670, 916-635-3997) also has a multifunction card for the 1000, called the 4N1. The board with the most features seems to be the TanPak from Hard Drive Specialist (16208 Hickory Knoll, Houston, TX 77059, 713-480-6000). And PBJ (P.O. Box 813, 5725 Kennedy Blvd., N. Bergen, NJ 07047, 201-861-0126) has a board called the MFB-1000. Give these companies a call and ask for details about the boards they sell. (For reviews of these boards, see *80 Micro*, January 1986, pp. 36 and 121.)

Q: I'm having a problem installing Radio Shack's high-resolution graphics kit (catalog number 26-1125). I need more detailed instructions about modifications necessary to the Model III to accommodate the graphics board. *(Richard F. Seipp, Newfoundland, Canada)*

A: The board is supposed to be Radio Shack-installed and they assume that the technician has been to one of their training courses on how to fix/upgrade the Tandy computer line. This does make it tough on the do-it-yourselfer.

I can't give any details that aren't already listed in the instructions. You do have to cut a few traces on your Model III CPU board and reroute a trace to another chip. If you're having difficulty getting the chip numbers to match your computer, then you must get an addendum sheet that details how to connect to your particular CPU version. Call Radio Shack National Parts Division (900 E. Northside Drive, Fort Worth, TX 76102, 817-870-5662) for information.

Q: Regarding the article "Little Wonder" (December 1984, p. 73): I have a two-drive 48K Model III and use TRSDOS 1.3. I changed line 380 from Q="DIR" to Q="D" as directed for TRSDOS 1.3, but I always get a "Syntax error line 380" when attempting to access the directory.

Also, in the print/display mode, page 80: "If you choose to display or print only certain sections of the file, Easydata displays a new set of prompts to selectively retrieve only specified files. . ." and so forth. I don't understand these instructions and would like to see an example or two so that I can start experimenting on other combinations.

FIELD?	This is clear.
CONDITION (= #> <)?	Example?
COMPARE WITH ?	Example?
CONNECTIVE (AND/OR)?	Example?

(Siegmund T. Gayer, Houston, TX)

A: First, change the statement from 'Q$="D"' to 'Q$="D:"'. TRSDOS 1.3 requires a colon between the directory specifier and the drive unit specifier. The finished command, as given to the system by the CMD command, should read "D:n" where n is the drive number. Don't put any spaces between the colon and the drive number. Change line 38 to include a print statement just before the CMD command to see if the string Q$ actually contains the proper command sequence.

As an example of searching sections of the file, let's say you have a field called "Age." Furthermore, you want to print out only those entries with a value above 21. First, tell the program to use the Age field (which you already understand). Next you can choose whether to select only those fields that are either equal to, less than, more than, or not equal to the age you give it (the program is actually going to take the character string you give it in answer to the next prompt and compare that string to each mailing-list entry under the field "Age"). You want to select only those names whose ages are greater than 21, so answer the prompt with a greater-than sign. The string you want to compare is 21, so that's what you type in in answer to the prompt.

Finally, the "Connective?" prompt is trying to determine if you want more than one string compared to the Age field. This is handy for searches in which you want printed only the ages 21 and 22. You can select once for both strings rather than running the program twice. Or you may have multiple strings in a field and want to print only those names that match both strings you type in in answer to this series of prompts.

That should be enough to get you started using the program; the rest you can figure out by trial and error.

Q: I own a 48K Model III. Every so often the computer goes berserk for no apparent reason. Uppercase becomes lowercase, the cursor and any graphics change form, certain keys don't work anymore, and the cursor just takes off across the screen, sometimes printing garbage along the way. It happens with any program at any time.

If I take the top off the computer and set it aside, the problem disappears. I then put everything back together and it works fine for a day, a week, or even a month or two.

I've talked with the managers of several Radio Shack service centers across the United States and they gave me a few ideas, but some made no sense. One said that it was probably voltage spikes. Granted I don't have a protector, but why would this problem present itself after I've owned the Model III for a year? The computer has always been in the same place, and the current in Venezuela, where I live, is fairly good—115V 60 Hz.

Another suggested that the CPU was getting too hot, but sometimes the problem starts two minutes after I turn the unit on. A third suggested that sometimes the insulation between the CPU board and the mounting screws becomes worn and certain circuits could ground out. I put some insulation around the holes and it corrected the problem for about four months, but now it's back!

Yet another suggestion was that I might have a defective chip in the RAM sector of the CPU. A new set of chips would cost me about $150 and I'd hate to spend that amount of money and still have the problem. Please let me know what you think. It's driving me wild! *(Brad Corson, M-104 Jet Cargo International, Miami, FL)*

A: Humidity is likely the culprit. The Tandy computer wasn't designed to work in a high-temperature, high-humidity environment such as that found in Venezuela. It's possible for microorganisms to feed off the insulation and short things out; that might be why reinsulating stopped the problem temporarily.

It doesn't have to be the CPU that's overheating, either. The early Color Computers frequently had a bad solder joint in the power supply. When it became too hot, the joint would flex and separate for a microsecond, just long enough to cool slightly and unflex. This produced almost exactly the same symptoms your Model III displays.

I suggest you get a small box fan to mount at the rear of the computer and see if that helps. At the very least it will eliminate the possibility that overheating is the problem. Anyone else care to comment?

Q: I have a Model III and will be installing Aerocomp's single-drive upgrade kit and 48K of memory. Which operating system offers the best performance/dollar value? Is LDOS worth the extra $10 over DOSPLUS 3.5? *(Bill Rollins, Honolulu, HI)*

A: Which DOS you use is a very personal preference. DOSPLUS includes a number of special Basic commands (such as INPUT@ as a match for PRINT@) that make for faster and more efficient programs. MULTIDOS is the most like TRSDOS, but it's faster, easier, and more powerful. It has a full set of programming commands built into Basic that really make it easy to create and debug programs.

LDOS and NEWDOS/80 are for real program and hardware hackers. Both offer lots of features to customize the operation of your computer to special equipment and needs. LDOS 5.1.3 for the Model III is very similar to TRSDOS 6.X, and you can swap many programs between the two without problems. That isn't necessarily true for the other DOSes. While they can run some TRSDOS 6 programs, you usually must spend some time converting them to your DOS.

In the December 1985 column (p. 17), Edward R. King of Bloomington, IL, asked about a Model I Level II driver for lowercase. H.T. Samuels, 6924 Wittman Drive, Fort Myers, FL 33907, has such a driver available.

Terry Kepner is a freelance writer and programmer. He writes monthly columns for Portable 100 Magazine, Pico, *and* 80 Micro. *He's been writing about microcomputers since 1979.*

There's No Business Like Show Business

Hot Items

No blockbuster computer introductions came out of Comdex/Fall 1985, the big annual computer dealers' exposition in Las Vegas last November. But, as usual, plenty of new hardware was on display, and the show set some industry trends for 1986.

Tandy officially introduced the Tandy 3000, an IBM PC AT workalike, during the show. However, the announcement lacked the hoopla that accompanied the debuts of the Models 2000 and 1000 in years past. Instead, at an invitational press conference, Fort Worth's powers that be proclaimed Tandy's stability and corporate commitment to providing "high-quality products at very affordable prices" (see Tandyland below).

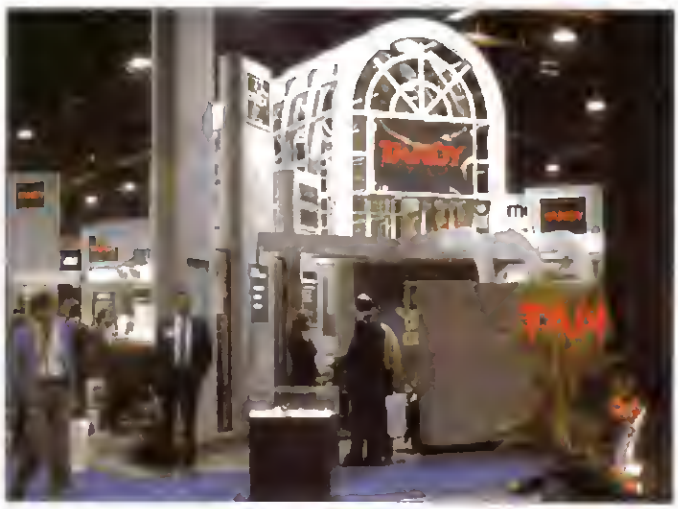

Photo 1. The Tandy booth at Comdex/Fall.

The Tandy booth featured an impressive display of computers, with the Models 1000, 3000, and the new Tandy 600 laptop getting prominent billing (see Photo 1). Tandy showed no Model 4Ds, 100s, 200s, or CoCos; the emphasis was entirely on their MS-DOS line. However, Tandy senior vice president Ron Stegall assured me that they weren't slighting their older machines, and especially that Tandy would continue to support the 4 (see Face to Face, p. 20).

Tandy's new 3000 and 600 had plenty of competition at Comdex—PC AT clones and laptops were everywhere. But two kinds of peripherals drew more attention than any computer: laser printers and optical disk storage.

While Hewlett-Packard's Laser Jet printer pretty much had the field to itself through most of 1985, that's all changed. More than 40 companies displayed laser printers at Comdex. Though features like speed and buffer capacity differed from model to model, the printers' price tags were remarkably similar, hovering around the $2,995 mark. But prices are on the way down. One newcomer to the laser printer market, QMS Inc., unveiled a six-page-per-minute (ppm) machine priced at $1,995.

Laser printers' high-quality output and speed should make them the "must-have" item of the year for small- and medium-sized businesses. But the products I saw had something in common besides price: lack of availability. Most vendors weren't expecting volume delivery for several months, and waiting lists were the rule.

The other hot item for 1986 is optical disk storage, which exploits the technology used to manufacture and play compact audio disks. CD-ROM applications, which permit storage of huge amounts of data on a read-only compact disk, are beginning to come to market. For example, the Grolier Publishing Co. is selling its entire encyclopedia on a single optical disk for $199, including the data base software required to find information in two seconds or less.

Archival use is the first step in applying optical technology to mass storage. The next wave is digital read and write (DRAW), also called write once, read many (WORM), which should soon be available and affordable. Sony introduced a DRAW product at Comdex that was due for shipment in volume early this year.

Beyond its great capacity, optical storage is appealing for two reasons. First, disks last an estimated 30 years. Second, the medium is extremely reliable, with an error rate of 1 bit per 10 bits for disks and players. These factors, along with predicted prices of $500 or so for disk drives, make optical technology worth watching in 1986.

Developments on the horizon include integrated data, video, and audio on a single optical disk; and erasable optical disk technology (EDRAW), which should reach consumers in 1987.

Tandyland

At its unveiling of the Tandy 3000 last November, Tandy rolled out the heavy artillery, including CEO John Roach and Radio Shack president Bernie Appel. In fact, Tandy executives probably outnumbered the few dozen invited members of the press.

Appel outlined plans to spend $80 million over the next five years remodeling Radio Shack stores to make them the "technical store of the future." As for computer products, Appel said the Tandy 1000, though only a year old, had replaced the Model 4 and Color Computer as the mainstay of Radio Shack's computer business. As the star of the Tandy line, the 1000 is now sold in all Radio Shack stores; the Model 4D is available only at Computer Centers and Plus Computer Centers. According to Appel, the 1000 is the top-selling IBM PC-compatible in North America.

Next, Roach reminded reporters that Tandy's strength is in the home, education, and small-business markets. He pointed out that consumers spend four times as much money on microcomputers as on VCRs, and noted that, despite what some analysts are saying, micros continue to be the "hottest thing since sliced bread."

Vice president of computer merchandising Graham Beacham outlined Tandy's overall marketing strategy in introducing the Tandy 3000, targeted at the 15 million small businesses in the U.S. The machine's operational compatibil-

Photograph by Penelope Hamblin

ity with the IBM PC AT and 12 megabytes of memory under the Xenix operating environment make it the single most powerful system Tandy offers. Tandy hopes the 3000 will become the centerpost of its Vianet networking system, working in connection with Tandy 1200HDs and 1000s.

With the MS-DOS line generally geared toward business, Beacham sees places for the 1000, the portables, and the Color Computer in the home market; and the 4D and the 1000 holding places in education.

Last on the docket came Ron Stegall, senior vice president of Tandy's Business Products Division. He emphasized that the 3000 was for buyers needing high-performance compatibility in small- and medium-sized businesses. Stegall mentioned data processing, office automation, and educational administration as examples of potential uses for the new machine.

Tandy has set up a Training Support Organization in 60 cities to help buyers learn how to use its machines, either at Radio Shack Computer Centers or on location.

Update

Searchers after a more readable display for laptop computers are taking interest in a new flat-panel electroluminescent display (ELD) from Planar Systems of Beaverton, OR.

Planar's product, called the EL8353M, features 640- by 200-pixel resolution and full 80-column by 25-line text. Unlike most liquid crystal displays (LCDs) now in use, the ELD offers high contrast and a wide viewing range. The panel weighs 16 ounces in its portable configuration and draws 12–14 watts of power, considerably more than current LCDs. Planar's president, Steven Hix, predicts that they'll be able to get the screen's power draw down to 5 watts.

The screen's current price is also high at $775 each in quantities of 1000. But Hix forecasts a drop to well below $300 over the next two years.

The new screen provides an alternative to LCDs, which are cheap but often unreadable, and to gas plasma displays, which are readable but power-hungry and expensive. According to Planar, three large vendors will use ELDs on new laptops this year. Speculation is that the three are Compaq, Data General, and IBM.■

Face to Face

During Comdex/Fall, I spoke at length with Tandy senior vice president Ron Stegall. Our conversation covered a variety of subjects; here's a sampling.

On the Model 4/4D's status: "The 4 continues to sell well. . .it would be a big mistake to stop supporting the Model 4." Will the 4 be alive a year or 18 months from now? "I don't think there's anything magic about 18 months. Don't get in your mind that we have a date out there because that's not my philosophy about how a product goes."

About persistent rumors that the 4 is doomed: "[The] press understands MS-DOS, but doesn't understand the installed base of the 4 and how it continues to sell. We intentionally came out with the 4D including DeskMate to get rumors [of the demise of the 4] stopped."

Stegall said the 4's performance is "excellent in education" and Tandy considers it a capable computer for home and small-business use. But the latest 1986 Radio Shack catalog contains no new Model 4 software products, and Tandy has no plans to produce any in-house. According to Stegall and others at Tandy, "Third-party software for the 4 is a fact of life." And for the product itself? "We believe that as time goes on, because of just the sheer quantities that the 1000 is selling, that the price advantage of the 4 is going to slowly slip away."

On Tandy's role in education: According to Stegall, the Tandy 1000 isn't hurting educational sales of the 4 because "large Model 4 customers

Photo 2. Tandy senior vice president Ron Stegall.

continue to buy Model 4's. What's neat is [the Tandy 1000 has] taken over where Apple once was." Tandy also sees a place for the new Tandy 3000 in education.

On the Tandy 3000: Microsoft's Xenix multiuser operating system "is important to the 3000 and we're going to tout it as an application in business." Tandy foresees offices using the 3000 as a hub ringed by 1200s and 1000s; this hinges on the first quarter introduction of Xenix V.

But Tandy already has a Xenix machine in the Tandy 6000, and with it owns a big piece of the corporate multiuser pie. Stegall had this to say about competition between the two machines: "Unix software has not come in the numbers that some would have us believe. The great majority of software developed for the 6000, we own. When software for the 286 comes under Xenix, it could provide some competition for the 6000, but that's not where it is today."

On the future of the Color Computer: "Tandy computer users are basically in the home and small business. The Color Computer, the Model 4, and the 1000 are the machines used by these masses." Anticipating the Christmas season, he noted that the CoCo "continues to sell unbelievably well. It's very seasonal and we're going to sell absolute truckloads during this next two months."

Is the CoCo losing ground to the 1000? "Nobody can sell an $88 machine and make money at it. The 1000 is also in the home market, but they are in different markets simply by the difference in price."

On future products from Tandy: Since the hottest new products Comdex were laser printers and CD-ROMs, I asked when Tandy would get into those areas. "Laser printers are absolutely wonderful technology," said Stegall. "It's still overpriced but that price is dropping so rapidly that you've got to believe we're looking very, very hard at it.

Stegall wasn't quite as definite about CD-ROM technology. "[CD-ROMs are] an interesting theory, but there are a lot of things that have to be answered, a lot of ground that has to be plowed, and even after all that ground has been plowed, you still have a huge pricing curve before it can ever be what everyone wants in their living room. We're looking at it. We have people following it closely, but it's not going to be in next year's book."■

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Rerun

P.G. Quartermain wrote to say he appreciated **Thomas L. Quindry's upgraded Basic compiler, FastBas, for the Models I and III** ("Running Like the Wind," January 1985, p. 42). However, he notes that if you want to write a Basic program and merge it with the compiler, you must first store FastBas on disk in ASCII format. Since line 2710 is a few characters too long, you get a "Direct input of data" error when you attempt the conversion. To circumvent the problem, Quartermain suggests deleting IFPN=37 from line 2710 and inserting this line:

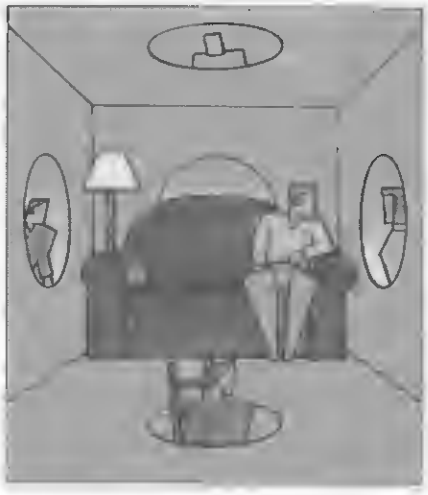
```
2705 IFPN<>37GOTO2720
```

Improved Script

Readers are evidently still getting good mileage from **Scripsit**. David L. Trafton of Bethesda, MD, developed a **patch to conquer a Model III/4 incompatibility problem**. Trafton uses Model 4 Scripsit for editing telecommunications files on the Model 4P at work, but he prefers Model III Scripsit for general word processing on the 4P and his Model III at home. While using LDOS with Model III Scripsit appeared to afford the necessary compatibility for TRSDOS 6.2 files, he found that LDOS 5.1.4 wouldn't work properly with Scripsit 3.2. Using a patch to bypass the Scripsit code that tests for the operating system version tricks Scripsit 3.2 into thinking it's working under TRSDOS 1.3 and eliminates the difficulty (see Program Listing 1).

From Greeley, CO, comes Michael Shrout's advice on **loading Scripsit files into DeskMate**. First, create a DeskMate file consisting of a single 1AH character (control-Z)—call it Append/DOC for convenience. Use the S,A command to save the Scripsit file in ASCII, adding DeskMate's normal /DOC extender. Finally, to link the Scripsit and DeskMate files, type in APPEND APPEND/DOC TO FILE NAME/DOC (STRIP).

Scripsit ends a file with a 00H character while DeskMate uses 1AH. If you don't change 00H to 1AH, DeskMate lets you scan beyond the end of the file into active memory; editing in that area can cause disastrous results. Transferring files from DeskMate to Scripsit is easy: Scripsit accepts DeskMate's /DOC files without changes.



Tandy Twosome

Michael Shrout also worked out a way to **use DeskMate with Memdisk on a three-drive system**. After booting a normal TRSDOS 6.2 system disk, you can type in DO FILE NAME to execute Shrout's five-line JCL (job control language) file (see Program Listing 2). Then insert the DeskMate disks, and type in DM and press the enter key.

When you use Text, DeskMate's word processor, you can save and load to drive 2. Be aware, though, that files on this drive don't show in the main menu unless you use the Swap function. Files must also contain a /DOC extension for Text to load them from drive 2.

A **bug in TRSDOS 1.3** moved Adam Rubin of Wappinger Falls, NY, to write a **set of pstches** (see Program Listing 3). Apparently, TRSDOS 1.3 opens all files with the LRL (logical record length) given in the directory, even if you request a different length. Rubin's modifications let you alter record size.

Continued Support

When LNW Research Corp. went out of business, they left a lot of users high and dry. Two readers wrote to request **assistance in tracking down a source for LNW products**. Although parts and software for LNW equipment are becoming scarce, you can still get them from Erb's Computer Systems (10840 Hunter Ave., Whittier, CA 94601, 213-699-6684). Erb also repairs LNW equipment if it was factory built.

Tandy's **DWP-210 has joined the ranks of discontinued products**. That isn't news to DWP-210 users like Thomas W. Towne, Peter G. Taylor, and Glen Cahn who tried to buy a bidirectional tractor feed (catalog number 26-1443) for it. Amy Arrut, assistant manager of marketing information, acknowledged that Tandy is currently backordering this item as of November 1985. According to Arrut, Tandy plans to deliver the bidirectional tractor feeds already on backorder; they'll continue to repair the DWP-210.

Error Messages

Andy Levinson's **Model 4 scroll-protection routine** (Reader Forum, December 1985, p. 25) contains a **typographical error**. The published routine omitted a minus sign; the correct equation for the fourth array variable is N%(3) = – 1384.

Bugs invaded **Roxton Baxter's article on solving equations** ("Finding Your Roots," February 1986, p. 48). Lines 5020–5040 of the Basic subroutine that allows you to change the value of R3 should read as follows:

```
5020 Y(3)=(X(1)+X(2))*U(1)-X(3)
5030 Y(4)=0.026*LOG(X(1)/6.4E-15)-X(4)
5040 Y(5)=0.026*LOG(X(2)/6.4E-15)-X(5)
```

The list of Solver's solutions for the unknown values X(1)–X(5) (when R3 is 1000) should contain five equations. Delete the fourth equation listed, X(4) = 3.193.

Program Listing 1. Scripsit Patch

```
PATCH SCRIPSIT/CMD:0 (E0B,43=18 05)
PATCH SCRIPSIT/CMD:0 (D0B,DB=18 10)

End
```

Program Listing 2. JCL file for DeskMate.

```
system (drive=2,driver="MEMDISK")
D
D
Y
set *CL to COM/DVR

End
```

Program Listing 3. Set of patches for altering record length of TRSDOS 1.3 files.

```
PATCH *2 (ADD=502D,FIND=3E03835F1A,
         CHG=1313131A77)
PATCH *2 (ADD=5032,FIND=7723131A,
         CHG=233A0E50)
PATCH *2 (ADD=503F,FIND=1E,CHG=11)

End
```

Illustration by Mark Fisher

CP/M...The Software Key That Unlocks Your Model 4

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Communication program included	YES	NO
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Assign multiple drives to HD	YES	NO
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"WE KEEP YOU RUNNING"

Tandy's Model 600: You *Can* Take It with You

by Bradford N. Dixon

★★★½

The Tandy 600 comes with 32K, one 3½-inch disk drive (360K), and Microsoft Works, an operating system manager with a word processor, calendar, data base manager, telecommunications, and spreadsheet. Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102. Catalog number 26-3901. $1,599.

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

Photo 1. Tandy's Model 600 laptop.

The Tandy 600, the latest addition to Tandy's line of portable computers, is the best combination yet of a functional, full-featured laptop. But compare it with the ideal laptop some of us have in mind and the 600 doesn't measure up: Although it runs a low-power 8088, it isn't IBM PC-compatible; it weighs in at a porky nine and a half pounds (11 with the external power supply); and the screen is still hard to read.

Hardware

The Tandy 600 sports some significant differences between it and its predecessors, the Models 100 and 200: a single-sided double-density 3½-inch microfloppy drive (which stores 360K), an 80-column by 16-line liquid crystal display (LCD), and an 80C88 central processing unit (CPU). Unlike the 100 and 200, which use an 80C85, the 600 contains a low-power CMOS version of the 8088 microprocessor used in the Tandy 1000, 1200, and virtually all other IBM PC-compatibles.

The 600 comes with a measly 32K RAM standard, with internal upgrade boards in 96K increments ($399 apiece) for a maximum, but oddball, RAM configuration of 224K. While this is contiguous RAM, your data files for any application can't exceed 64K.

Unfortunately, while these differences represent improvements over Tandy's older laptops, they're also disappointing. The LCD still isn't particularly readable, except under the best lighting conditions, even though the size and form of the characters are acceptable. Tandy uses the 80C88 that could run MS-DOS software but doesn't, and Tandy doesn't guarantee that the microfloppy disk drive will read other MS-DOS 3½-inch disks.

Software

However, the 600 does offer a powerful package of applications comprising Tandy's best bundled-software offering to date. It is grouped around an operating system manager called Microsoft Works, which runs the software and coordinates disk input/output with the internal microfloppy drive. (Microsoft Works was originally developed for the Zenith ZP-150 laptop.)

Like Tandy's other laptops, the 600 has a text/word processor, a schedule/calendar program, a data base manager, a telecommunications module, and a spreadsheet (Multiplan in a ROM cartridge). In a change from previous laptops, Tandy offers Basic as a $129.95 optional plug-in ROM cartridge. While it's inconvenient to buy Basic, you can still have all the applications and Basic available by transferring Basic onto a disk.

The Good Word

Like other portable users, Tandy 600 owners will probably use their laptops primarily as word processing workstations away from the office. The 600's word processor is functionally similar to Microsoft Word and provides word processing features lacking in the Model 100 and Tandy 200 Text programs.

Beyond the standard abilities to insert, delete, save, and print text, Word offers an advanced search-and-replace capability and a full variety of printout options. You can specify margin settings, set tab positions, define paragraph formats, center, justify, indent, and set page breaks and page numbering.

While working in Word, you move the cursor using the arrow keys for single spaces, the shift/arrow combination to move the cursor from word to word, and the control/arrow combination to move the length or width of a document.

Options for manipulating the text in a Word file appear on the command line near the bottom of the display. By highlighting the command-line cursor on the command of interest or pressing the first letter of a Word command, you can copy, delete, edit, format, insert, jump, merge, print, replace text, search, and set cursor and screen options.

Beyond these options, you can view extended text selection commands by pressing the F1 function key. The other function keys activate extended select commands to control text block manipulations, such as block moves, block copies, and block deletes.

The Word module is the best of Tandy's laptop word processors. It formats text as you'll see it on paper and gives you much greater control over the final look of a document than its predecessors on the Models 100 and 200. Although it will take some time to get used to, Word very capably performs almost anything you want to do.

Photo 2. The Model 600's liquid crystal display.

Dated Material

Like the calendar module in Tandy's DeskMate program, the 600's calendar acts as a scheduler and appointment book with an alarm option to remind you of upcoming events.

You can set a reminder start and end time for an event on a specified date. Unlike DeskMate's reminder, you can set each event with a priority level from urgent to low priority, and you sort items by priority or by other criteria. In addition, if you activate the alarm function, you can have it remind you of upcoming items before the event takes place.

The Calendar command line lets you copy calendar information to another file or within Calendar, delete Calendar information, jump to a month calendar screen, and print information from a Calendar page. You can also transfer information from the calendar data base to Word and insert it into a document.

For those of you who use desktop items like this, Calendar will be of some value. Many portable users are on the road with their machines and would rather be reminded of appointments by their computer than rely on an old-fashioned appointment book.

Circular File

For maintaining a Telcom phone book file, or storing names and addresses (or even favorite recipes), the 600's File program is certainly adequate. Yet, because it manages information in a horizontal format, it is difficult to use for anything other than lists.

You use the arrow keys to move from field to field and enter information in the fields you set up. The only time you press the enter key is to exit the edit mode of the program and return to the command mode.

As in the other applications, File has copy, delete, and edit options, and print commands, but has additional commands to find, insert, jump, lookup, and move data unique to this module.

The Find command lets you search your file for matches of up to two criteria. Insert takes information previously copied into the scrap buffer and puts it into another place in your data base. Jump moves the cursor to the specific row and column you identify. Lookup takes information from a specific column in one data base file and puts it in a column of the same name in the file you're currently using. The Move command will take a block of information from one point in the data base and move it to another location within the same file.

File was initially described as a PFS:File work-alike, but I found it much less versatile than any desktop data base manager. Nonetheless, as a program used to store large amounts of information in a list type format, File is certainly useful. Prospective purchasers should be aware that File is the weakest module amongst the programs.

In Contact

The Telcom module is far and away the most comprehensive of the 600's built-in programs. You can set up files for automatic log-ons and prompt responses, and you can set it to activate at a specified time, call a remote computer, perform necessary tasks, and log-off. You can create a phone book of frequently called numbers with communications parameters set automatically when you auto-dial the remote computer. In fact, the only thing wrong with Telcom is that the chapter in the user's manual doesn't contain enough information about it.

You can configure Telcom to automatically answer incoming calls as well as automatically dial out for remote computing. It supports both XON/XOFF and XMODEM file transfer protocols and can separate files too large for its download buffer into smaller files. Unfortunately, the documentation barely scratches the surface in telling you about Telcom's full abilities.

In addition to telephone communications, you can transfer files with Telcom to a desktop unit using a direct connection through the machine's RS-232C port and a null modem. Transfer rates are the same as on the 100 and 200, ranging from 110 baud to 19,200 baud.

Money Minder

Plan is the on-board name for this version of Microsoft Multiplan and it is functionally the same as the desktop version. If you aren't familiar with spreadsheets you'll find the simple tutorial in the user's manual easy to follow and will soon be building a variety of templates.

With a focus on the nontechnical user, Tandy's choice to stick with Multiplan makes the machine less intimidating and lets Tandy 200 owners upgrade to a more powerful machine without having to learn a new spreadsheet. You can interchange Multiplan files with Word, Calendar, and File files.

The User's Manual

The Tandy 600's user's manual's most glaring flaw is a dearth of applications examples. That's OK for straightforward modules like Word and Calendar, but File, Multiplan, and especially Telcom need more examples.

The manual's layout is easy to follow and the appendixes at the back answer questions about formatting disks and transferring files from one application to another. But this is one machine where you need to read the manual. If you start in on the machine without doing so, you'll become hopelessly lost and frustrated.

Conclusion

Tandy believes there is a definite need for a low-priced laptop computer with an 80-column display and disk storage. The market for portables centers on business applications. Word processing, number crunching, data management, and an ability to send and receive information over the telephone are crucial for the success of a portable computer. The Tandy 600 provides all these features in a manageable package at an affordable price.

But I can't wholeheartedly recommend this machine. Once again, Tandy has opted for a proprietary operating system. They've provided a machine with a base configuration of a meager 32K of memory when even 128K is considered skimpy. And the 600 uses an LCD that could well be obsolete a year from now.

The 600's strengths are its powerful software applications, which are head and shoulders above anything previously offered by Tandy. However, the machine can't be considered anything more than an intermediary step between the needs of current portable owners and the MS-DOS-compatible technology which will be available next year for the same price.■

Big-League Assembly-Language Programming

by Hardin Brothers

★★★★★

MRAS runs on the Models I, III (48K) and 4 (64) and requires two disk drives. Misosys Inc., P.O. Box 239, Sterling, VA 22170, 703-450-4181. $74.95.

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

Misosys's EDAS has been one of the best TRS-80-compatible assemblers available for the last several years. MRAS, Misosys's new assembler, is significantly more powerful, but significantly more complex, too. It's best suited to writing and maintaining complex Assembly-language programs rather than small utilities or modules you add to Basic programs.

If you use one of the older TRS-80 editor/assemblers, you may find it tough to adjust to MRAS at first. It isn't just a single program but a combination of seven separate tools, each used for a specific function.

To use MRAS, you write the source code for several program modules using its text editor, assemble each to a separate relocatable file, combine those relocatable files into a library with the MRAS librarian, and finally link the modules together to produce an executable program. If you are writing a small program, you can take shortcuts through several of the steps and produce a direct assembly of a /CMD program. But MRAS's real power is most apparent when you start to work on a major project. You can also automate many of the development steps with customized job control language (JCL) files.

The Editor

You don't need to use MRAS's editor to write your source code. You can use any text editor or word processor, as long as it saves text in ASCII format and terminates a file properly (you can get around this last restriction, too).

However, MRAS's Said text editor is flexible enough that it may become your favorite. Said's command structure is straightforward and easy to learn. If you're used to another editor, you can change the Said commands to fit whatever editing style you prefer.

Said is a full-screen editor that operates in four modes: insert and type-over (like most word processors), line insert for large chunks of new text, hexadecimal (hex) mode for any of the possible 256-character values, and quote mode to disable the cursor-movement keys and enter their character values when you press an arrow key. You can easily shift among modes at any time.

Like many text editors, you can use Said to delete single characters, words, lines, blocks of text, everything from the cursor to either the beginning or the end of the file, or all the text in memory. Said also has an undelete function that recalls and replaces text erased from the last delete command.

Said has a macro-key facility that can store up to 64 keystrokes and then repeat them a specific number of times. The macro command is useful if you find yourself having to type in the same sequence of keystrokes, since Said learns the sequence while you use them.

You can mark up to 10 blocks of text with Said and then move or copy them to other parts of your source code, save them as separate files, or print them separately from the rest of the source code. Said can also perform normal search-and-replace functions and can merge files from disk into the file on which you're working.

If you use a Model 4 with more than 64K of memory, Said can store blocks or separate files in the additional banks of memory. You can then switch between one bank and another or copy blocks of text between files stored in separate banks.

Said has a built-in decimal, binary, and hex calculator. It can issue DOS commands and automatically change entire words to upper- or lowercase. It also has a help menu you can display constantly or call up when you need it. But the help screen is only valid if you use the default Said commands rather than configuring the editor with your own set of commands.

While Said can't handle the line-numbered source code that some editor/assemblers produce, it includes a special program (FIXUP) that converts the source code of almost any editor/assembler into the Said format and also translates Said files to most editor/assembler formats.

The Assembler

The heart of the MRAS development package is the stand-alone assembler. It is upwardly compatible with version 4 of EDAS and can properly assemble any source file created with it.

While you can use MRAS to create /CMD files like most other assemblers, you can also create relocatable files. You can't run a /REL file because it's partially assembled, but you can link one together with other /REL files and then assemble the whole into a /CMD program.

The advantage of using relocatable

More powerful, but more complex than EDAS.

files is that you can create a number of modules to perform specific functions, which you can later link into any program you write. Since these modules are already assembled, you don't have to reassemble them each time you want to make a change in your program or correct a bug. Once you get used to the system of creating and testing modules separately, the process of writing Assembly-language programs becomes faster and easier. And you won't have to wait while the assembler recompiles a large program after you change a single line.

Although MRAS is compatible with EDAS and PRO-CREATE, it has many new features. You can force the assembler to scan the macro table before the opcode table if you want. Using this option, you can change the effects of the standard Z80 opcodes and could, conceivably, use MRAS as a cross-assembler for a different computer.

MRAS has several new expression operators useful in complex macro instructions, including those to obtain the low or high byte of a word value and others to test whether one value is less than, greater than, less than or equal to, or greater than or equal to another value.

The assembler supports a number of new pseudo-ops, including ones to assemble the system date or time as a byte string, to assemble a value as a four-digit hex string, to define a module's /REL file name, to select one of four segment program counters, and to declare symbols as global or external. Ten new conditional pseudo-ops and a half-dozen new miscellaneous pseudo-ops let you select assembler switches from within a source code module and write macro instructions that can handle any number of arguments.

You can also reset the default radix for numerical expressions at any point in a source code file. And /REL files can pass requests to the linker to search specific library files.

The Librarian

The most efficient way to work with MRAS is to create many small /REL files and link them together to make your final program. However, the number of /REL files on your disks may soon become unmanageable. That's when you need a library manager.

The library manager's purpose is to collect individual /REL files into single-file libraries of related modules. MLIB,

the librarian included with MRAS, starts by reading a library of /REL files into memory. You can then delete or add new files to the library, extract files for export to other libraries, and view a map of files already in the library along with their entry points and external symbols.

When you finish working with a library, MLIB can write it back to disk as either a /REL library or an /IRL library. The /REL library is compatible with Microsoft's M80 assembler and L80 linker, which are part of Radio Shack's Fortran packages. The /IRL library is more convenient and allows easier linkage of individual modules into a final program.

The Linker

After you create a number of /REL files, you use the linker program (MLINK) to pull them together into a single, executable program. MLINK is a command-driven program similar to the L80 linker. It accepts the same commands, but it also has several new capabilities. You can specify the load addresses for the code, data, and common segments of your program; specify the order in which to save the segments in the /CMD file; choose whether you want to add a comment or copyright notice to the beginning of the /CMD file and whether you want to have a five-character header at the beginning of the program; decide whether you want memory space allocated with the DS (define space) pseudo-op saved as bytes of zero hex on the disk; and specify whether you want MLINK to abort to DOS if it encounters an error during processing.

Like MLIB and MRAS, you can use MLINK either in an interactive mode or run by a job control language file. However, unless you are used to the L80 linker or a similar program, you may find the MLINK program the least friendly part of the MRAS package. It prints error messages and gives you information about the program it is building but never prompts for commands. This isn't a criticism but rather a warning that MLINK operates much the way other linkers do. You will have to study the manual carefully as you create your first programs with MLINK.

If you write a large program, MLINK may run out of memory while reading your /REL files and creating a /CMD program. If so, it will open a disk file and shift into a virtual memory mode to complete the linking process. Its virtual memory organization guarantees that MLINK can create any program that will fit in your computer; you won't have to worry about whether it will run out of room.

Overlays

Large programs or ones that must operate in limited sections of memory often get around space problems by using a system of overlays to load parts of the program into the computer as needed. The concept behind the use of overlays is fairly simple, but their actual execution can require hours of careful programming.

MRAS provides a powerful facility, through its linker and a special /REL file, that makes programming with overlays simple. You can have your program make calls to the MRAS overlay handler with the Z80's registers properly set and then issue special instructions to MLINK at link time. MRAS does the rest for you. The overlay system can handle up to 35 overlay subprograms—enough for almost any application program.

Cross-Reference

The final program in the MRAS package is a cross-reference utility identical to the XREF program included with EDAS and PRO-CREATE. You can use it to generate a list of all symbols any program module uses or to create an assembler source file of EQU commands for use in another program's source code file.

XREF is simple to operate, although you must remember to instruct MRAS to create a special file for XREF to use.

Conclusion

The MRAS manual is a terse but adequate 100 pages, with only six pages devoted to an advanced tutorial. The rest is a reference to each of the MRAS tools.

The documentation does assume that you're an experienced Assembly-language programmer. If you haven't had much experience with relocating assemblers, you may have to reread some sections several times to understand them.

I did find the manual too brief in several places. A few more sentences on the differences between /REL and /IRL libraries and a clearer explanation of how to use segments would have eliminated confusion. However, the documentation is quite similar to the EDAS manual and it seems both accurate and complete.

The Model 4 version of MRAS runs under any version of TRSDOS 6.X. The Model I/III version runs under LDOS 5.X, DOSPLUS 3.5, TRSDOS 1.3, and TRSDOS 2.3. The documentation does note that while operation on a Model I or III under a DOS other than LDOS is possible, it may require some patches.

While MRAS may be complex, it is also the most powerful assembler available for the TRS-80 computers. Applications developed with it will be able to take full advantage of the computer's potential. If you are serious about Assembly-language programming, MRAS is both a powerful development tool and an excellent value.■

KAMAS: CP/M's ThinkTank

by John B. Harrell III

★★★★☆

KAMAS (version 1.2) runs on the Model 4 (64K) and requires Montezuma Micro CP/M 2.2 and two disk drives. KAMASOFT Inc., P.O. Box 5549, Aloha, OR 97007. 503-649-3765. $149.

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

Outline processors, like MS-DOS's ThinkTank or Framework, haven't been available for 8-bit computers because of so-called limitations in memory and speed. However, KAMAS (Knowledge and Mind Amplification System) brings much of ThinkTank's power and versatility to your Model 4.

KAMAS is a first-rate outline processor. You generate outlines, each element of which is called a leaf, and whole ideas become branches of a tree-structured topic. Each leaf contains enough text to convey a complete thought. You can also use KAMAS as a flexible data storage and retrieval system and a limited data base manager.

KAMAS is actually a complete programming language, and it was used to develop the program. The best thing about KA-

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

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

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

MAS is its extensibility: If you don't like the way it does something, you can write your own approach to the problem.

Features

You receive the software disk and four documentation manuals with over 500 pages of text and a reference card. The documentation is organized into three volumes with a fourth supplement containing installation instructions and a Getting Started chapter. If your only goal is to write and edit outlines, you can start work in just a few minutes.

KAMAS isn't copy protected and after you make back-up copies, you first install the system. Your version should come preconfigured for your type of CP/M if you specified system information when you ordered it.

However, you can also elect to perform a detailed configuration of your system. You must specify each facet of how your CP/M installation handles the video display. You have to specify the disk drive search order, which tells KAMAS how to search for files. You can also select editor commands similar to either WordStar or Perfect Writer. I used the WordStar variation and had no difficulty.

The latter part of the installation manual is the Getting Started section, which walks you through the development of a rudimentary outline.

Developing Ideas

Each project begins with the selection of a topic, which is also the name of the CP/M file that will contain your information. KAMAS maintains the elements of a topic in a tree structure and each of these elements relates to a level.

All levels (except for the top) have a parent item that precedes it in the structure. Each parent item has subdivisions called children. An item preceding a level is that level's ancestors and each child of a parent item is its descendants.

Each item in the topic is a stem, with a stem and its descendants called a branch (see the Figure). Stems can have a title and a text section called the leaf, and the title may be subdivided into a key and a subtitle. The text part of any leaf may contain up to 2,420 characters (about 30 full lines of text).

After deciding what your outline name will be, you prepare a topic to contain the outline. KAMAS will then create and initialize the CP/M file containing the topic.

With the topic created, you can begin to add ideas to it from either the command level or the full-screen editor. I found the full-screen editor the better technique. It lets you visualize one full screen of structure while you develop your ideas. If you are a haphazard thinker like me, it's easier to quickly jump from one stem to another instead of typing in the key name.

Editing the outline structure is easy in either mode. The normal command level (called Rove) provides the same functions as the outline editor but operates remotely. Because it doesn't use your working storage to hold the titles, it can edit much larger outlines.

After defining a stem in the structure, you can easily move into the leaf editor. This is another full-screen editor for entry of the leaf text. Your installation choice determines whether this editor mimics Perfect Writer or WordStar commands. However, this set of editor commands isn't the same as those used earlier: a glaring inconsistency.

After completing the outline, you can format it with various commands and print it to a printer or disk file. You have several global formatting options available and controls you can put on each stem.

KAMAS will win no prizes for sophisticated printer control. It assumes that it only communicates with the CP/M LST device. KAMAS will produce an output file compatible with WordStar that you can easily modify into a polished document.

You can also use a menu mode for working on your outline. You use these menus to move up or down in your outline structure for editing or querying the data base. You may also invoke a Job Execute (JEX) command on any stem containing a program from the menu.

Inside KAMAS

Outline processing only touches the surface of the KAMAS system. The outline processor is built around a threaded, interpretive language, specifically designed to support the outline processor.

You start each session in the lowest operating level. First-time users are shielded by an automatic job execution procedure (AUTOJEX) which initializes the system and puts it in the KAMAS topic environment mode (Rove). This is where you spend most of your time initially.

Entering the Expanded Topic Environment (TOPICVOC) from Rove takes you to the first level of the programming environment. TOPICVOC contains the commands to manipulate the outline structures. This is similar to Basic, with a calculator mode and a programming mode. Unlike working in Basic, you must enter all expressions in reverse Polish or postfix notation. For example, the expression to add A to B and multiply the result by C would be written in postfix as: A B + C *.

The next level is the Language Environment (LANGVOC), which contains the commands and operators that let you perform the manipulations.

The last level is the System Environment (SYSVOC), containing the lowest

TOPIC—(a data base of text)
Topics contain structured text organized into hierarchies. There can be any number of levels within a topic or any number of items on a level. Topic files can range in size from 8K to 8 megabytes. On a disk with about 200K, you can have a topic with a maximum of about 1500 items if you do not have any leafs (which would be unusual). You can access 16 of these topics at the same time.

BRANCH (a part of a topic): Each branch within a topic is made up of an item with all of its descendants.

STEM (a single item in a topic): A stem is the basic unit within a topic.

TITLE (a part of a stem): A title can consist of up to 94 characters.

KEY—the required part of a title: A key is part of a title up to 31 characters long. Every key in a topic must be unique.

SUBTITLE—an optional part of a title: A subtitle is the secondary part of a title up to 63 characters long.

LEAF—an optional part of a stem: Each leaf can be up to 2420 characters long.

In this example, each line beginning with the capitalized word is a title and the capitalized word is the stem key. The paragraph under these titles is the leaf text.

Figure. Example of a KAMAS outline structure.

Continued on p. 114

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An all-purpose, customizable data base management system.

A data base manager should be a very personal thing. Like shoes that mold to your feet, it should be able to change its shape to suit individual needs and idiosyncracies. The Basic Data Base System (Program Listings 1–7) is a general-purpose program in a structured, modular form that makes it easier to modify. If you're not a programmer, BDBS is ready to run as is.

BDBS lacks the speed and special features of commercial programs, but it has all the standard functions you'd expect in a data base manager. The program handles up to 500 records (more, with a few modifications), each with a maximum of 40 fields. You can design custom input screens and report forms, search through the data base for specific information, select a subset of the data base for special reports, and sort records quickly. You also get the ability to develop fancy sorts and indexes.

I'll first explain how to use the BDBS. Later on, I'll explain some of the more unusual programming techniques I used and make some suggestions about modifying the program.

First Things First

Before you can store information in any data base, you need a clear idea of what you're going to store and how you want your information to look. Let's assume that you want to keep track of the price of ice cream at several local stores and the best flavor available at each store. Each record in your data base will contain a store name, the price for a carton of ice cream, the date when you last shopped at that store, your nomination for the best flavor the store sells, and some general comments about the store. You might eventually want to know who sells the best pistachio ice cream, perhaps, or the average price of a carton of ice cream. You can answer both questions easily with BDBS.

To run the data base manager, get into Basic and run Listing 1, Main/BAS. You'll see the main menu, which lists nine choices (see the Figure). Because you're starting a new data base, pick option 1, Definitions. After a short pause while Basic loads in the Definitions subprogram, BDBS asks for the name of your new data base. You can enter any name of eight letters or less. Icecream seems like a logical choice. The program also asks what disk drive you want to store Icecream on; if you have a two-drive system, you should probably put the data base on

Photograph by Edward Judice

a newly formatted disk in drive 1.

Next you'll see a menu with the options of defining a data base, defining an input screen, and defining a report form. Until the data base is defined, nothing else makes much sense, so press the 1 key to begin.

To define a data base, you'll need to know how many fields you want in each record, and what type of information will be stored in each field. BDBS accepts three types of fields: numeric fields (the price of the ice cream), date fields (when you last shopped at a store), and alphanumeric character fields (everything else). BSDS requires 4 bytes of disk space to store a numeric field and 3 bytes for a data field. You can set the length of a character field as you see fit. The total number of bytes required by all the fields in a record must not exceed 256, a limitation that is set by the way TRSDOS and Basic handle data files.

BDBS asks for the number of fields in your data base (five in our example) along with a type designation and length for each. For example, the first field in our ice cream data base will hold the store name, so it will be an alphanumeric field with, say, a length of 30 characters. The second field will be the price of a carton of ice cream, so we'll designate it as a numeric field and BDBS will automatically assign it a length of 4.

After you define the fields, BDBS displays a chart showing what you've designated. If you're satisfied with the results, you'll probably want to dump the chart to your printer (press control-*). If you want to change something, BDBS will take you through the definition process again.

Designing an Input Screen

Once you define a data base, you need to create an input screen. The process will be much easier if you first use a piece of graph paper to plan the layout of your screen. BDBS itself uses the screen's top two and bottom two lines; the 20 lines in the middle are yours to define.

During the screen definition process, you must enter a prompt label for each field. For example, you might label the first field "Store:," the second "Price:," and so on. BDBS knows that you need eight spaces to enter a date (all dates must be in the standard mm/dd/yy format) and assumes that you will want the input area for a character field to be the same length as its disk space. However, it asks you to specify how many characters can be entered in a numeric field. In our example, four or five should be enough, since it's difficult to imagine a price higher than $99.99 (five characters, including the decimal point) for a carton of ice cream.

You have to tell BBDS where to put each prompt message and corresponding field input area on the screen. The program asks for each fields's vertical and horizontal coordinates, and gives you the allowable range for each answer. Here's where preplanning pays off, because it's up to you to make sure that fields don't overlap and that they're spaced as you want them. After you define the input parameters for each field in the data base, BDBS shows you the input screen you've created and asks for your approval.

Now the program returns you to the definitions menu. You can define a report form if you wish, or leave that for later. The process is similar to defining an input screen. You specify a header for each page of the report and indicate which fields should appear where. You also can get a count of records by a nonnumeric field, or a total of the values contained in a numeric field. This way, you can find averages. For example, if you needed to know the average cost of a carton of ice cream, you could ask for a sum of the price field and a count of any other field. When the report is complete, you can divide the total cost by the count to get the average.

Each record in the report can take up as many lines on a printed page as you want, so you can either produce a columnar report or one that looks more like entries on individual filing cards. It's also easy to create mailing labels using BDBS.

To use the BDBS report form intelligently, you may have to review the Print Using symbols in your Basic manual, since you're really creating a Print Using format string for each field. For example, you might define the report form for the first two fields in our ice cream data base like this:

```
Store: \                    \
Cost per carton:  $#.##
```

You can redefine the input screen and the report forms at any time, but not the fundamental data base definitions. Experiment with the input and report forms until you find ones that you like.

Setting Records

When you return to the main menu from the Definitions program module, you can begin to enter information into your data base. However, first you must choose option 2 on the main menu, which lets you open a data base for use. Then you can tell BDBS that you want to add new records to the data base.

You can define a data base, an input screen, or a report form.

LOAD 80

System Requirements

Models 4 and 1000
Basic

MAIN/BAS

Lines	Description
240–320	Top menu. Because the Chain Merge command destroys the subroutine stack, all routines end with GOTO 240. Do not change that line number!
500–520	Open a data base for work (Top menu choice 2). Reads /DEF file information for all other routines to use.
600–604	Close and release an active data base. Updates the /DEF file, closes all files, and leaves data base in the same state as during initialization.
700–706	Overlay handler. Loads in a program overlay unless it is already resident in memory.
Lines 1000–1118 are subroutines available to all program modules.	
1000	Test whether a file exists on disk. Returns – 1 in TEST.FLAG if file exists, zero if it does not exist, 1 if illegal file name, or 2 if some other error occurred.
1012	Print "press any key" at bottom of screen, empty the type-ahead buffer, and wait for a keystroke.
1018	Prompt for a yes/no answer, and return uppercase "Y" or "N" only. Ignores all input except for "Y", "N", "y", and "n".
1024	Open and read the /INP file.
1030	Open and field the /DAT file. Uses the array F$(x) as fielding variables. File buffer #2 is reserved for /DAT.
1040	Display a blank input form on the screen. Assumes that 1024 has already been called.
1046	Display an input form with information from the current record in the /DAT file buffer.
1054	Write the /DEF file to disk. Called at the end of each overlay that has the capability of changing the Key$(x) strings.
1060	Calculate how many active records are currently in the data base.
1064	Formatted input for text strings. Swallows the carriage return at end of the input string. Guarantees that the input string will be no more than Q characters long.
1068	Same as 1064, but allows numeric input only.
1070	Actual formatted input subroutine.
1086	Handle screen input of a text string for field Loop.
1090	Handle screen input of a numeric value for field Loop.
1094	Handle input of a date string for field Loop. Checks the validity of the input to be sure it is in date-string form.
1102	Put field numbers, in inverse video, on an input-screen form. Assumes the input form is already on the screen.
1106	Read the next active physical record from /DAT into buffer #2. Assumes that there is a record to read.
1114	Read the next pointer from a /SEL or /IND file (through buffer #3) and use that to read a physical record from /DAT file into buffer #2. Assumes that there is a pointer and record to read.
1118	Strip trailing blanks from the string Q$.

DEFINE/OVL

2000–2012	Get name and drive of file to define. Test to be sure the name is legitimate.
2016–2026	Main Definition menu.
2030–2060	Get definitions (number, type, and storage length) of data base fields. Verify with user that they are correct.
2062–2074	Get maximum number of records from user. Create Key$(x) strings; create /DAT file on disk (if there is no room, now is the time to find out). Write /DEF file to disk.
2078–2114	Define the input screen. User must know where each field will be. Ask for input length of numeric fields; use /DEF file data for text strings and set date fields to 8-characters long. Save input screen to /INP file.
2118–2134	Begin defining report form. Get page length and page header from user.
2138–2152	Define look of each record in report form. User must know where each will be located, how many fields will appear on each line, etc.
2154–2160	Get number of records to print on each page of the report form. Verify that the number is possible.
2164–2186	Get fields to total or count and the printed label that will appear with each sum.
2190–2204	Create /RPT file to save the report form definitions.

ADD/OVL

2000–2020	Get data base records from user. Verify that each is okay before saving it in the data base and updating Key$(x). Refuse input if data base is full.

READ/OVL

2002–2010	Main Read/Search/Modify menu. Asks whether to use all records or just those in the /SEL or /IND files.
2014–2032	Control routine if /SEL or /IND key file is being used to limit which records will be accessible.
2036–2048	Control routine if all physical records will be accessible.
2052–2060	Display one record and handle user instruction.
2066–2068	Erase the current record (remove from Key$(x) string and blank screen).
2072–2076	Modify information in current record.
2080–2096	Jump to new record after verifying that the record exists and is accessible.
2100–2142	Search forward from current record to match a search string, value, or date.

SELECT/OVL

2000–2010	Main Selection menu. Allows creation of selection criteria, reading criteria from disk, and forming a new /SEL file of selection keys.
2014–2016	Read selection criteria from disk.
2020–2110	Define selection criteria. Prompt for a field number, then a comparison operator, then either a constant (string, date, or numeric depending on field that was chosen) or another field of the same type for comparison. Then prompt for a conjunction (And or Or) to next comparison. Verify correct entry with user.
2114–2144	Very short subroutines to make comparisons and conjunctions. Comparison results are stored in the Result(x) array; conjunction results are accumulated in the variable Select.
2148–2160	Set up to use /SEL or /IND keys, or all records, for new selection key file.
2164–2190	Create a new /SEL file by testing each record against the selection criteria. Store the physical record number of those that pass in the /SEL file along with a count.

INDEX/OVL

2000–2008	Main Index menu. Choose whether to index all records or those with keys in the /SEL file.
2012–2018	Set up to use /SEL file or all records.
2022–2032	Get field to sort on from user and determine which type of sort is needed.
2036–2052	Use Shell method to sort by a numeric field. Save keys to records in sorted order in /IND file.
2056–2078	Use Shell method to sort on a text or date field. Save keys to records in sorted order in /IND file.

REPORT/OVL

2000–2010	Main Report menu. Choose /SEL, /IND, or all records for report.
2014–2026	Set up to use appropriate group of records for report.
2030–2040	Read in the report form definitions from the /RPT file.
2044–2054	Get output destination (screen, disk file, or printer) and open that destination as a logical file on buffer #1.
2056–2082	Read each record and send to output destination. Include page header and pad spaces at the end of each page as appropriate.

Table 1. Line descriptions.

```
1. Definitions
2. Use Existing Data Base
3. Add Records to Data Base
4. Read/Search/Modify Records
5. Build Selection Key
6. Build Sort Index File
7. Print Reports
8. Release and Close Data Base
9. End Program
```

Figure. Main menu.

The process of entering information is quite simple. BDBS displays a blank input screen with a row of dots in the field where you are to type. If you are entering information in a numeric field, the program will accept only numbers, a decimal point, and a minus sign—any other key you press will be ignored. If you're entering a date, BDBS checks whether it's in the proper format before letting you continue to the next field. When you've finished typing in information in the last field on the input screen, BDBS asks first if you want to store that information, then asks if you want to add another record.

The Read/Search/Modify subprogram is a great deal more powerful than the Add subprogram described above. Its first menu gives you the options of working with a Selection file, an Index file, or all records in the data base. Until you have created a selection or index file, you will have to make the third choice.

Next, you'll see the first record in your data base file. Your options are displayed at the bottom of the screen: move to the next record, erase the record displayed on the screen, jump to a particular record, search for specific information, or modify the contents of the displayed record. After you use each option a couple of times, its workings should be clear.

The search option, however, needs some explanation. It searches only for exact matches, and is case-sensitive. For example, if you ask it to search the ice cream flavor field for "Pistachio," it will not find an entry of "pistachio" or "Pistachio Nut." Also, it only searches forward from the present record (to allow searching for more than one record containing a specific key word). If you want to search through the entire data base, jump to record 1 and then begin your search.

Selections and Indexes

The Selection and Index subprograms are the two most powerful sections of BDBS. The indexing routine is easier to understand, so we'll start with it. In the parlance of data bases, a sort index is a list of records as they would be stored if they were in sorted order. It is highly inefficient to actually sort the records on disk; it is much faster to build an index to the records.

The Index program asks you to select one of the data base fields for sorting. It then reads through the records in the data base to find what each has stored in that field. Finally, it sorts that information and stores the results in a special disk file.

You can then use the Index file in the Read/Search/Modify routine, in the Selection routine, and in the Report routine so that you can work with records in sorted order. For example, after entering information about the stores and their ice cream flavors, you could then sort your file by date, by store name, by ice cream flavor, or by cost and produce a report that displays records in that order.

The Selection routine is a little more complicated. It asks you to specify a set of criteria and selects the records that fit the criteria. Like the Index routine, it doesn't actually move any records around on disk or in memory; rather, it builds its own list of pointers to your information.

When you define the selection criteria, you're actually establishing a set of logical requirements that each record must pass in order to be included in the selection file. BDBS asks for a field to work with, then a logical operator, and finally either a constant or another field (in the same record) to test against the first field. You can link up to six comparisons together with the logical conjunctions And and Or. (And means that a record has to pass both comparisons to be included; Or means that it only has to pass one or the other.)

BDBS evaluates the entire expression of comparisons and conjunctions from left to right. It doesn't allow parentheses, so you might have to experiment a bit to define a complex set of criteria correctly. You can

save your criteria in a disk file for later use.

You can test records from the entire data base, the most recent selection file, or the sort index. By combining several steps through sorting and indexing, you can develop some very sophisticated selection processes.

Printing Reports

The report generator uses the report definition that you developed earlier (see above). Records can come from a selection file, a sort index, or the entire data base. You can send your report to the video screen, a disk file, or your printer.

If you want fancier formatting than BDBS allows, you can invoke the TRSDOS Forms Filter before entering Basic and running BDBS, or you can send your report to a disk file and format it with your word processor.

Understanding the Programs

If BDBS satisfies you as is, you can stop reading, type in the Listings or take the program off the Load 80 disk, and start playing. But if you want to modify BDBS to fit your own special needs, adapt some of its techniques to your own programs, or convert it for use on a computer other than a Model 4, the following sections are for you.

Much of the code is straightforward and should be easy to understand with the help of Tables 1–4. However, my use of logical operations and user-defined functions might seem strange to many of you.

Many programmers only vaguely understand that Basic has two different operators, both represented by the equals sign. In the statement:

```
A = 5
```

the equals sign assigns a value to the variable A. However, in the statement:

```
IF A = 5 THEN PRINT 'OKAY'
```

the equals sign tests whether the value in A is 5. Many languages use different symbols for these two operations; the Basic interpreter depends on an instruction's context to determine which operation you intend.

Although it may look like gibberish at first, the following line is quite proper Basic:

```
A = 5: PRINT A = 5; A = 3
```

Basic will print:

```
-1  0
```

indicating that the first test, A = 5, is true and the second test, A = 3, is false.

In general, anything that can go between If and Then produces either a –1 or a zero when Basic evaluates its "truth." Also, anything that evalutes a numeric value can go between an If and Then. If the value is zero, Basic interprets it as false; otherwise, Basic interprets it as true. Therefore, you can write a statement like:

```
IF A THEN PRINT "OKAY"
```

and Basic will print "okay" if A has any value other than zero.

Most of the tricky sections of BDBS are based on the way Basic handles these logical operations. For example, four of the user-defined functions at the beginning of the program, FN CHKDATE, FN ROOMEXIST, FN NUMERIC, and FN CHARACTER, are designed to return either a –1 or a zero. Later in the program (line 2016 of the ADD/OVL module, for example), you'll find statements like:

```
IF NOT FN ROOMEXIST THEN. . .
```

which make direct use of the Boolean, or logical, value returned by the function.

BDBS also uses an unusual method of handling dates. It accepts date strings only in the form mm/dd/yy and prints out all dates in that form. However, it's difficult to sort dates in that form and wasteful of disk space to store them that way. Internally, BDBS converts dates to three-character strings: The first character is CHR$(yy) (the character formed by the year), the second is CHR$(mm), and the third is CHR$(dd). These strings can be sorted just like any others and require only 3 bytes of disk space instead of the 8 bytes that standard date form requires.

Program Organization

Main/BAS is always in memory when BDBS is running. It contains the Dimension statements for arrays that stay in memory, definitions of functions, the main menu, an overlay handler, three short routines called from the main menu, and a group of subroutines that are available to all sections of BDBS. All other sections of BDBS load in as overlays when you call them from the main menu.

Basic's Chain Merge instruction, which calls the overlays without losing the user functions or variables in memory, destroys the GOSUB/Return stack. Therefore, each overlay must know the address of the main menu so it can return there when it's finished. If you modify Main/BAS, don't renumber line 240 (the beginning of the main menu) or any of the subroutines unless you're also willing to change all of the overlay routines.

The Define subprogram (Listing 2) is long, but not very complicated. Its main job is to prompt for the information it needs to build the data base definitions, verify that information with the user, and save everything to disk.

Model 4 Basic differs from other versions in its method of placing the cursor at a specific screen location. BDBS makes extensive use of Print@ and often uses a single value instead of horizontal and vertical coordinates. If you are programming on a Tandy 1000, you have to change

```
PRINT @ POSN,"something"
```

to

```
LOCATE (POSN MOD 80,POSN\80): PRINT "something"
```

Notice here and elsewhere in the program,

Variables	Program Module							Description
	Main	Define	Add	Read	Select	Index	Report	
BLANK.LINE$	•			•	•	•	•	String of 79 spaces for clearing screen line
BLANK.LINES		•					•	Number of blank lines between records on report form
CMP$					•			User choice of constant or field for comparison
COMP(x)	•				•			Array of comparison operators for select process
COMP					•			Temporary storage for one comparison operator
CONJ(x)	•				•			Array of conjunctions for selection process
CONJ					•			Temporary storage for one conjunction operator
DAT.FILE$		•						Temporary string to hold name of data base /DAT file
DEF.MENU$		•						User response to Definitions menu
DRIVE$	•	•	•	•	•	•	•	Number of disk drive containing data base files
DUMMY$	•							Place-holder for /DAT file fielding subroutine
DUMMY$						•		Empty string for dimensioning SORT$( ) array
EOL(x)		•					•	Boolean array showing where to place (CR)s in report form
EQUAL.LINE$	•							String of 79 equals signs for input screen formatting
F$(x)	•			•	•	•	•	Field variables for buffer of /DAT file
F.NUMBER(x)							•	Array of field numbers for fields in report form
FALSE	•			•				Basic's value (0) for Boolean False
FIELD.NUMBER(x)		•						Array of field numbers to be displayed on report form
FIELD.SUMS		•					•	Count of fields to be totaled/counted on report form
FIELDS(x,y)	•	•	•	•	•	•	•	Field parameters: (1,y) = record length; (2,y) = field type
FIELDS							•	Number of fields included in printed report
FILE$	•	•	•	•	•	•	•	Name, without extension, of active data base
FOUND				•				Boolean variable for search routine
GAP						•		Interval between comparison records for Shell sort
HEADER$(x)		•					•	Lines of text printed at top of each report page
HEADER.LINES		•					•	Count of lines of lines of report header text
HERE			•					Temporary value of current record number
HOLD1				•				Holds current record number during search
HOLD2				•				Holds current PTR value during search
I.FIELDS	•							Number of input fields
I.HEAD$	•	•						Header line for input screen
IN(x,y)	•	•	•	•	•			Input field info: (1,y) = Input length; (2,y) = screen location
IND.FLD						•		User choice of field to sort on
IND.MENU$						•		User selection from top Index menu
INDEX(x)						•		Pointers to records after sort
JUMP				•				User choice of record to jump to
KEY$(x)	•	•	•	•				Index of active/inactive records in /DAT file
LABEL$(x)		•					•	Field labels for printed reports
LENGTH		•						Characters available in /DAT record for definitions
LOOP	•	•	•	•	•	•	•	General For. . .Next loop counter
LP		•		•				Secondary For. . .Next loop counter
LVAL!					•			Temporary value for left side of comparisons
LVAL$					•			Temporary value for left side of comparisons
LVAL					•			Temporary value of field number for left side of comparisons
LVAL(x)	•				•			Field list for left side of comparisons
MAIN.MENU$	•							User choice from main menu
MAX		•						User choice of number of records in data base
MAX.REC		•						Maximum number of records on printed report page
MOD.CHOICE$				•				User choice at modification menu
MORE				•				Boolean: more records available for scanning?
N.LOOP	•							Counter for field numbering routine
NUM.RECS	•				•	•	•	Number of records available
NXT				•				Boolean value used during Search routine
OKAY	•			•				Boolean: used for loop control
OLD.OVL$	•							Current overlay in memory
OUTFILE$							•	Output file for report form
OUTPUT$							•	User response to output menu
OVL$	•							Name of requested overlay
PADS							•	Number of blank lines at bottom of report page
PAGE.LINES							•	Printed page length
PIC$		•						Print Using string for displaying definitions

	Main	Define	Add	Read	Select	Index	Report	
PROMPT$(x)	•	•	•	•				Input screen field labels
PTR	•			•		•		Pointer to record numbers and sort items
Q	•	•		•	•	•	•	Field length for formatted input routine
Q$	•	•		•	•	•	•	String returned by formatted input routine
Q1$	•							Input string for formatted input routine
Q1	•							Counter for formatted input routine
QLOOP	•							Loop counter for formatted input routine
QQ$	•							Temporary variable for blank-stripping routine
QLP	•							Temporary loop counter for formatted input routine
R.COUNT				•				Count of records available to Read routines
RD(x)				•				Array of record numbers available to Read/Search
REC				•				Physical disk-file record number
REC.PTR					•			Pointer to record number for Select routines
RECLEN	•	•						Length of /DAT file record
RECORDS.PER.PAGE		•					•	Number of records per printed report page
REPORT.LINES		•					•	Number of lines per record in printed report
REPT.REC							•	Pointer to record number for Report routines
RESULT					•			Boolean variable for result of comparison test
RESULT(x)					•			Array of comparison results
RPT.MENU$							•	User response to top Report menu
RVAL!					•			Temporary value for right side of comparisons
RVAL$					•			Temporary value for right side of comparisons
RVAL$(x)					•			Field numbers or constants for right side of comparisons
RVAL					•			Temporary value of field on right side of comparison
S.PTR					•			Pointer to parse array elements in Select
SEARCH				•				Field number for search routine
SEL(x)					•			Array of record numbers used by Select routine
SEL.MENU$					•			User response to top Selection menu
SEL.COUNT					•			Count of records chosen by Select routine
SELECT					•			Boolean result of comparison
SORT!(x)						•		Array of values to be sorted
SORT$(x)						•		Array of strings to be sorted
SORTLOOP						•		For. . .Next counter for sorting loops
SRC.CHOICE$				•				User response to second Read/Search menu
SRC.MENU$				•				User response to top Read/Search menu
SUM.FIELDS$(x)		•					•	Field labels for printed report forms
SUM.FIELDS(x)		•					•	Numbers of fields to be summed/counted
SUMS.COUNT(x)							•	Accumulators for sum/count routine
TEMP	•							Temporary value for /DAT file fielding
TEST$	•	•	•	•	•	•	•	Full name of file to test for existence
TEST.FLAG	•	•	•	•	•	•	•	Flag showing whether file exists
TOTAL.FIELDS	•	•	•	•	•	•	•	Total number of fields in data base
TRUE	•	•		•	•			Basic's value (–1) of Boolean true
TYPE					•			Temporary value of comparison type
TYPE$		•						User designation of field type
TYPE(x)					•			List of comparison types
X.COORD		•						Horizontal screen position of field and prompt
Y.COORD		•						Vertical screen postion of field and prompt
YN$	•	•	•		•			Value ('Y' or 'N') returned from yes/no routine

Table 2. Program variables. All are integers unless typed otherwise.

I used the backslash integer division sign, not the standard forward slash representing real number division.

Add (Listing 3), the second overlay, is short and to the point; you should have no trouble understanding it when you read through the listing.

The Read overlay (Listing 4), which handles search, modify, and scan functions, is more complicated. One problem I had was setting up routines that could jump back and forth between different records, yet still scan forward one record at a time when necessary. Another was moving from one function to another from the Modify menu without losing track of active records or falling off the end of the list of records. The result might not be elegant, but it seems to work well.

The most unusual subprogram, and the one that was most fun to devise, is Select/OVL (Listing 5). The challenge was to find a way to put the user's selection criteria in a form that the computer could understand. So I set some ground rules for the format of the selection criteria, and I used Boolean operations extensively.

The first ground rule is that the left side of every comparison must be a field. The right side of the comparison can be either

another field or a constant. The left-side field numbers are stored in an array called LVAL( ), the right-side constants or field numbers in an array called RVAL$( ). If you specify a constant for the right side, it's stored in RVAL$( ) exactly as you type it in. If you specify a field, it's stored as CHR$(127) plus the field number.

My second solution was to write 12 short subroutines (lines 2114-2138 of Select) to do the actual comparisons. Each stores a true or false value in the array called Result( ); after all comparisons are made, results are combined with two short conjunction routines (2142 and 2144). The comparison routines for strings (including dates) and for numbers must be separate, but you need only one set of conjunction routines, since they always operate on Boolean values.

Compared to Select, Index (Listing 6) was easy to write. I used a modified Shell sort, since it's fast and also simple to write and debug. However, the Shell sort has an undesirable side effect: It doesn't guarantee that items of equal value will retain their relative positions after the sort. That is, if records 5 and 18 have the same value in the sort field, you can't tell which will come first in the final sorting index. You might want to change Index to use an Insertion sort or a Quick sort if this bothers you.

The final overlay program, Report (Listing 7), isn't very complex. It reads the report definition, then reads each record and prints it out. It must keep track of the number of records printed per page (the MOD operation in line 2056 works well for that).

Report's method of sending output to the printer, the screen, or a disk file might not be self-evident. TRSDOS 6 sees devices like the screen and printer as almost identical to disk files in structure. After you specify an output channel in line 2046, the program opens an output file either to disk, to the *DO device (the screen), or to the *PR device (the printer). Once the output channel is open, the program is no longer concerned about where the output is going; everything is printed with a Print #1 command. Print Using, Tab, and the other print commands still work normally when the destination is a file/device buffer. However, printout formatting using the Forms Filter works only if the output is indeed being sent to the printer.

Modifications

The program's modular structure should make writing and testing modifications fairly simple. If you use an MS-DOS machine, you don't have to restrict records to 256 bytes; they can be 512 bytes or longer. Just be sure you issue the correct commands when entering Basic from DOS. (Model 1000 users need to make some changes to get BDBS to run; see the Model 1000 changes below.)

You might want more than one sort or selection index available at a time. It wouldn't be difficult to set up some extra menus to choose, for example, among 10 files of each type, stored on disk as /SL0 to /SL9 and /IN0 to /IN9. You could probably add a single subroutine to Main/BAS that would ask for such a selection every time the program is ready to open a /SEL or /IND file.

You could use the INSTR( ) function in the search routine and perhaps make it a choice in the comparison menu. Or you might want to add an option that allows sorting on several fields linked together.

Model 1000 Changes

To run the program on a Model 1000, you should make several changes in the listings.

In Main/BAS, delete line 8 and change line 320 to:

```
320 CLOSE:CLS:END
```

Eliminate PRINT CHR$(24);: in line 1070. Eliminate PRINT CHR$(24);".";CHR$(24);: in lines 1076 and 1078. Eliminate PRINT CHR$(17);: in line 1102.

Change the variable Key$ to Kee$, since Key is a reserved word in Model 1000 Basic.

Change the backslash in all file names with extensions to a period.

You also have to rearrange file names to use Model 1000 syntax.

For example, in line 508 of Main, the statement:

```
TEST$ = FILE$ + "/DEF:" + DRIVE$
```

should be:

```
TEST$ = DRIVE$ + ":" + FILE$ + ".DEF"
```

and in line 1030:

```
OPEN "R",2, FILE$ + "/DAT:" + DRIVE$, RECLEN
```

should be:

```
OPEN "R",2, DRIVE$ + ":" + FILE$ + ".DAT", RECLEN
```

Change all Print@ statements to Locate statements. You don't have to change most of the row, column numbers. However, you need to change any zero to a 1, since Locate locations start at 1 and Print@ statements start at zero.

For example PRINT@ (23,0) should be LOCATE 23,1. For proper Locate syntax, the following changes must be made. In Main, change line 80 to read DIM IN(3,40). Whenever IN(2,variable) appears, add ,IN(3,variable). For example, in line 1024 you should use:

```
INPUT #1, PROMPT$(LOOP), IN(1,LOOP), IN(2,LOOP), IN(3,LOOP):NEXT LOOP
```

in line 1040:

```
LOCATE IN(2,LOOP), IN(3,LOOP):
```

and in line 1096:

```
IF NOT OKAY THEN LOCATE IN(2,LOOP), (IN(3,LOOP) + LEN(PROMPT$(LOOP))):WEND
```

In Define/OVL, line 2014 should read:

```
IN(2,LOOP) = Y.COORD: IN(3,LOOP) = X.COORD
```

Line 2112 should read:

```
WRITE #1, PROMPT$(LOOP) + " ",IN(1,LOOP), IN(2,LOOP),IN(3,LOOP):
```

In line 2048 of Report/OVL, change *PR to PRN and in line 2052, change *DO to CON.END.

Taking Out the Trash

One of Microsoft Basic's greatest weaknesses is its method of string storage and its infamous garbage collection routine that puts your computer in a coma for several minutes at a time. I haven't found garbage collection to be a problem with BDBS, partly because I took some precautions when writing the program. For example, most of the arrays that the overlays need are erased from memory before control returns to the main menu.

Also, wherever possible, I avoided filling up memory with extra copies of strings. The routine that strips trailing blanks from a string (for example, line 1118 of Main/BAS) doesn't move or copy the string it is working with. Rather, it changes Basic's count of the number of characters in the string with the POKE and PEEK commands.

Also, the sort routine uses the Swap command both for speed and to avoid copying strings, and I used the LSET command to copy strings into an array for sorting in the Index overlay. I can't guarantee that your computer will never stop for garbage collection with BDBS, but it will probably do so less often and for shorter periods of time than with some other Basic data base programs.

End of File

The more I use BDBS, the less I like the time Basic takes to chain from one program to another. However, without chaining of some sort, the program is too large for a 64K Model 4. You could always have one program simply run another, but then you'd have to include the same subroutines in several different programs, and also find a way to pass variables between the programs, perhaps through a special disk file.

A second solution would be to compile BDBS, but that would involve a fair amount rewriting to make it fit your compiler's syntax. The easiest solution, of course, is to learn to live with the delays and appreciate the rest of the power of BDBS.■

Send us your modifications to DBMS. We'll publish the best ones in a future issue.

You can write to Hardin Brothers at 280 N. Campus Ave., Upland, CA 91786. Enclose a stamped, self-addressed envelope for a reply. You can also contact him on CompuServe's WESIG (PCS-117).

Name	Definition
Main/BAS	(can be renamed) Controlling program for entire data base system. Contains array definitions, Open/Close/End routines, and all common subroutines.
Define/OVL	Creates definitions for data base, input screen, and report form.
Add/OVL	Adds new records to the data base.
Read/OVL	Contains modules to read through the data base, search for specific information, and modify records already in the data base.
Select/OVL	Creates selection key of data base records based on up to six comparison tests.
Index/OVL	Creates sorted-order key of data base records, in ascending order, based on any individual field in data base.
Report/OVL	Creates reports based on data base records.
Data Base Files:	
name/DAT	Holds actual data. Created full-sized during data base definitions; file size never changes after that. Direct access.
name/DEF	Fundamental definitions of data base: number of fields, total record length, record length and type for each field, keys to active/inactive records. Sequential.
name/IND	Count and record numbers of records in sorted order. Sequential.
name/INP	Input screen definitions: screen header, input prompts, input length and screen position for each field. Sequential.
name/RPT	Report definition: lines per page; lines in page header; text of page header; number of fields; labels, field numbers, and end-of-line markers for each field; number of fields to total or count; field numbers of total/count fields, and display labels for each. Sequential.
name/SEL	Count and record numbers of records that match selection criteria. Sequential.
name/SLC	Selection criteria generated by menu choice 1 in Select/OVL. Sequential.

Table 3. Program and data base file names.

Functions	Description
FN CONDATE$(x$)	Condenses a date string to a 3-character, sortable string FN.
EXPONE$(x$)	Expands one character of condensed date string to a two character digit string.
FN EXPDATE$(x$)	Expands condensed date string to eight character mm/dd/yy format.
FN CHKDATE$(x$)	Simple validity check of date string.
FN ROOMEXIST	Returns Boolean TRUE if more room exists in /DAT file.
FN NEXTREC	Returns record number of first open slot in /DAT file.
FN NUMERIC(x$)	Returns Boolean TRUE if x$ is a digit or '.' or '-'.
FN CHARACTER(x$)	Returns Boolean TRUE if x$ is a printable character.
FN OKAY(x$)	Programmed-defined function used in formatted input routine.

Table 4. User-defined functions. Untyped functions return integer values.

Continued on page 98

Making Adjustments

Alter disk drive speed on your Model III or 4 without opening the case.

Photo 1. The potentiometer and small brass adjusting screw seen through the disk drive latch.

Photo 2. Use a screwdriver to adjust the speed through a hole drilled in the front of the drive.

Two of the most common causes of disk input/output error are dirty heads and incorrectly timed drives. Keeping the heads clean is easy—just use a commercial cleaning kit. But adjusting drives on a Model III or 4 usually requires opening the computer case, which voids your warranty. And even if your warranty has expired, disassembling your computer isn't an easy job.

If you have the right type of disk drive, you can adjust drive speed without taking your computer apart. I'll describe how to drill a small hole in your drive's faceplate so you can access and adjust the drive speed control with a screwdriver.

Driver's Ed

Open the drive latch and, using a flashlight, look up through the drive slot to the left of the printed circuit board on top of the drive. If you see a blue potentiometer with a small brass adjusting screw like the one in Photo 1, you're in business.

The potentiometer controls drive speed, which should be 300 rpm. When you drill a ¼-inch hole in your disk drive plate to get at the adjusting screw, you can use a small screwdriver to vary drive speed.

Use the template in the Figure to position the hole. I used a sharp wood bit and a variable-speed drill at low speed. This gave me a clean hole without a lot of dust. If you have a 2-inch-long screwdriver with a blade smaller than ¼ inch, you can make a smaller hole.

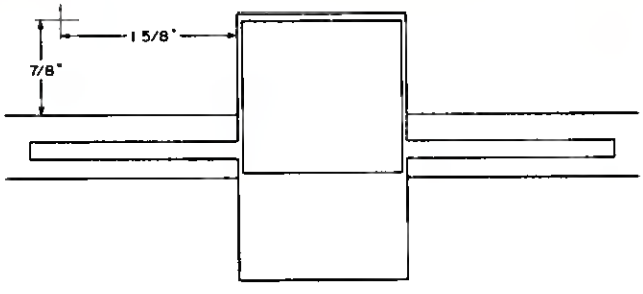

Figure. Template for the hole in the front of the disk drive.

Insert your screwdriver into the hole and, while looking through the open latch, fit the blade into the adjusting screw (see Photo 2). With the screwdriver in place, run a commercial timing program, or use the Assembly-language drive timer in the September 1984 issue of *80 Micro* ("Keeping Time," p. 72). Turn the screw clockwise to increase the speed, counterclockwise to reduce it.

The whole process is quick and easy, which encourages me to keep my drives at the proper speed. I've also found that using a disk from another computer sometimes requires different speed settings to get it to work properly. ■

Editor's note: Our local repair center technician said the hole wouldn't void your warranty for repairs, but if your disk drive ever needs replacement, you must pay the full price for a new drive—you can't turn in the old drive for credit. He also warned that dust from the drilling could cause problems.

Write to Gerard Kiernan at Manhattanville College, Purchase, NY 10577.

System Requirements

Models III and 4

Related Articles

Goodwin, Mark D., "Keeping Time," September 1984, p. 72. A Model I/III/4 disk drive timing program.

Meyer, Vincent E., "Drive Ways," September 1984, p. 42. Disk drive maintenance and repair for TRS-80s.

Photographs by Gerard Kiernan

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Illustration by Greg Spaeth

Points of View

by Glen E. Sparks

Incorporate two- and three-dimensional images into your programs.

A good program, like a good spy novel, usually benefits from a new twist. Nowhere is this more apparent than in computer graphics: Rotating an image literally adds another dimension to the picture on the screen. I'll provide several algorithms that twist and turn various shapes on-screen. They take you from simple line drawings through the rotation of three-dimensional objects. You can incorporate these techniques into your programs to change an object's perspective, manipulate a design, and produce limited animation.

While this imaging process involves mathematics, you don't have to be a mathematician to experiment with the technique. A computer equipped with Basic can perform all the necessary calculations.

As you run each program, experiment with different variable and input values to produce different shapes. If you see a design you particularly like, list out the program for future reference.

Joining the Movement

Line/BAS demonstrates rotation at its simplest level (see Program Listing 1). It constructs a box within a For. . .Next loop and repositions the lines forming the sides of the box with each iteration of the loop (see Photo 1). The result is a box that looks like it's fading into the background, turning and getting smaller as it does so.

Spiral/BAS takes things one step further by letting you choose the degree of rotation and the size of the final graphic image (see Photo 2 and Program Listing 2). To get a skinnier, fatter, larger, or smaller spiral than the one in Photo 2, alter the input values for the number of degrees and the radian conversion (DG and AP), as well as the X and Y values. To create a spiral of circles, change line 230 to read:

```
CIRCLE(X,Y),5
```

A common algorithm governs the next three listings. Polygon/BAS (see Program Listing 3) lets you choose the number of sides of a polygon (a many-sided flat-plane object [see Photo 3]). Entering a 1 or 2 in response to the prompt for the number of sides creates a flat line or series of lines; as you increase the number of sides from 3 to 19, you make progressively smaller, nested polygons. Values higher than 20 approximate a circle (see Photo 4).

While the algorithm in Radar/SUB and Spokes/BAS (see Program Listings 4 and 5) is the same, the images created are totally different (see Photos 5 and 6)—proof that you can get a variety of results by adding or subtracting program lines. You might want to explore this process further by introducing GOTO statements to bypass values or statements that send output to the screen.

You can also alter images by superimposing them on other images; I designed Radar /SUB especially for this purpose. To run the routine by itself, add:

```
Line 1 SCREEN 0:CLR
```

In Orbit

Box/BAS (see Program Listing 6), which explores the rotation of a defined object, marks a departure from previous listings (see Photo 7). With Box, you control the size and number of rectangles orbiting in a circle and the projection of the circle itself. You can, for example, project the angle of the circle into the background so that the box appears to be traveling on an ellipse. The small circles on the boxes help highlight their rotation.

Box employs a number of techniques to speed program execution. Using the DEF FN command and storing the rotation algorithms in the program section that defines and initializes variables gives Box a structured format. To rapidly rotate the cube, I restricted calculations to manipulation of variables X1 and Y1. Line 270 uses a simple, quick formula to derive XX and YY from X1 and Y1; Box draws all lines using these four variables and a constant that repositions the line. This technique speeds program execution since Box essentially redraws the same lines instead of recalculating the position of each one individually.

LOAD 80

System Requirements

Models III and 4 with hi-res board and Basic G
Models 1000, 1200, and 2000 with changes and Basic

Taking a Spin

The most advanced program in the series, Spin/BAS, lets you rotate an object of your choice (see Program Listing 7). You enter the object's code as the object data statements; Spin scales it and keeps it in the center of the screen while you rotate it. You can view the object head on or from any degree to the right, left, top, or bottom.

Although the image you draw is two-dimensional, Spin gives the illusion of producing a three-dimensional picture by adding a third axis, Z, for depth. To simplify use, Spin limits the range of values for Z; keeping the values between 3 and −3 ensures that the entire image remains on the screen. Negative values bring the image forward; positive values make it recede. To view an object straight on, set the value of Z to zero.

You control the plotting of points using data statements. Spin reads the variables X, Y, Z, and L. Variables X and Y are the actual screen coordinates of those values. Z projects the image into the foreground or background, and L indicates whether Spin plots a point or draws a line. When L equals zero, Spin plots a point; when it equals 1, Spin draws a line from the previous point or endpoint of a line to the current point.

Keep in mind that you need two coordinates to plot one point, so an X and Y coordinate makes up one point on the screen. The Z value affects the placement

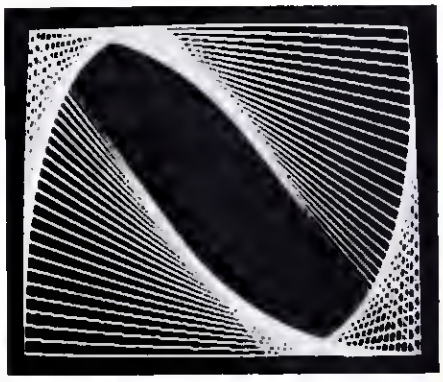

Photo 1. Screen shot of the nested box Line/BAS creates.

Photo 2. Sample output from Spiral/BAS. Here, DG = 100 and AP = 150.

of that point. Spin uses line statements to create images by creating corners of polygons; by rotating the corner points, you produce the illusion of perspective.

To see how this works first-hand, type in and save Spin/BAS; then type in the data file Cube/DAT (see Program Listing 8a) and save it in ASCII format. Finally, merge the two listings. The first five data statements draw a square. Setting the value of L to zero in the first data statement prevents the program from drawing a line from the initial default setting of 0,0.

The next five data statements are exactly the same except for the value of Z. To project this plane into the background, the program sets Z to – 1. The remaining data statements merely use the same X,Y values to connect the foreground and background squares. To ensure that all the points on the screen do not interconnect, the value of L alternates between zero and 1.

Now run the merged program. If the values you supply for the vertical and horizontal inputs are both zero, a square appears on the screen. Changing the vertical value to 10, the horizontal value to 20, and the scale to 1 rotates the cube 10 degrees

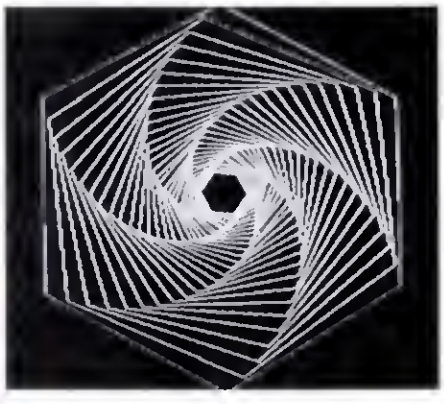

Photo 3. Sample output from Polygon/BAS. SD = 6.

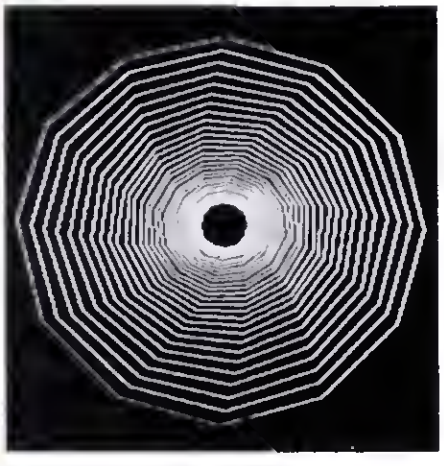

Photo 4. When you specify a number of sides in Polygon/BAS greater than 20, it produces a nested, rotating spiral. Here, SD = 12.

Program Listing 1. Line/BAS.

```
100 'LINE/BAS
110 'also place ,,B and the end of some or all of the LINE command
s for other effects
120 SCREEN 0:CLR  ' go to graphics screen and clear (erase)
130 XC=320:YC=120  'center point of screen
140 X2=2*XC-1:Y2=2*YC-1
150 X=10:Y=10:ST=(Y2-A)/Y2
160 FOR I=0 TO Y2-1 STEP ST*10
170   LINE(X+I,Y)-(X2,Y+I)
180   LINE-(X2-I,Y2)
190   LINE-(X,Y2-I)
200   LINE-(X+I,Y)
210 NEXT I
220 IF INKEY$=""THEN 220
```

End

Program Listing 2. Spiral/BAS.

```
100 'SPIRAL/BAS
110 SCREEN 1:CLS
120 XC=320:YC=120
130 ' input of 50 for DG is fast
140 INPUT"DEGREES ";DG
150 ' input of 60 for AP is fast
160 ' experiment with both of these inputs
170 INPUT"RADIAN CONVERSION (5-360) ";AP
180 SCREEN 0:CLR  'graphics screen
190 DG=DG/AP:PSET(XC,YC)
200 FOR R=0 TO 100 STEP DG
210 X=R*COS(R):X=X+XC:Y=R*SIN(R)
220 Y=Y*.7+YC
230 LINE-(X,Y)  'change this line to CIRCLE(X,Y),5
240 NEXT R
250 IF INKEY$="" THEN 250
260 GOTO 140
```

End

Program Listing 3. Polygon/BAS

```
100 'POLYGON/BAS
110 SCREEN 1:CLS
120 INPUT" SIDES ";SD
130 XC=320:YC=120
140 T=SD/2:TT=SD*SD
150 PI=3.14159:AP=5/11:X=250:SC=.93
160 C=COS(PI/T):S=SIN(PI/T)
170 C1=COS(PI/TT):S1=SIN(PI/TT)
180 CLR:SCREEN 0
190 FOR K=1 TO 30 'how many concentric polygons
200  FOR I=0 TO SD 'SIDES
210    SX=X+XC:SY=YC-Y*AP
220    IF I=0 THEN PSET(SX,SY)
230    LINE-(SX,SY)
240    XN=X*C-Y*S:Y=X*S+Y*C:X=XN
250  NEXT I
260 XN=SC*(X*C1-Y*S1):Y=SC*(X*S1+Y*C1):X=XN
270 NEXT K
280 IF INKEY$=""THEN 280
290 RUN 'for quick experimentation
```

End

Program Listing 4. Radar/SUB.

```
20000 'RADAR/SUB   save as ASCII file to merge to program
20010 PI=3.14159:S1=480:SD=20  'SD=number of radiating lines
20020 SP=PI/SD
20030 FOR A=0 TO PI+SP/2 STEP SP
20040 SZ=S1*SIN(A)+.5
20050 X=SZ*SIN(A)+120 'LAST NUMBER HIGHER MOVES IMAGE TO RIGHT
20060 Y=S2/2*COS(A)+120 'LAST NUMBER MOVES DOWN IMAGE IF HIGHER
20070 IF A=0 THEN 20100
20080 LINE(X0,Y0)-(X,Y)
20090 LINE-(320,120)
20100 X0=X:Y0=Y
20110 NEXT
20120 FOR CC=1 TO 7:CIRCLE(320,120),R+20:R=R+30:NEXT
20130 IF INKEY$="" THEN 20130
```

End

Program Listing 5. Spokes/BAS.

```
100 'SPOKES/BAS
110 INPUT" SIDES ";SD
120 SCREEN 0: CLR  'go to graphics screen and clear (erase)
130 'initialize variables
```

Listing continued

down and 20 degrees to the left. A three-dimensional figure existed there all along.

Since you are plotting on a two-dimensional surface, you always see one of the coordinates straight in front of you. Your point of view is the same, but the image on the screen gives you the impression of having moved. To make the image smaller or larger (as if you were moving closer or farther away), set the scale from 0.3 to 1.8. If you use values larger than 2.5 (on the Models III and 4), you create the illusion of entering the object or having it zoom past you.

I have included two other data files, Face/DAT (Program Listing 8b) and BLKHOLE/DAT (Program Listing 8c), with which you can experiment. Photo 8 illustrates two possible projections using BLKHOLE/DAT.

If you want to speed the time between rotations for any of these objects and thus produce rudimentary animation, you can write a subroutine to store values X, Y, Z, and L in dimensioned arrays. You therefore won't need to rerun the program and reread the data statements. Instead, you can increment the angles of rotation at the end of the drawing routine and use a GOTO statement to run the routine again. However, you should also clear the screen; otherwise you'll simply superimpose the new drawing over the old one.

Alternatively, you can bring in the values from random-access or sequential files to increase speed. I omitted such features;

With Spin/BAS, the image on the screen gives you the illusion of having moved.

Photo 5. Screen shot of Radar/SUB. Here, SD = 20.

they are system specific and would make transferring the programs to other Tandy computers more confusing.

Machine Specifics

Although written for a Model III or 4 with a high-resolution graphics board, these programs should run on all Tandy computers with minor changes.

For the Models 1000/1200/2000, change the Screen commands to Screen (2) and CLR to CLS. You must also delete line 360 of Spin/BAS.

The system you use determines resolution and therefore affects the size and position of images on the screen. The variables XC and YC represent the center-screen coordinates. To figure the appropriate value for XC for your system, divide the horizontal resolution in pixels by 2; to compute YC, divide the vertical resolution by 2. Keep in mind that zero is a significant digit; if, for example, the range for horizontal pixels is zero to 639 pixels, you have a total of 640 pixels.

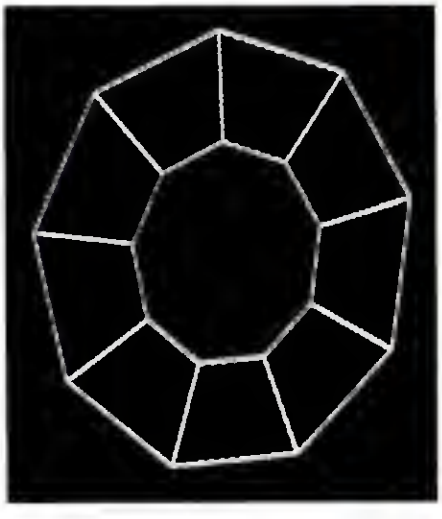

Photo 6. The algorithm used here in Spokes/BAS is the same as that for Radar/SUB, but a few lines have been changed. Here, SD = 9.

Photo 7. Sample output from Box/BAS. Size = 2, aspect ratio = 2.

Listing continued

```
140 XC=320:YC=120  'center points on screen
150 PI=3.14159:X2=XC:Y2=YC:MT=2*YC
160 MA=YC*3.333:SP=PI/SD
170 'MA=magnitude(size) of image
180 'MT = Move image To (alter to adjust placement on screen)
190 FOR I=0 TO PI+SP/2 STEP SP
200   SZ=MA*SIN(I)+.5
210   TZ=MA/2*SIN(I)+.5:X3=TZ*SIN(I)+MT:Y3=TZ/2*COS(I)+YC
220   X1=SZ*SIN(I)+(YC+20) 'last number adjusts image horizontally
230   Y1=SZ/2*COS(I)+YC 'last number adjusts image vertically
240   IF I=0 THEN 290   'avoid div by zero error
250 'experiment with GOTO statements to bypass one or more lines i
n 260-280
260   LINE(X1,Y1)-(X2,Y2) 'outer ring
270   LINE(X3,Y3)-(X1,Y1) ' outer spokes
280   LINE(X3,Y3)-(X0,Y0) 'inner ring
290   X2=X1:Y2=Y1
300   X0=X3:Y0=Y3
310 NEXT I
320 IF INKEY$=""THEN 320
```

End

Program Listing 6. Box/BAS.

```
100 'BOX/BAS
110 ' rotates box and orbit of box as well
120 CLS:PRINT"SIZE OF RECT = 10 OR SMALLER (MORE RECT'S THE SMALLE
R THEY ARE"
130 PRINT"THE CIRCLE ON THE RECTANGLE HELPS SHOW IT'S ROTATION":PR
INT
140 INPUT" SIZE OF RECTANGLE ";F1
150 PRINT:PRINT"HIGHER NUMBER FLATTENS CIRCLE INTO PERSPECTIVE"
160 PRINT"(DECIMAL FRACTIONS OK)
170 INPUT"ASPECT RATIO OF PATH OF RECTANGLES (2=CIRCLE) ";AS
180 SCREEN 0:CLR  'go to graphics screen and erase it
190 'define and initialize variables
195 XC=320*2:YC=120
200 PI=3.14159:X2=XC:Y2=YC:SD=30:SI=400:SP=PI/SD
210 DEF FN F0(I)=SI*SIN(I)+.5
220 DEF FN F1(I)=SZ*SIN(I)+YC
230 DEF FN F2(I)=SZ/AS*COS(I)+YC
235 'loop for drawing and placing boxes
240 FOR I=0 TO PI+SP/2 STEP (SP*F1)
250   SZ=FN F0(I):X1=FN F1(I):Y1=FN F2(I)
260   IF I=0 THEN 350
270   XX=(X1+X2)/2:YY=(Y1+Y2)/2
280   CIRCLE(X1,Y1),5 'places circle for reference
290   LINE(X1,Y1)-(XX,YY):LINE(XX,YY)-(XX+30,YY+15)
300   LINE-(X1+30,Y1+15):LINE-(X1,Y1)
310   LINE(XX,YY)-(XX+30,YY-15):LINE-(X1+30,Y1-15):LINE-(X1,Y1)
320   LINE(X1+30,Y1+15)-(X1+60,Y1):LINE-(X1+30,Y1-15)'BOT
330   LINE(XX+30,YY-15)-(XX+60,YY):LINE-(XX+30,YY+15)
340   LINE(XX+60,YY)-(X1+60,Y1)
350   X2=X1:Y2=Y1
360 NEXT I
370 IF INKEY$="" THEN 370
380 RUN  'rerun program for fast experimentation
```

End

Program Listing 7. Spin/BAS.

```
100 'SPIN/BAS
110 CLS:PRINT"FOR -VERTICAL- INPUT ONE NUMBER IN RANGE (-60 to 60)
120 PRINT"(NEG NUMBERS SHOW BOTTOM OF FIGURE)"
130 PRINT"NUMBERS HIGHER THAN 60 (120,etc ) START TO INVERT FIGURE
"
140 PRINT:PRINT"FOR HORIZONTAL INPUT ONE NUMBER (-360 TO +360)
150 PRINT"HIGHER NUMBERS TURN FIGURE AROUND ":PRINT
160 INPUT" VERTICAL ";V:INPUT" HORIZONTAL ";HR
170 PRINT"NORMAL SCALE IS 1: <1 MAKES SMALLER : >1 MAKES LARGER"
180 PRINT"YOU MAY USE DECIMAL FRACTIONS:"
190 INPUT" SCALING FACTOR  ";SC
200 'initialize and define variables
210 XC=320:YC=120  'center of screen
220 AC=45/ATN(1):T=33.33:AP=3.3334:HU=100
230 DEF FN FA(Z)=Z*COS(RA)+X*SIN(RA)
240 DEF FN FB(Z)=-Z*SIN(RA)+X*COS(RA)
250 DEF FN FC(Z)=-X1*SIN(V1)+Y*COS(V1)
260 CLR:SCREEN 0
270 READ X,Y,Z,L
280 IF X=999 THEN 360  'check for end of data,then end prog
290 IF Y=YC THEN Y=0:GOTO 310
300 IF Y<>YC THEN GOSUB 470
310 IF X=XC THEN X=0:GOTO 330
320 IF X<>XC THEN GOSUB 530
330 GOSUB 400  'perform rotation
340 GOSUB 430  'write to screen
350 GOTO 270  'read in more screen co-ordinates
360 GLOCATE(620,5),0:PRINT0-3,"*" 'indicate on screen when done
370 IF INKEY$=""THEN 370
380 END
390 'perform rotations and plot points on screen
400 RA=HR/AC:X1=FN FA(Z):Z1=FN FB(Z):V1=V/AC:Y2=FN FC(Z)
```

Listing continued

Listing continued

```
410 YP=YC-T*(SC*Y2):XP=(SC*60)*Z1+XC
420 RETURN
430 ' draw to screen
440 IF L=1 THEN LINE-(XP,YP) ELSE PSET(XP,YP)
450 RETURN
460 'conversion to screen co-ordinates
470 IF Y>YC THEN 500
480 A1=YC-Y:F1=A1/AP:F1=F1*.10:F1=INT(F1*HU+.5)/HU
490 Y=F1:GOTO 520
500 A2=Y-YC:F2=A2/AP:F2=F2*-.1:F2=INT(F2*HU+.5)/HU
510 Y=F2
520 RETURN
530 IF X>320 THEN 560
540 A3=320-X:F3=A3/60:X=-F3
550 GOTO 570
560 A4=X-320:F4=A4/60:X=F4
570 RETURN
```

End

Program Listing 8a. Cube/DAT.

```
999 'CUBE/DAT
1000 'front of cube
1010 DATA 260,90,1,0,260,150,1,1,380,150,1,1
1020 DATA 380,90,1,1,260,90,1,1,
1030 'back of cube
1040 DATA 260,90,-1,0,260,150,-1,1,380,150,-1,1
1050 DATA 380,90,-1,1,260,90,-1,1
1060 'lines that connect front to back
1070 DATA 260,90,1,0,260,90,-1,1,260,150,1,0,260,150,-1,1
1080 DATA 380,150,1,0,380,150,-1,1,380,90,1,0
1090 DATA 380,90,-1,1,999,999,999,999
```

End

(b) Face/DAT.

```
999 'FACE/DAT
1000 'Right side face
1010 DATA 320,60,-2,0,360,60,-2,1,390,70,-2,1,400,85,-2,1
1020 DATA 400,110,-2,1,390,115,-2,1,400,135,-2,1
1030 DATA 360,160,-2,1,350,180,-2,1,320,185,-2,1
1040 'Left side face
1050 DATA 320,60,-2,0,280,60,-2,1,250,70,-2,1,240,85,-2,1
1060 DATA 240,110,-2,1,250,115,-2,1,240,135,-2,1
1070 DATA 260,160,-2,1,290,180,-2,1,320,185,-2,1
1080 'Center line face
1090 DATA 320,60,-2,0,320,80,-1.2,1,320,100,-1,1
1100 DATA 320,145,-1,0,320,165,-1.3,1,320,185,-2,1
1110 'Lines from center to side of face at eyeline
1120 DATA 240,105,-2,0,260,95,-1.5,11,200,80,-1.2,1
1130 DATA 360,80,-1,1,380,95,-1.5,1,400,105,-2,1
1140 'Lines from ctr to side at chin
1150 DATA 260,160,-2,0,300,156,-1.5,1,320,150,-1,1
1160 DATA 340,156,-1.5,1,380,160,-2,1
1170 ' Right eyebrow
1180 DATA 380,105,-1.5,0,360,100,-1.2,1
1190 DATA 340,100,-1.2,1,330,105,-1.5,1
1200 'Right eye
1210 DATA 340,103,-1.5,0,360,103,-1.5,1,360,108,-1.5,1
1220 DATA 340,108,-1.5,1,340,103,-1.5,1
1230 'Left eyebrow
1240 DATA 260,105,-1.5,0,280,100,-1.2,1
1250 DATA 300,100,-1.2,1,310,105,-1.5,1
1260 ' Left eye
1270 DATA 280,103,-1.5,0,300,103,-1.5,1,300,108,-1.5,1
1280 DATA 280,108,-1.5,1,280,103,-1.5,1
1290 'Base nose
1300 DATA 320,100,-1,0,330,115,-1,1,340,135,-1,1
1310 DATA 330,145,-1,1,310,145,-1,1,300,135,-1,1
1320 DATA 310,115,-1,1,320,100,-1,1
1330 ' Front of nose
1340 DATA 320,115,-.5,0,330,135,-.5,1,322,142,-.5,1
1350 DATA 318,142,-.5,1,310,135,-.5,1,320,115,-.5,1
1360 'Connect nose front to back
1370 DATA 322,142,-.5,0,330,145,-1,1,318,142,-.5,0
1380 DATA 310,145,-1,1,310,135,-.5,0,300,135,-1,1
1390 DATA 330,135,-.5,0,340,135,-1,1,320,100,-1,0
1400 DATA 320,115,-.5,1,999,999,999,999
```

End

(c) BLKHOLE/DAT.

```
1000 'BLKHOLE/DAT
1010 DATA 280,180,1.5,0,374,164,1.5,1,432,124,1.5,1
1020 DATA 432,75,1.5,1,374,35,1.5,1,280,20,1.5,1
1030 DATA 185,35,1.5,1,127,75,1.5,1,127,124,1.5,1
1040 DATA 185,164,1.5,1,280,180,1.5,1
1050 'next circle
1060 DATA 280,160,1,0,350,148,1,1,394,118,1,1
1070 DATA 394,81,1,1,350,51,1,1,280,40,1,1
1080 DATA 209,51,1,1,165,81,1,1,165,118,1,1
1090 DATA 209,140,1,1,280,160,1,1
1100 'next circle
```

Listing continued

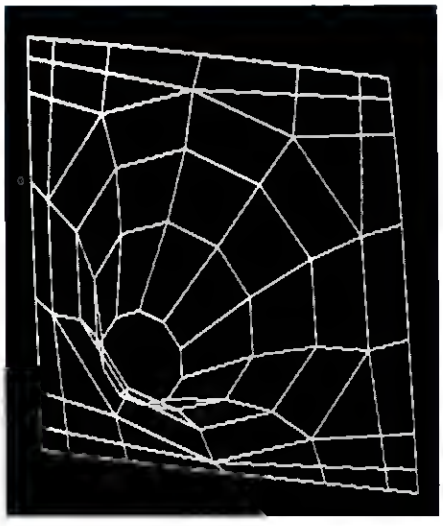

Photo 8. (a) Sample output from merging Spin/BAS and BLKHOLE/DAT. Vertical and horizontal values are set at 20; the scale is 1.2. (b) Here, the vertical input is 10, the horizontal input is 60 and the vertical input is −60.

Your Turn

The opportunity to improve and expand on these models is great. Your output might look slightly different from the figures presented here because of differences in screen resolution. If you're lucky enough to own a Model 1000, 1200, or 2000, you have greater speed and color available for experimentation. Because they are computation-intense and therefore would slow program execution, I omitted hidden line removal and computation of angles for solid color modeling. With the 8 MHz processing power of the Model 2000 at your disposal, you might find these features worthwhile.■

Write to Glen E. Sparks at 6186 Custer, S. Rockwood, MI 48179.

Related Articles

Commander, Jake, "Something-Or-Other 3-D," Anniversary 1983, p. 436. Create rotating cubes in two colors.

Fogelin, Eric, "3-D Graphics," March 1982, p. 138. The mathematics of three-dimensional objects.

Leibow, Michael, "Grade-A Graphics," February 1985, p. 45. A graphics editor that lets you create a design, produce a mirror image, rotate it, and display it in reverse video.

Yellin, Bruce, "Rotation," September 1981, p. 154. The basics of 3-D rotation.

Listing continued

```
1110 DATA 280,140,0,0,327,132,0,1,356,112,0,1
1120 DATA 356,87,0,1,327,67,0,1,280,60,0,1
1130 DATA 232,67,0,1,203,87,0,1,203,112,0,1
1140 DATA 232,132,0,1,280,140,0,1
1150 'smallest circle
1160 DATA 280,120,-1.5,0,303,116,-1.5,1,318,106,-1.5,1
1170 DATA 318,93,-1.5,1,303,83,-1.5,1,280,80,-1.5,1
1180 DATA 256,83,-1.5,1,241,93,-1.5,1,241,106,-1.5,1
1190 DATA 256,116,-1.5,1,280,120,-1.5,1
1200 'connect every of vertice of all circles
1210 DATA 280,180,1.5,0,280,160,1,1,280,140,0,1
1220 DATA 280,120,-1.5,1,432,124,1.5,0,394,118,1,1
1230 DATA 356,112,0,1,318,106,-1.5,1,374,35,1.5,0
1240 DATA 350,51,1,1,327,67,0,1,303,83,-1.5,1
1250 DATA 105,35,1.5,0,209,51,1,1,232,67,0,1
1260 DATA 256,83,-1.5,1,127,124,1.5,0,165,118,1,1
1270 DATA 203,112,0,1,241,106,-1.5,1
1280 'connect rest of vertices of all circles
1290 DATA 374,164,1.5,0,350,148,1,1,327,132,0,1
1300 DATA 303,116,-1.5,1,432,75,1.5,0,394,81,1,1
1310 DATA 356,87,0,1,318,93,-1.5,1,280,20,1.5,0
1320 DATA 280,40,1,1,280,60,0,1,280,80,-1.5,1
1330 DATA 127,75,1.5,0,165,81,1,1,203,87,0,1
1340 DATA 241,93,-1.5,1,185,164,1.5,0,209,148,1,1
1350 DATA 232,132,0,1,256,116,-1.5,1
1360 ' grid at top
1370 DATA 100,10,2,0,460,10,2,1,460,190,2,1
1380 DATA 100,190,2,1,100,10,2,1,100,180,2,0
1390 DATA 280,180,1.5,1,460,180,2,1,100,164,2,0
1400 DATA 185,164,1.5,1,185,190,2,1,374,190,2,0
1410 DATA 374,164,1.5,1,460,164,2,1,100,124,2,0
1420 DATA 127,124,1.5,1,127,190,2,1,432,190,2,0
1430 DATA 432,124,1.5,1,460,124,2,1,280,190,2,0
1440 DATA 280,180,1.5,1,100,75,2,0,127,75,1.5,1
1450 DATA 127,18,2,1,100,35,2,0,185,35,1.5,1
1460 DATA 185,10,2,1,432,10,2,0,432,75,1.5,1
1470 DATA 460,75,2,1,374,10,2,0,374,35,1.5,1
1480 DATA 460,35,2,1,280,10,2,0,280,20,1.5,1
1490 DATA 100,20,2,0,280,20,1.5,1,460,20,2,1
1500 DATA 999,999,999,999
```

End

The Disappearing DOS

Five utilities let you access Model I/III system functions from DOS Ready.

While you can't deny that a disk operating system is a necessity, in some cases it's also a hindrance. For example, if you want to execute a low-level function like modifying memory, initializing a printer, sending data out a particular port, or calling a ROM subroutine, you have to leave DOS, load either Basic or Debug, execute the function, and then return to DOS.

I've written five utilities that break this DOS barrier and let you use almost all your Model I/III capabilities directly from DOS Ready. This is especially useful in writing Build files, where a transparent DOS gives you direct access to system functions.

Typing in the Utilities

The five utilities presented below all use the same shell, which appears in the listing for POKE/SRC (see the Program Listing). Type in and assemble POKE, then write the file to disk. Load POKE/SRC and, for each of the other four utilities, make the changes indicated in the Table. Then assemble and save those four programs to disk with the appropriate file name.

The Five

POKE/SRC modifies up to 20 contiguous bytes of memory with a single command so you can change the cursor character, write to the screen, change case, and so on from DOS Ready.

POKE's format is POKE nnnn,nn, where the first parameter is a four-digit hexadecimal (hex) address and the second is a two- to 40-digit hex data stream. For example, POKE 4023,nn changes the cursor character, with nn the hex code for the new character. POKE 3C00,54455354 displays the word "TEST" in the upper left-hand corner of the display. POKE 4019,00 sets the keyboard for lowercase characters; 01 instead of 00 sets it for uppercase.

LPRINT/CMD, a line printer utility, sends up to 20 control bytes to your line printer. This lets you execute a form feed or change modes on a programmable printer such as an Epson MX-80 without leaving DOS. The utility's format is LPRINT nn, where nn is a two- to 40-digit hex data stream. For example, LPRINT 0C sends a top-of-form control character to your line printer. LPRINT 1B451B47 sends an escape sequence; it sets the Epson MX-80 to emphasized, double-strike print mode.

Out/CMD, a port output utility, sends a data stream of up to 20 bytes to any Z80 port. You can initialize any port-mapped peripheral, such as a universal asynchronous receiver/transmitter (UART) or a Z80 speed-up modification, from DOS Ready. The command's format is OUT nn,nn, where the first parameter is a two-digit hex port address and the second is a two- to 40-digit hex data stream. For example, OUT EC,04 sets your screen to 32-character mode; CLS returns you to 64-character mode. OUT FF,01020102010201020102 generates a beep from the cassette port.

Call/CMD, a machine-language subroutine call utility, executes any machine-language subroutine and then returns to DOS. You can use this to reenter resident programs after a hang-up, to test subroutines, or to execute ROM subroutines. The command's format is CALL nnnn, where nnnn is a four-digit hex address. For example, CALL 0049 stops execution until you press a key, useful as part of a Build file. CALL 01D9 prints the screen contents on a line printer, also useful as part of a Build file.

Execute/CMD, a machine-code execution utility, lets DOS serve as a machine-language interpreter. You pass hex digits as a parameter, and Execute converts them to binary and puts them in a buffer beginning at 5300H. The buffer is padded with No Operations (NOPs) and terminated with a jump to DOS (JP 402DH). Thus, unless the machine-language routine contains a jump external to the buffer, or contains an infinite loop, DOS will regain control after execution. You use this utility to test short routines, move blocks of memory, or pass parameters to subroutines. Execute's format is EXECUTE nn, where nn is a two- to four-digit hex data stream. For example:

```
EXECUTE 21003C1100F0010004EDB0
```

moves screen data to the buffer at 0F000H. Following is the Assembly-language code for the above statement:

```
LD   HL,3C00H
LD   DE,0F000H
LD   BC,0400H
LDIR
```

The sequence below turns your TRS-80 into a typewriter:

```
LPRINT/SRC  -  LPRINT/CMD
Add:        412          EXX
Change:     260          JR       NZ,PARAM2
            400          EXX
            410          CALL     3BH
Delete lines 300-380

OUT/SRC   -   OUT/CMD
Change:     400          LD       C,D
            410          OUT      (C),A
Delete:     lines 320, 330

CALL/SRC  -  CALL/CMD
Add:        292          LD       IX,EXIT
            294          PUSH     IX
Change:     340          EX       DE,HL
            350          JP       (HL)
Delete lines 360-420

EXECUTE/SRC  - EXECUTE/CMD
Add:        930          DEFW  0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
            940          DEFW  0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
            950          DEFB  0C3H
            960          DEFW  EXIT
            970          END   START
Change:     300 PARAM1   LD     DE,START+100H
            460          JP     Z,START+100H
            570          JP     Z,START+100H
            920          ORG    START+100H
Delete lines 310-370
```

Table. Changes to POKE/SRC for the four other utilities.

LOAD 80

System Requirements

Models I and III
32K RAM
DOS
Editor/assembler
Printer

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Program Listing. POKE/SRC.

```
5200            00160 START   EQU     5200H
402D            00170 EXIT    EQU     402DH
021B            00180 PRINT   EQU     021BH
                00190 ;
5200            00200         ORG     START
                00210 ;
5200 7E         00220 SPACE   LD      A,(HL)          ;FIND FIRST PARAMETER
5201 FE0D       00230         CP      0DH
5203 C8         00240         RET     Z
5204 FE20       00250         CP      ' '
5206 2003       00260         JR      NZ,PARAM1
5208 23         00270         INC     HL
5209 18F5       00280         JR      SPACE
                00290 ;
520B CD2152     00300 PARAM1  CALL    GETBYTE         ;get address
520E 57         00310         LD      D,A
520F CD2152     00320         CALL    GETBYTE
5212 5F         00330         LD      E,A
5213 7E         00340         LD      A,(HL)
5214 FE2C       00350         CP      ','
5216 C26452     00360         JP      NZ,ERROR
5219 23         00370         INC     HL
                00380 ;
521A CD2152     00390 PARAM2  CALL    GETBYTE         ;get data string
521D 12         00400         LD      (DE),A
521E 13         00410         INC     DE
521F 18F9       00420         JR      PARAM2
                00430 ;
5221 7E         00440 GETBYTE LD      A,(HL)
5222 FE0D       00450         CP      0DH
5224 CA2D40     00460         JP      Z,EXIT
5227 CD4252     00470         CALL    LEGAL
522A DA6452     00480         JP      C,ERROR
522D 87         00490         ADD     A,A
522E 87         00500         ADD     A,A
522F 87         00510         ADD     A,A
5230 87         00520         ADD     A,A
5231 4F         00530         LD      C,A
5232 23         00540         INC     HL
5233 7E         00550         LD      A,(HL)
5234 FE0D       00560         CP      0DH
5236 CA2D40     00570         JP      Z,EXIT
5239 CD4252     00580         CALL    LEGAL
523C DA6452     00590         JP      C,ERROR
523F 81         00600         ADD     A,C
5240 23         00610         INC     HL
5241 C9         00620         RET
                00630 ;
5242 FE20       00640 LEGAL   CP      20H
5244 CA2D40     00650         JP      Z,EXIT
5247 D630       00660         SUB     30H
5249 FE00       00670         CP      0
524B 3F         00680         CCF
524C FA6252     00690         JP      M,ILLEGAL
524F FE0A       00700         CP      0AH
5251 3F         00710         CCF
5252 F8         00720         RET     M
5253 D607       00730         SUB     7
5255 FE0A       00740         CP      10
5257 3F         00750         CCF
5258 FA6252     00760         JP      M,ILLEGAL
525B FE10       00770         CP      16
525D 3F         00780         CCF
525E F26252     00790         JP      P,ILLEGAL
5261 C9         00800         RET
                00810 ;
5262 37         00820 ILLEGAL SCF
5263 C9         00830         RET
                00840 ;
5264 216D52     00850 ERROR   LD      HL,MERR0
5267 CD1B02     00860         CALL    PRINT
526A C32D40     00870         JP      EXIT
                00880 ;
526D 0A         00890 MERROR  DEFM    0AH,'*** Command Parameter Error ***'
     2A 2A 2A 20 43 6F 6D 6D
     61 6E 64 20 50 61 72 61
     6D 65 74 65 72 20 45 72
     72 6F 72 20 2A 2A 2A
528D 0A         00900         DEFB    0AH,0DH
     0D
                00910 ;
5200            00920         END     START
```

End

EXECUTE CD4900CD3300CC03B00C30053

Following is the Assembly-language code for the above statement:

```
CALL   0049H :ROM INKEY routine
CALL   0033H :Display character
CALL   003BH :Line print character
JP     5300H :Jump to beginning
```

DOS Ready

The five utilities described above let you access almost all the Model I/III features from DOS Ready. If a needed DOS command doesn't exist, you can simulate it with one of these utilities. And if the excessive typing starts to bother you, you can type in Commando (see "Macro Economics," February 1986, p. 66), which lets you rename long, hard-to-remember commands to short, meaningful, logical names. ■

You can reach Craig Chaiken at 32 Beverly Drive, Avon, CT 06001.

Circular Reasoning

Discover an Assembly-language programming trick that cuts your source code down to size.

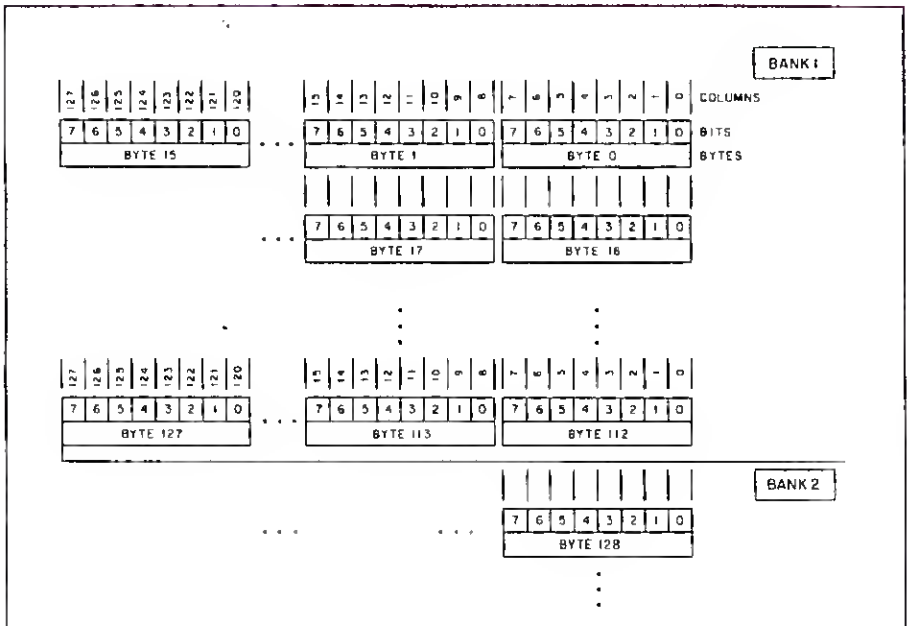

Figure 1. Representation of screen pixels as individual bits.

```
                LD      HL,0H
                LD      IX,BANK1
                BIT     0,(IX+0)
                JR      Z,$+4
                SET     0,L
                BIT     0,(IX+16)
                JR      Z,$+4
                SET     1,L
                BIT     0,(IX+32)
                JR      Z,$+4
                SET     2,L
                 .....
                 .....
                 .....
                BIT     0,(IX+112)
                JR      Z,$+4
                SET     7,L
                 .....
                 .....
BANK1     DS    128
BANK2     DS    128
ETC.
```

Figure 2. Sample code for testing bit patterns.

For. . .Next loops do a lot of the grunt work in Basic programs, and they save you programming wear and tear. I'll describe an Assembly-language technique that lets you simulate the For. . .Next structure with the Z80's index registers; in this way, you can control the Bit, Set, and Reset instructions from within a program.

Your resulting source code will be a little harder to follow, but it will be much shorter. You'll save lots of money on printer paper, your printer head will last longer, and your source code will fit into your editor/assembler more easily. Best of all, you'll spend less time typing and more time programming.

Register Here

If you've ever written the instruction LD A,10H or POP HL, then you have at least a nodding acquaintance with the Z80's two index registers, IX and IY. You can load either register with an address—say, an individual record of a data base—and access that data by specifying an offset to the register, "d."

For example, in an employee data base you might allocate 5 bytes for an employee number, 40 bytes for a name, 9 bytes for a social security number, and so on. When you load IX with the address for a particular employee, IX + 0 (or just IX) points to that employee's number, (IX + 5) points to his name, and (IX + 45) to his social security number. This is much easier than adding and subtracting values to keep one of the Z80's general registers pointing to the required information.

In using the index registers, you can specify offsets as much as 128 bytes from the address to which the index register points. You keep track of where everything is located and where information should go or where it can be obtained with instructions like:

```
LD A,(IX + 4)
LD (IY - 2),A
```

But have you ever thought about writing the machine-language version of:

```
FOR 'd' = 0-82
Do neat stuff with (IX + d)
Next 'd'
```

In other words, find a way for your program to vary "d". Unfortunately, no Z80 instruction like "INC d" (Increment d) or "DEC d" (Decrement d) exists. In fact, tutorials on using the index registers frequently warn against varying "d", although they don't explain why.

As long as you're careful, there's no reason not to create such a program loop. I'll show you how, and I'll start by describing the programming problem that led me to the techniques.

A Bit of Background

Visualize an electric signboard consisting of 48 rows of lights, with each row containing 128 equally spaced bulbs (a total of 6,144 bulbs). The bulbs are randomly lit at any given moment. Your problem is to pick any column of 48 bulbs, note its on/off pattern, and determine if one or more of the other 127 columns have identical patterns.

I was faced with this problem while writing a special graphics program. The lights were actually the Model I/III screen pixels. The program had to be fast, which meant machine language.

It pained me to think of allocating 6,144 bytes in which to store 1's or zeros to in-

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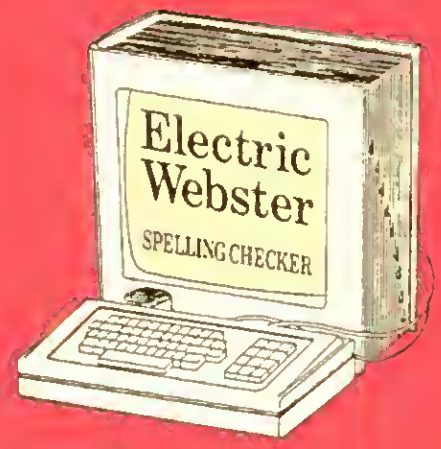

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```
     Line A              NOP                 ;Explained in text
     Line B              LD    A,6           ;Play with bit 6
                         RLCA                ;Shift left 1 bit
                         RLCA                ;Shift left again
                         RLCA                ;Once more (0011 0000)
TYPE                     OR    46H           ; and get (0111 0110)
                         LD    (THISBIT),A
     Line C              LD    A,3           ;Examine (IX+3)
                         LD    (OFFSET),A
TESTBIT     DW           OCBDDH              ;Std. starting bytes for
OFFSET      DB           OH                  ;  BIT b,(IX+3)
THISBIT     DB           OH                  ;  Merged code for BIT 6

                         Do some great stuff here
```

Figure 3. Sample code for creating a program loop to test bit patterns.

dicate on and off respectively. I decided instead to represent a single row's 128 pixels by individual bits in 16 bytes, with 48 groupings of 16 bytes. This brought the byte count down to 768, an 88 percent improvement.

Now look at Fig. 1, which shows the first 128 bytes (eight rows with 16 bytes in each row, representing the 128 pixels of one screen line). I followed the convention of numbering bits from zero to 7, starting at the right. Note that I numbered the bytes in the same fashion. Of course, the bytes aren't really laid out like this in memory, but this scheme makes visualization easier.

Imagine the IX register loaded with (pointing to) the address of byte zero (bank 1). I needed a routine to load the HL register with the bit pattern of column zero's first eight rows—that would be bit zero of bytes zero, 16, 32, 48, 64, 80, 96, and 112—and then load the DE register with the bit pattern of column 1's first eight rows (bit 1 of the same group of bytes).

Next, I had to compare HL and DE (I used the RST 18 instruction). If they're equal, I loaded IX with the address of byte 128 (bank 2) and repeated the process (load HL with the column-zero (bit zero) pattern of bytes 128, 144, 160, 192, 208, 224, 240, and 256 and DE with the bit-1 pattern for the same bytes). If DE and HL are again equal, point IX to the start of the next bank of eight rows and continue the process as long as DE and HL remain equal.

If you go all the way through the last (sixth) bank, then you know that column 1 is the same as column zero. (The program I wrote included a way to make note of this identity, but the method is beyond the scope of this article.)

If DE and HL aren't equal at any time during this process, you stop checking, since you know that column 1's bit pattern doesn't match column zero's. Either way, you need to point IX back to byte zero and again load HL with the first 8 bits of column zero. This time, you load DE with the first 8 bits of column 2. Now repeat all the steps outlined above (to check column 1). Continue this sequence out to column 127, always filling HL with the appropriate column-zero bits while DE gets its pattern from the column you're testing.

Figure 2 shows how you can start coding this job. The routine loads HL with the column-zero bit pattern for the first eight rows. A couple of things should be obvious.

First, you're going to do a lot of typing, perhaps even overflow your editor. This sequence is for the first bank only, and I haven't even shown the corresponding code that loads DE with the column-1 information.

Second, the code begs for some sort of

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	BIT b, ( )			SET b, ( )			RES b, ( )		
	(HL)	(IX + d)	(IY + d)	(HL)	(IX + d)	(IY + d)	(HL)	(IX + d)	(IY + d)
Byte 1	NOP	DDH	FDH	NOP	DDH	FDH	NOP	DDH	FDH
Byte 2		CBH			CBH			CBH	
Byte 3	NOP	offset	offset	NOP	offset	offset	NOP	offset	offset
Byte 4		46H	*		C6H	*		86H	*

Table. Bytes for controlling Bit, Set, and Reset from within your programs. An asterisk indicates the value you want to OR with the 3-bit, shifted code to designate the bit that the instruction tests or controls.

programming loops to increment "d" by 16 and increment the bits that the Set commands reference.

Stand By for Instructions

Now I'll detour to examine some of Fig. 2's Z80 instructions in detail. BIT b, (IX + d) is a 4-byte instruction, the byte sequence for which is:

```
Byte 1   ODDH
Byte 2   OCBH
Byte 3   |||||||| :Contains offset 'd'
Byte 4   |0|1|b|b|b|1|1|0| :Designates the test bit
```

The three "b" entries in byte 4 are decoded as if they were a 3-bit binary number. For example, 000 represents bit zero, while 110 is bit 6's code. Note that if you're dealing with bit zero, then byte 4 would be 0100 0110, which is 46 hexadecimal.

Another instruction you need is RLCA. Each time you use it, the instruction shifts the A register's contents one position to the left and moves what had been bit 7 into bit zero. If you loaded the A register with 6, the bits' set-up would look like this:

|||||||1|1|0|

(The blank bit positions actually contain zeros, but I've omitted them for the sake of clarity.) Now if RLCA executes three times in a row, the A register would look like this:

|||1|1|0|||

If you OR 46H, the result would be:

|0|1|1|1|0|1|1|0|

Enter the Loop

I'll use some of the concepts I just described to program a loop. Take a look at Fig. 3. If you were to assemble this listing, you'd discover that, at Testbit's address, you had the instruction BIT 6,(IX + 3). You're now in a position to set up your loop.

Suppose you wanted to examine bit 6, starting at (IX + 10) down to (IX + 0). In Fig. 3, replace the NOP in Line A with LD B,10. Change Line C to read LD A,B. Add code of your choice where indicated, and end with DJNZ Line C.

Here's another view of the same idea. Suppose you wanted to test all 8 bits of, say, (IX + 8). You can use the loop you just created. Change Line A to read LD B,8. Next, change Line B to read LD A,B and then insert a new line reading DEC A (so that A will range from 7 to zero, while B goes over the range of 8 to 1). Finally, in line C, load A with 8 instead of the 3 and change DJNZ to reference Line B.

The technique I just outlined for manipulating the Bit command works just as well with the Set and Reset commands. Look at their byte sequences:

	SET b,(IX + d)	RES b,(IX + d)
Byte 1	DD	DD
Byte 2	CB	CB
Byte 3	offset	offset
Byte 4	|1|1|b|b|b|1|1|0|	|1|0|b|b|b|1|1|0|

If you compare these byte sequences with those that described the Bit command, you'll note that the first 3 bytes of each sequence are identical—DD, CB, (offset)—for all these instructions.

Byte 4's format is also the same. The 3 bits that designate the actual bit under consideration are in the same relative position and are coded the same way. The only difference is byte 4's value when all the b's are set to zero. In the case of Set, it's 1100 0100 or C6H, while in the RES group, it's 1000 0110 or 86H.

This means that by changing the value that's ORed at the instruction labeled Type in the loop you created, you can make that loop execute a Bit, Set, or Reset instruction sequence under your program's control. If you set up that loop as a subroutine, your main program could put either a 46H, 86H, or 0C6H into (TYPE + 1) before it called the routine, and that would determine which of the three possible instruction sets the loop would perform.

Having dared to do this, why not use the same idea to control the second byte of line C of the loop segment (the LD A,n command)? You can do so from outside the loop or use a nested loop that, effectively, steps the value of "d". As in all machine-language programming, be careful.

You can extend this concept to the entire family of Bit, Set, and Reset commands. The Table lists the data you'll need to keep your bit-diddling under complete program control. (I put two NOPs into the HL columns to emphasize these commands' parallel construction.)■

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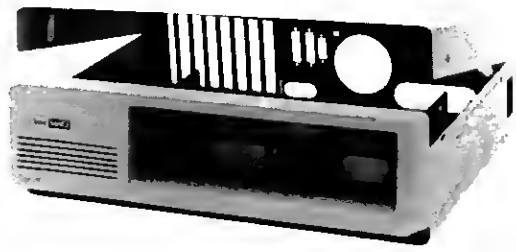

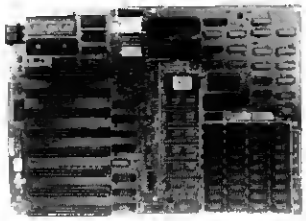

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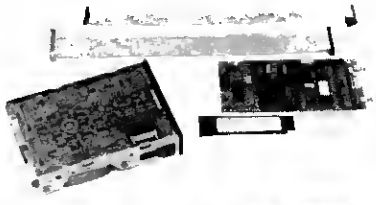

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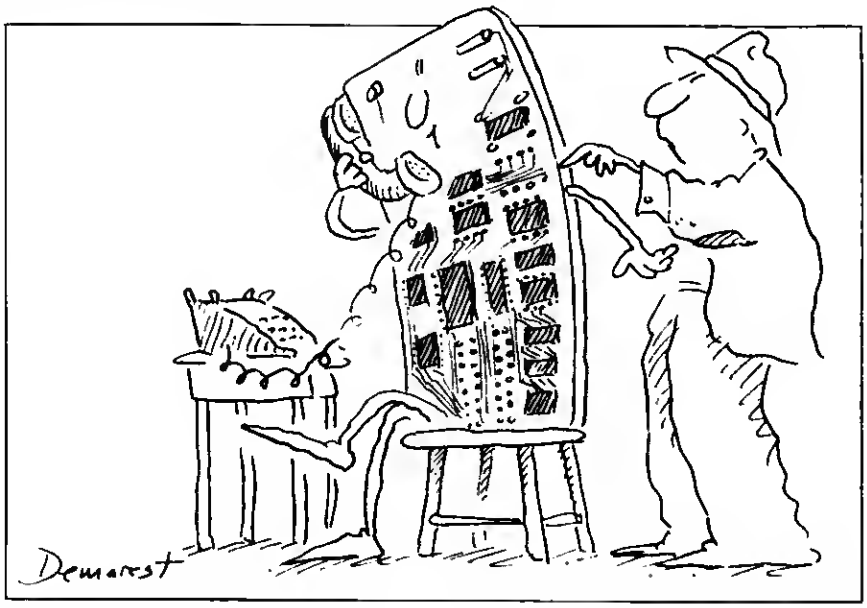
We Interrupt This Program...

If you're wondering why you have to customize PC hard drive controllers for the Model 1000, or why the Tandy Mouse board knocks out serial port 2, you should know about interrupts.

An interrupt is one of the most important features of any MS-DOS computer, and it's built in to the 8088 central processing unit (CPU) of your 1000 or 1200 (and into the 80186-controlled 2000). For whatever reason, the 1000's hardware interrupt assignments differ slightly from the IBM PC's. This can cause incompatibilities if you're not careful.



Breaking In

Interrupts let your computer's peripherals access the CPU. When the keyboard, clock chip, or disk drives need service, they get the microprocessor's attention with an interrupt request. The CPU interrupts the program it's running (at the end of the current instruction), stores its place (the whereabouts of the next instruction) on the stack, and services the request. When the interrupt routine ends, the CPU recovers its place from the stack and continues where it left off.

The clock chip ticks, for example, by sending an interrupt request 18.2 times a second on the 1000 (more often on the 2000). At each interrupt, the CPU momentarily jumps to a routine that increments a counter. The system time is figured from the clock counter. Similarly, the keyboard advertises that you've pressed (or released) a key so that the CPU can act accordingly, usually by storing a value in the keyboard buffer.

What if more than one peripheral needs attention at the same time? Only one of the 8088 CPU's input lines is meant for hardware interrupts. However, Intel supplies another chip (the 8259A) that acts as hardware receptionist and traffic cop for the 8088. (Its functions are partially built into the 2000's 80186.) The 8259A programmable interrupt controller (PIC) receives interrupt request lines from the system hardware, prioritizes requests, and directs interrupts one at a time to the CPU.

PC clones (but not the 2000) have eight interrupt request lines (IRQ0–IRQ7); most are located on the system bus (a track of parallel signal lines connecting the CPU and everything else) where expansion cards can tap into

System Requirements

Models 1000, 1200, and 2000

Program Listing 1. Batch file to produce blue DOS screen. Don't type comments.

```
ECHO OFF                    'turns off display of batch commands
ECHO CTRL-V[[1;37;44m       'bright white letters on blue background.
ECHO .                      'so DOS won't ignore next command
CLS                         'clears screen to blue
```

End

Program Listing 2. Long screen paging routine for the Model 1000.

```
10 KEY OFF:SCREEN 0,,0,0:COLOR 3,4:CLS
20 FOR I=1 TO 24 STEP 4:FOR J=1 TO 80:LOCATE I,J:PRINT CHR$(219);:NEXT J,I
30 SCREEN 0,,1,1:CLS
40 FOR I=2 TO 24 STEP 4:FOR J=1 TO 80:LOCATE I,J:PRINT CHR$(219);:NEXT J,I
50 SCREEN 0,,2,2:CLS
60 FOR I=3 TO 24 STEP 4:FOR J=1 TO 80:LOCATE I,J:PRINT CHR$(219);:NEXT J,I
70 SCREEN 0,,3,3:CLS
80 FOR I=4 TO 24 STEP 4:FOR J=1 TO 80:LOCATE I,J:PRINT CHR$(219);:NEXT J,I
90 SCREEN 0,,0,0:SCREEN 0,,1,1:SCREEN 0,,2,2:SCREEN 0,,3,3:GOTO 90
```

End

Program Listing 3. Short screen paging routine for the Model 1000.

```
10 KEY OFF:SCREEN 0,,0,0:WIDTH 80:COLOR 3,4:CLS
20 FOR H=0 TO 3:SCREEN 0,,H,H:CLS
30 FOR I=H+1 TO 24 STEP 4:FOR J=1 TO 80:LOCATE I,J:PRINT CHR$(219);:NEXT J,I,H
40 FOR K=0 TO 3:SCREEN 0,,K,K:SOUND 300*(K+1),1,1:NEXT K:GOTO 40
50 'SCREEN 0,,0,0:SCREEN 0,,1,1:SCREEN 0,,2,2:SCREEN 0,,3,3:GOTO 50
```

End

Illustration by Chris Demarest

Circle 301 on Reader Service card.

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them. The PIC is programmed so that IRQ0 has highest priority and IRQ7 lowest priority. Each line is assigned to a particular peripheral (see the Figure). In the interest of accurate timekeeping, the clock chip uses IRQ0 so it usually gets attention whenever it ticks.

How does the CPU know which peripheral needs attention and where to jump for the right routine? After the PIC sends an interrupt request to the CPU, it waits for an acknowledgement before taking further action. When the PIC receives the OK signal, it replies with the number (zero through 7) of the highest-priority IRQ waiting for service. The CPU uses this number to point to an address in the interrupt vector table. This table occupies the first 1,020 bytes of memory and contains space for 255 4-byte addresses pointing to potential interrupt subroutines. Many of these point to BIOS and DOS subroutines, conveniently called with the INT instruction—the software interrupt.

Some expansion boards (e.g. hard drive controllers) come with their own interrupt service routines programmed in a ROM chip on the board. During the booting process, these boards tie their ROMs into high memory (way above RAM) and stick the address of their ROM routines into the proper spot in the interrupt vector table. Expansion boards using interrupts must tie in electrically to the appropriate IRQ line on the system bus. As a result, a hard drive controller can issue an interrupt request and the CPU will jump to a routine in the controller's ROM. RS-232 boards, however, use existing interrupt service routines in the computer's ROM.

IRQ0	System clock
IRQ1	Keyboard
IRQ2	Hard drive controller
IRQ3	Serial port 2
IRQ4	Serial port 1
IRQ5	Vertical synch (video)
IRQ6	Floppy drive controller
IRQ7	Parallel printer port

Figure. Tandy 1000 interrupt request line assignments.

If you're a curious machine-language programmer, you can use Debug both to find an interrupt's address in the interrupt vector table (the interrupt number times 4), and to unassemble it. The hardware interrupts are 8 through 15 (IRQ line number plus 8). The *Model 1000 Technical Reference Manual* gives information on the PIC, and most books on 8086/8088 machine language specific to the IBM PC detail the use of interrupts.

Compatibility Issues

IBM PCs and the Tandy 1200 use IRQ2 for the video vertical synch signal, and IRQ5 for the hard drive controller. The 1000 (and the PCjr) uses IRQ2 for vertical synch. You can't install a PC-compatible hard drive in your 1000 unless the controller board is modified. Not only must the board use IRQ2 instead of IRQ5 (a circuit change), but its ROM software must also put the hard drive interrupt address in a different spot in the interrupt vector table.

The Tandy mouse controller can also cause interrupt problems. You'll notice in the Figure that there's no established IRQ line for a mouse. Tandy chose to use IRQ3, which is normally assigned to COM2, the second serial port. As a result, you can't use COM2 with the mouse board installed (people have tried). Microsoft's mouse plugs into the serial port itself. The effect is the same: only one serial port with a mouse.

ANSI Echos

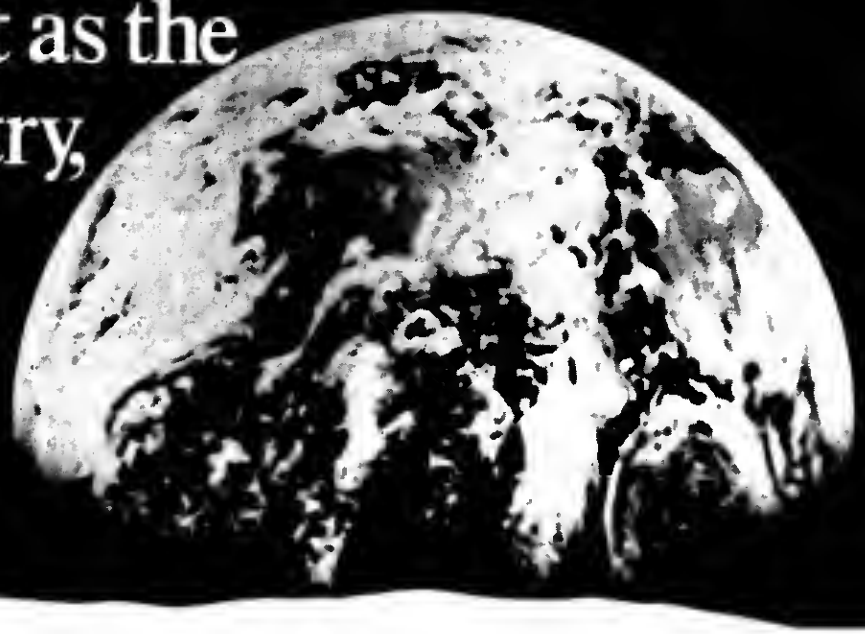
In my November 1985 column (p. 94), I described how to use the DOS Prompt command to pass control codes to the American National Standards Institute (ANSI) extended screen and keyboard driver. John Harrell has since given me a method I like better: the Echo command. I use Echo because I don't have to fool with the system prompt.

The trick is to get the escape character into the Echo command. The ESC code gets the ANSI driver's attention so that it takes the characters following ESC as control codes. Fortunately, ESC and control-[have the same ASCII code (27), and the EDLIN text editor on your DOS disk lets you put the control code in a line by pressing control-V. To represent ESC using EDLIN, you press the V key while holding down the control key, then press the [key by itself.

Use EDLIN to make a batch file with Echo statements containing the escape sequences you want to send to the ANSI extended screen and keyboard driver. The batch file in Program Listing 1 is another way to give you a blue screen when using the operating system (but not while running most programs). When you first enter the line using Echo to send the escape code, you'll see exactly what you type: ECHO ^V[[1;37;44m. If you then use EDLIN's List command after editing, the line appears as ECHO ^[[1;37;44m.

After exiting EDLIN, you can list the batch file with DOS's Type command:

If the space program had advanced as fast as the computer industry, this might be the view from your office.



And space stations, Martian colonies, and interstellar probes might already be commonplace. Does that sound outlandish? Then bear these facts in mind:

In 1946 ENIAC was the scientific marvel of the day. This computer weighed 30 tons, stood two stories high, covered 15,000 square feet, and cost $486,840.22 in 1946 dollars. Today a $2,000 kneetop portable can add and subtract more than 20 times faster. And, by 1990, the average digital watch will have as much computing power as ENIAC.

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TYPE FILE NAME.BAT. Only the Echo statement appears on the screen. The ANSI driver interprets everything after the ESC code as control codes.

The Echo technique creates one problem: The DOS batch file processor doesn't recognize the line following the ESC sequence. Therefore I put the dummy Echo statement in the batch file just to be ignored. The screen doesn't turn completely blue until the CLS command, and you must type in CLS to regain the blue after running black-and-white programs. I find that two DOS prompts appear after running this file if I don't put the first line (ECHO OFF) in the program.

Video Paging

I've finally figured out how to make the 1000's buggy first version of GW-Basic switch video pages without clearing everything off the screen. You can switch video pages with the contents intact as long as you never specify the Burst parameter in the Screen command. Once you do so, any invocation of the Screen statement clears the screen. There's no way (not New, Clear, CLS, nor any permutation of Screen) to get paging back short of leaving and reentering Basic.

To commemorate this event, I wrote a demo program that creates four video pages and switches rapidly between them. What a test pattern. I wrote two versions; the first (Program Listing 2) is a better demonstration. Line 90 does the actual page-switching.

The second version (Program Listing 3) uses more loops to do the same thing in less space, only it works much faster (too fast) using a loop to change pages. I added the Sound statement to slow it down. You can vary the speed by changing the value in the tone length parameter of the Sound statement. Vary it from 0.1 to 10 (or higher) to get a feel for the screen change. I find the speed difference between the two program versions to be puzzling.

You might use paging to put a series of menus or help screens on pages 1–3 in 80-column text mode (1–7 in 40-column mode). If you use page zero for normal program use, you can quickly display the extra pages with Screen. I couldn't get more than four pages in 80-column mode even with CLEAR ,,,32768. I'll experiment more with paging when I start using the newer, fixed version of Basic.

Miscellaneous

Sears stores (with computer departments) sell a cheap ($350) RGB monitor that works with the 1000. It can double as a TV. *Consumer Reports* rated it a best buy. Its small but heavy footprint may cause the 1000's plastic case to buckle. The cable is extra.

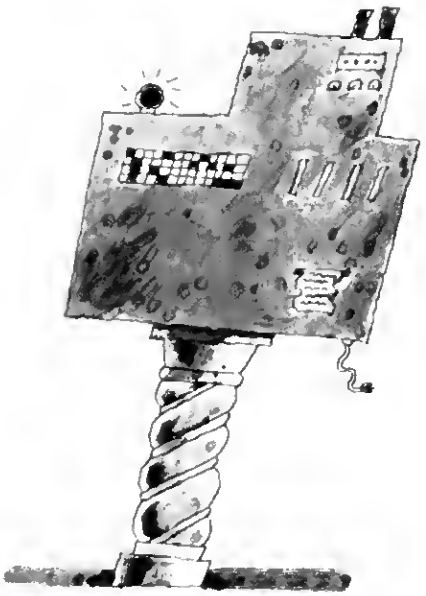
If you miss TRSDOS's ability to search all drives for a file, you can re-create that ability on MS-DOS with the Path command as follows: PATH A:\;B:\. You can run any program without specifying the drive. The Copy, Rename, Delete, and other functions will not jump drives with MS-DOS 2.11. It's safer that way.

Two keys can make your 1000 appear to hang up. The Hold key is obviously the first, and its effects end when you press it again. The print key, however, can stop your computer cold if your printer isn't ready or hooked up. When it happened to me, I could still call up SideKick, but I couldn't make the DOS command processor budge. I rebooted.

The DOS Print command is handy if you've got a large file to print, but must be doing other things with your computer. You can run other programs while printing. Printing is slower because it gets second priority. ■

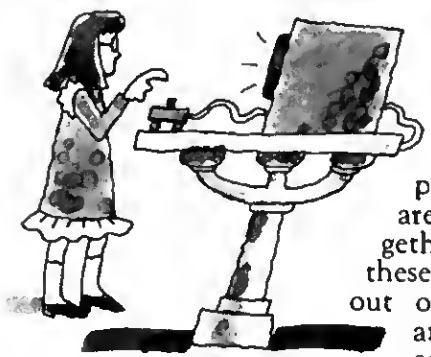
You can write to Dave Rowell at 80 Micro, 80 Pine St., Peterborough, NH 03458.

WANTED: OLD THINKER TOYS.

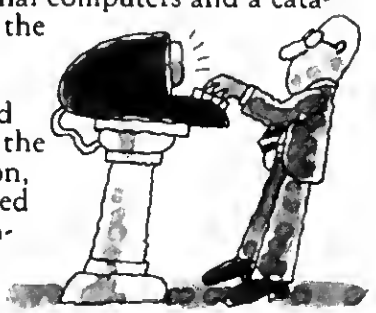


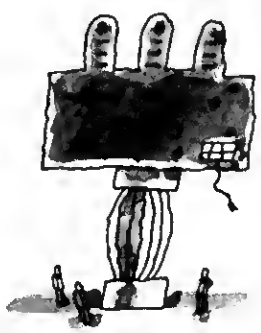
CW Communications, ComputerLand and The Computer Museum invite you to send in your early personal computers, software, and memorabilia — you could win a free trip to The Computer Museum in Boston

Your old, dusty "thinker toy" may now be ready to become a treasured museum piece. The Computer Museum in downtown Boston — an international museum dedicated entirely to computing — is searching for the very best and most unique relics of the personal computer revolution.



ComputerLand, CW Communications, and The Computer Museum are working together to bring these early relics out of your attic and into the collection of The Computer Museum. The museum is especially looking for kit machines, prototypes, programs, output, newsletters and memorabilia of early computing from around the world. A selection of the finest items will be used to create an exhibit on the evolution of personal computers and a catalog highlighting the Museum's collections. If your submission is accepted for addition to the Museum collection, you will be invited to the grand opening of the exhibit and will receive a bound edition of the catalog. If your item is selected as one of the five best "finds", you will also receive an all-expense-paid trip to Boston for the grand opening party.





So, get up to the attic, down to the cellar and into your closets, and tell us what you find! Call or wtite the Museum for an official entry form, or send a photo and description of your items by March 1, 1986 to: The Computer Museum, Personal Computer Competition, 300 Congress St., Museum Wharf, Boston, Massachusetts USA 02110, (617) 426-2800, Telex: 62792318.

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Bars and Stripes

The STROBE from Pro/Digital Systems lets you enter bar code data into an IBM PC or Model 1000 (running MS-DOS 2.1 or greater) as if you typed it in. It automatically recognizes and bidirectionally decodes the bar code formats UPC, Code-39, and Codabar.

The STROBE package consists of a high-resolution red Opticon MSH-510 optical wand, an IBM PC interface, disk-based bar code decoding software, and a manual. The STROBE decoder is transparent to all software and requires no changes to your programs. It is embedded into MS-DOS at power-up and constantly checks the reader wand for activity.

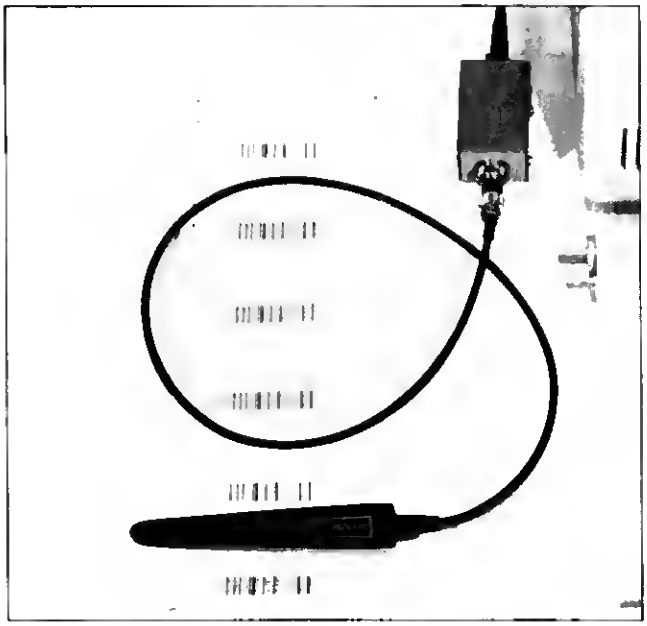
STROBE works with spreadsheets, data bases, Basic, and DOS. With the IBM PC interface, the optical wand reads data through the parallel printer port and permits simultaneous wanding and printing. Bar code printing software is optionally available to print bar code labels on any Epson-series printer.

The STROBE package costs $299.95. You can use optical wands sold by Radio Shack with the program. The interface and the software alone is $149.95. For more information, contact Pro/Digital Systems, 3825 W. Garden Grove Blvd., Suite 25, Orange, CA 92668, 714-750-5724.

Circle 575 on Reader Service card.

Death Wish

Borrowed Time by Activision is an illustrated text adventure game where you are both the hunter and the hunted. As Sam Harlow, a small-time private eye of the 1930s, you must track down and cross-examine a number of suspects in less than a day. Time and strategy are critical. You must constantly keep an eye over your shoulder to avoid losing your life to the one suspect who is tracking you.



STROBE decodes UPC, Code-39, and Codabar.

Borrowed Time includes special on-screen command features such as pull-down windows, point-and-press options, and "most-used command" menus. An expanded parser lets you enter commands in plain English. The program is available for the IBM PC and the Model 1000 for $39.95. For more information, contact Activision Inc., 2350 Bayshore Frontage Road, Mountain View, CA 94043, 415-960-0410.

Circle 574 on Reader Service card.

Fast Math

Trionix offers an electronic board designed to upgrade the Model 1000 so that it can use Intel's 8087 math coprocessor. The board retrofits the Model 1000 to take advantage of the speed increase for floating-point math calculations. For example, a math program that currently takes 60 seconds without an 8087 will run in 4–5 seconds with an 8087.

The board doesn't use an expansion slot and you install it yourself. You can order the board with the 8087 ($235) or without ($110). It comes with full installation instructions. For further details, contact Trionix, 3563 Roosevelt # B, Carlsbad, CA 92008, 619-434-4439.

Circle 571 on Reader Service card.

Assembly Time

Microsoft offers a new, high-speed version of its Macro Assembler language. Macro Assembler 4.0 is three times faster than the previous version. It requires 128K, one disk drive, and MS-DOS 2.0 or higher.

The new version lets you assemble larger source files with more symbols and more macro text. New assembly switches make the assembler more convenient to use and more efficient. Microsoft's Symbolic Debug Utility supports source-level debugging of programs written using the Microsoft C compiler, Fortran, Pascal, or Macro Assembler. Screen-swapping lets you switch between the debugging screen and the application output.

The assembler comes with an interactive source-level symbolic debugger, linker, program maintenance utility, library manager, cross-reference utility, and .EXE file-packing and header utility. The program costs $150, and upgrades for registered owners are $75. For more information, contact Microsoft Corp., 10700 Northup Way, Box 97200, Bellevue, WA 98009, 800-426-9400.

Circle 577 on Reader Service card.

Hot Flashes

Personal Computer Support Group's LIGHTNING makes disk access two to four times faster on your IBM PC or compatible.

LIGHTNING loads onto your DOS disk if you use floppies, or into the DOS area if you have a hard disk. When you boot the DOS, LIGHTNING loads itself permanently in memory. It works with your data base manager, word processor, or spreadsheet and speeds up loading and saving files.

A copy-protected version of LIGHTNING is $49.95; unprotected, it's $89.95. For more information, contact Personal Computer Support Group, 11035 Harry Hines Blvd. 206, Dallas, TX 75229, 214-351-0564.

Circle 578 on Reader Service card.

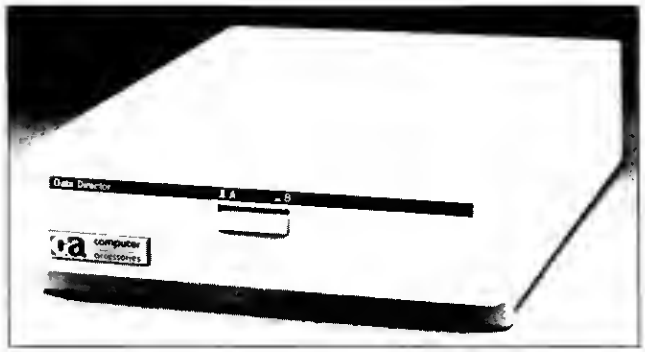
Worth While

The Scarborough Systems Inc. (55 S. Broadway, Tarrytown, NY 10591, 914-332-4545) offers an upgraded version of its home financial management program, Your Personal Net Worth. It works on the IBM PC AT and is compatible with the Model 1000.

The non-copy-protected program handles up to 10 checking accounts, up to 350 different budget categories, credit card accounts, and thousands of individual entries. It records stock and other investment transactions and documents household valuables, collectibles, and important papers.

Your Personal Net Worth

MS-DOS NEW PRODUCTS



The Data Director, a data transfer switch.

costs $99.95. If you already own the program, you can get the upgraded version for $10. For further information, contact Scarborough Systems.

Circle 576 on Reader Service card.

Data Sharing

Computer Accessories Corp. offers The Data Director (Model Q1020), a two-position data transfer switch that lets two parallel peripherals share the same computer port. It features printed circuit board construction, a scaled push-button switch, a shielded case, and DB-25 female port connectors.

The switch costs $99.95. For more information, contact Computer Accessories Corp., 6610 Nancy Ridge Drive, San Diego, CA 92121, 619-457-5500.

Circle 570 on Reader Service card.

Easy Words

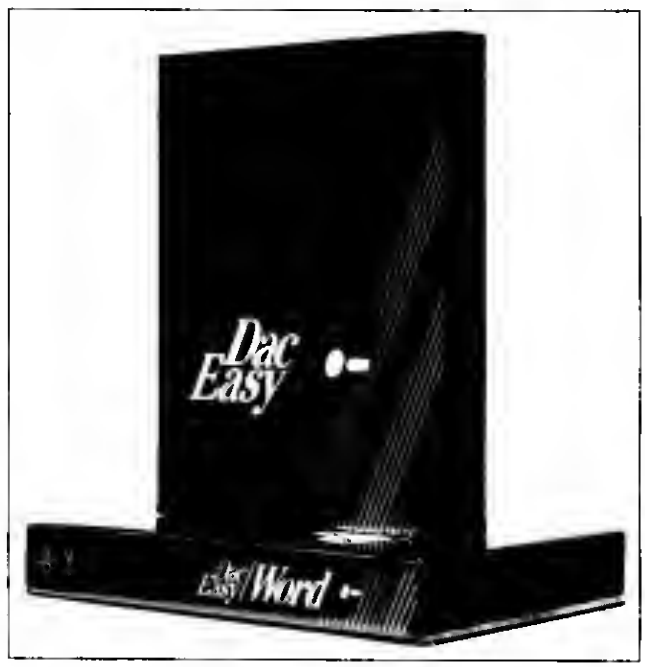
Dac-Easy Word from Dac Software is a full-featured word processor for the 256K IBM PC and compatible computers. You can work on four different documents at once using Dac Windows, automatically hyphenate words with Dac's internal dictionary, merge files, automatically search text, get a word count, and number pages.

Dac-Easy Word costs $49.95 plus $7.50 shipping and handling. For further information, contact Dac Software Inc., 4801 Spring Valley Road, Bldg. 110B, Dallas, TX 75244, 214-458-0038.

Circle 573 on Reader Service card.

To the Rescue

The Brown Bag File Recovery System for the IBM PC



A word processor from Dac Software Inc.

Circle 145 on Reader Service card.

Circle 441 on Reader Service card.

MS-DOS NEW PRODUCTS

and compatibles works with both hard and floppy disks. It recovers erased files, repairs damaged files, locates a file you misplaced in some subdirectory, and more.

The menu-driven program offers on-line help for each option. The package is $49.95. For more information, contact Software Resource Group Inc., 15100 El Camino Grande, Saratoga, CA 95070, 408-395-9568.

Circle 579 on Reader Service card.

Fractions

T-1000 Math:Fractions by Viking Educational Software teaches you how to add, subtract, multiply, and divide fractions. A special section covers vocabulary related to fractions.

Step-by-step explanations along with exercises make the program an effective learning aid. T-1000 Math: Fractions is designed for the 128K Model 1000 with one disk drive. It costs $19.95. The program is also available for the Models I, III, and 4. For more information, contact Viking Educational Software, 910 Soo Blvd., Rice Lake, WI 54868, 715-234-2680.

Circle 572 on Reader Service card.

Corporate Taxes

BNA Corporate Tax Spreadsheet ($695) from BNA Software lets you do corporate tax planning and audits. The program is a self-contained spreadsheet that runs on the IBM PC and compatibles with 256K, MS-DOS 2 or higher, and two double-sided floppy drivca or one double-sided floppy drive and one hard drive.

Features include automatic calculation of regular, alternative, and minimum taxes (including special transition rules for changes in rates for fiscal-year corporations); net operating loss (NOL) carryovers and carrybacks; and invesiment tax credit (ITC) limitations.

Contact BNA Software, 1231 25th St. N.W., Washington, DC 20037, 202-452-4453.

Circle 580 on Reader Service card.

Keystroke Saver

Productiviiy Software International's PRD + helps you speed up data entry and improve accuracy. it's a memory-resident program that runs on IBM PC-compatible computers and works with popular word processors, data base managers, spreadsheets, and graphics and integrated software packages.

The program lets you define and use abbreviations that expand into words, phrases, formulas, or programming commands (up to 240 characters).

PRD + costs $195. For more information, contact Productivity Software International L.P., 1220 Broadway, New York, NY 10001, 212-967-8666.

Circle 583 on Reader Service card.

MS-DOS New Products Index

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

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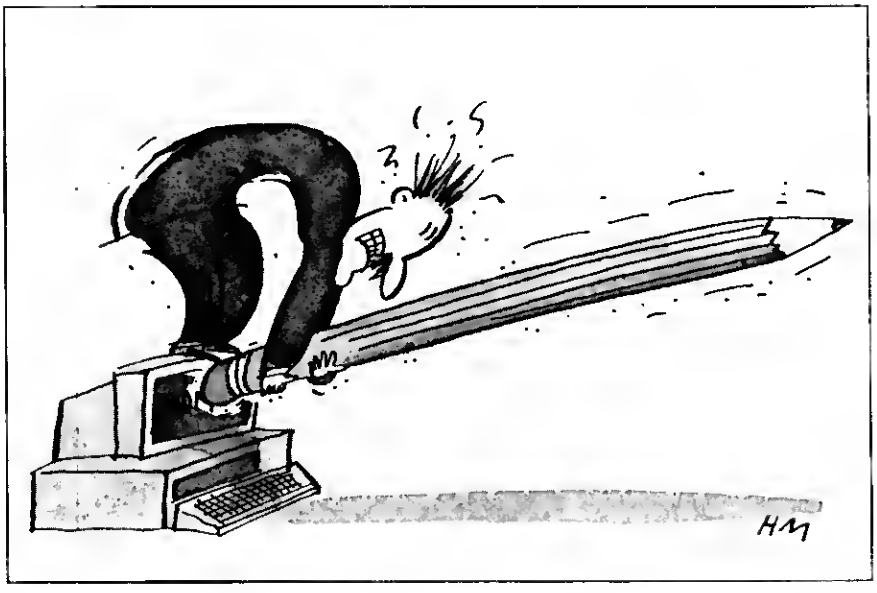

The first TRS-80 was the 4K Model I with Level I Basic, in which you could correct typing mistakes in only two ways: Type over the line or backspace to the mistake if you hadn't yet pressed the enter key and retype from that point. The Model I also tended to throw in "exxxxxxtra" characters because of the once-notorious keyboard bounce. Imagine the frolics a fumble-fingered beginner had in debugging even a 10-line program.

Level II Basic quickly appeared. Along with added commands it offered line editing—and a miserable era closed. Today's Tandy computers offer a variety of ways to edit Basic programs. I'll cover what's available on the Model 4/4P.

Learn to Edit

I've discovered that many beginning programmers take what they consider to be the line of least resistance. They retype lines again and again rather than stop for a while to learn how to edit. Or they learn a couple of editing commands and make do. I was exactly that way for about three months in 1979, when learning Basic was so heady an experience that there didn't seem to be time to slow down and learn it properly.

So I want you to solemnly repeat after me: "In the interest of saving untold hours in my future programming life, I promise never to change a Basic line by retyping until I learn all there is to know about editing." Having made that promise, you're committed. I guarantee you'll seldom resort to retyping once you know the system.

Follow the Rules

The rules aren't difficult to learn, but you have to put them in your fingers as well as your head. In the same way you learned to type, practicing the editing commands will make your fingers intelligent so they do what's needed without explicit instruction from the brain every step of the way. That's why I made you promise to forego retyping lines until you learn the editing rules.

To begin, type in this line and press the enter key:

```
100 RUM * SOMETHING WRONG
```

The computer registers the material in memory as a program. It will produce a syntax error when you run it, so you need to correct it. "RUM" should be "REM" for remark.

Type in EDIT 100, meaning "edit line 100," and press the enter key. The line number appears with the cursor positioned after it. Though you can't see any of the line's characters yet, they're there. Tap the space bar. The cursor moves one position rightward, and the "R" of RUM appears. Press the D key for "delete." Basic displays the incorrect "U" between backslashes, meaning it's deleted the character. Now press the I key to get into the insert mode. Press the E and the enter keys, then type in LIST. Now you know both how to delete and insert material within a line.

Note that in typing in Basic material, Basic lists all letters of the alphabet not within quotes or to the right of a REM statement in capital letters, even if you type them in in lowercase. Type in LIST, press the enter key, and this appears:

```
100 REM * SOMETHING WRONG
```

Now for an experiment. Type in EDIT 100 and press the enter key. Hold down the space bar until the cursor reaches the end of the line. It sticks there. Now hold down the left-arrow key. The cursor races leftward to its starting position, while the characters disappear. Go back and forth all you want, then press the enter key. You've made no changes to the line.

Now change the "E" back to a "U" and run the incorrect program. Finding the syntax error, the computer announces it and puts itself in the edit mode for the offending line. For now, press the enter key to leave the line.

Next, type in CLS. This blanks the screen and prints the Ready prompt. Type in EDIT 100. Again, the line number comes up without immediately revealing line contents. How can you edit what you can't see? The sloppy solution is to press the enter key and immediately type in another edit command, but it's simpler to just press the L key. Basic prints out the full line of material and displays a second line with only the line number showing. You're still in the edit mode. The line above remains as reference for the new version you're creating.

The program is now basically correct but paradoxically wrong. The REM statement says "something" is wrong, but it isn't. Let's fix it. Tap the space bar

System Requirements

Models 4 and 4P
Basic

Illustration by Hal Mayforth

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to move the cursor over the S in the word "something." Type in 4D, meaning to delete the four characters "some," which appear between backslashes. Now press the I key for insert, type in NO, and press the enter key. List the line to see the corrected version.

Don't Give Up

This is the point at which many programmers quit and go back to the fun of programming. Life becomes a limping series of edit commands, spacing over to the area to change, then deleting and/or inserting. It works, but it's like using a 10-watt bulb as a reading lamp.

I know an excellent Basic programmer whose style was to re-edit a given line for every insert made at a different point in the line. "Once in the insert mode, you can't get out unless you press the enter key to end editing the line," he said. But he was wrong.

At any time after you've pressed the I key, you can press the shift and up-arrow keys together to leave the insert mode. To try it, first type in this line:

```
100 PRINT "One Three Five"
```

Type in EDIT 100, press the L key to register the reference line, and space over to the "T." Press the I key to get into the insert mode. Type in TWO and a space. Press the shift and up-arrow keys together. You're out of insert mode. Space over to the "F" and press the I key. Type in FOUR and a space, and press the enter key. List the line to see the result. Note that you didn't have to leave the insert mode after you made the final change. You can continue work on a line, by turns inserting, deleting, and moving back and forth until you're satisfied.

Type in the word EDIT, a space, and a period, and the computer will bring up the line it recognizes as current, either because it's an error line, a just-typed line, or the line most recently edited.

Plus Two

Two additional subcommand modes are X for going to the end of a line, and H for hacking off all line material from the cursor to the end of the line. After you enter a line for editing, pressing the X key takes the cursor to the end of the line and starts insert mode.

You can type in additional material at the end of the line. If you use the left-arrow key to move leftward in this mode, Basic will erase the material. To try it, type in EDIT 100, press the X key, use the arrow key to back up to the space following the final letter in FOUR, type in a double quote mark, and press the enter key. To go to the end of the line and move leftward without erasing, type in X, then press shift/up-arrow to leave the insert mode.

The H command lets you get rid of all characters from cursor position rightward to the line's end. In line-editing mode, space the cursor rightward until it covers the first character of the unwanted material. Press the H key. You are in insert mode and may either type in more material, register the change by pressing the enter key, or leave insert mode to space backward for other changes.

Et Cetera

I think what I've covered will serve you well in 80 percent of your editing. I'll go over remaining editing commands without examples. To use any of them, make sure you're out of the insert mode.

- Quick forward: Type in a number and press the space bar, and the cursor jumps rightward that many characters. Nothing is changed. If the number exceeds the number of characters to the right of the cursor, it goes to the end of the line.
- Quick backward: Same as above, except press the left-arrow key following the number, and the cursor goes leftward.
- Change characters: To change a set number of characters in an overstrike mode, type in a number and press the C key. New material you type in will replace old characters for the number of characters specified. Control then returns to the regular edit mode.
- Delete characters: Type in a number and press the D key. Basic erases that many characters, with deleted characters appearing between backslashes.
- Search: The form is N for number of occurrences, S for search, and C for character sought, typed in together. For example, 3SP takes the cursor to the third occurrence of the letter "P." The search is exact. If you want a lowercase "p," you'd type in 3Sp. It's a quick and precise way to move the cursor.
- Search and kill: The form is similar to the search command. It deletes all material from the cursor to the specified occurrence of a certain character. For example, 1Ks kills all characters from the cursor to the first occurrence of "s."
- Cancel and start over: If you muddle a line past the point of knowing exactly what you've done—or for any other reason—press the A key. Any changes made are canceled and the line is again listed for a new editing try.
- Exit: Press the E key for exit. The changes made are retained, and editing is stopped.
- Quit: Press the Q key to cancel all changes made and quit the editing mode. Basic retains the line as it began. For the beginner, the quit command is very important. Now I press the Q key until April.■

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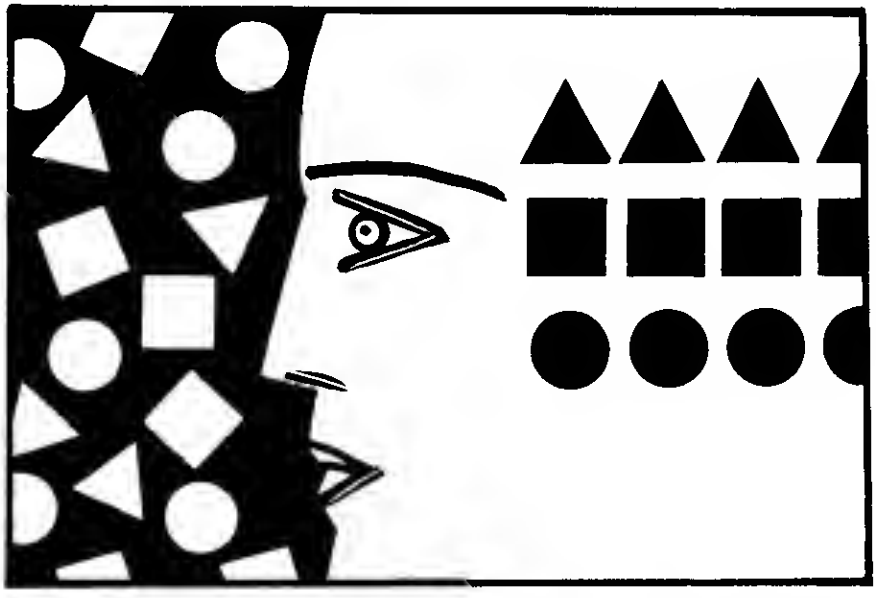

One of the handiest features of Disk Basic on most Model I/III operating systems is the CMD"O" sort. Unfortunately, Model 4 Basic has no equivalent. This created a problem for me recently while trying to convert a Model III program to the Model 4. I wrote a sorting algorithm in Basic but it was slow, taking about 90 seconds to order a list of 1,000 strings. So I reached for the assembler and started writing a Model 4 version of CMD"O".

My program had several arrays that it sorted many times while it ran. I needed something that would sort quickly, would reside in memory instead of on disk, could be installed as part of a /JCL program, and required no intervention by the user. The result was a program that could sort string, integer, and single-precision arrays. Program Listing 1 shows a condensed version that sorts only string arrays.

The program loads and protects itself in high memory, passes its address to Basic, and can sort an array of 1,000 random strings in about three seconds. If you add a few elements to an array that is mostly in correct order, the sort will usually take under a second.

What Sort of Sort?

One of the problems I faced was finding an algorithm that was both fast and reasonably easy to write in Assembly language. I first considered using a quick sort, but discarded it because it needs a large amount of stack space and is inefficient when sorting a list that is mostly preordered.

I settled on a Shell sort, because it can quickly sort a mostly ordered list and because it is relatively easy to implement. The Figure, a pseudocode listing for the Shell sort algorithm I used, should make the program in Listing 1 easier to follow.

LOAD 80

System Requirements

Model 4
64K RAM
Basic
Assembly language
Editor/assembler

The Shell sort algorithm works through a process of successive approximations. It divides the list you want sorted into a large number of shorter lists, which it quickly sorts. Then it again divides the partially sorted main list into fewer and longer sublists, which it sorts. The process is repeated until the entire list is in the correct order.

You handle the subdivision by picking a "gap" value and using it to select which items to sort. For example, if you choose a gap of four, one sublist is the first, fifth, ninth, 13th, and so on elements of the main list. Another sublist comprises the second, sixth, 10th, 14th, and so on elements. When the gap is four, you'll have four separate sublists.

The Shell sort starts with a relatively large gap value to move items quickly toward their correct locations in a list. After each pass through the list, the routine reduces the gap value. Once the list has been sorted with a gap of one, it is in correct order and the sort routine is complete.

```
A. Calculate initial gap setting                    (740-790)
B. If gap < 4 then gap = 4                          (810-850)
C. Repeat:                                          (900-960)
    1. Reduce to next lower gap size if gap = 0 then stop.
    2. For counter = gap + 1 to array size          (970-990
                                                    &1880-1990)
        a. set pointer = counter
        b. compare array element at pointer
           with element at pointer - gap            (1080-1510)
           If elements in wrong order:              (1560-1660)
           i. swap and
           ii. set pointer = pointer - gap and      (1740-1810)
           iii. if pointer > gap, loop to b.        (1810)
       Loop back to 2.                              (1810)
    Loop back to 1.                                 (2030-2050)
END.
```

Figure. Sort routine pseudocode.

Illustration by Anthony Russo

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Program Listing 1. String array sort.

```
00100 ;*****************************************************************
00110 ; String Array Sort for Basic Strings
00120 ;   Ascending Shell Sort (1,4,13, etc. intervals)
00130 ;   Calling Sequence from Basic:
00140 ;     CALL SORT% (ADDRESS%,NUMBER%)
00150 ;   SORT% is address of this routine (see text)
00160 ;   ADDRESS% is the address of first element to sort
00170 ;   NUMBER% is total number of elements to sort
00180 ;*****************************************************************
00190 ;SVCs used:
00200 @DIV16  EQU     5EH
00210 @DSPLY  EQU     0AH
00220 @HIGH$  EQU     64H
00230 ;
00240 ;EQUates:
00250 USTOR$  EQU     0013H
00260 CR      EQU     13
00270 LF      EQU     10
00280 ;
00290 ;MACROs
00300 SVC     MACRO   #NUM
00310         LD      A,#NUM
00320         RST     28H
00330         ENDM
00340 ;
00350 MUL3    MACRO                   ;HL = HL * 3
00360         LD      C,L             ;  uses BC
00370         LD      B,H
00380         ADD     HL,HL
00390         ADD     HL,BC
00400         ENDM
00410 ;
00420 LDDEHL  MACRO                   ;Load DE,(HL)
00430         LD      E,(HL)
00440         INC     HL
00450         LD      D,(HL)
00460         ENDM
00470 ;
00480 ;---------------------------------------------------------------
00490 ;TRSDOS Memory Header
00500         ORG     03000H
00510 ENTRY   JR      BEGIN           ;Branch to start
00520 OLDHI   DW      $-$             ;Hold old HIGH$
00530         DB      MODDCB-ENTRY-5  ;Calculate length of name
00540         DB      'SSORT'         ;Module name
00550 MODDCB  DW      0               ;These pointers are unused
00560         DW      0
00570 ;---------------
00580 ;       On entry, HL==> descriptor of string holding array name
00590 ;                 DE==> number of array elements to sort
00600 ;---------------
00610 BEGIN   PUSH    DE              ;Save DE value
00620         LDDEHL                  ;Get LOW varptr in DE
00630         LD      HL,-3           ;Subtract 3 to count
00640         ADD     HL,DE           ;  array from 1
00650         LD      (BASE),HL       ;Save BASE of sort area
00660 RL01    EQU     $-2
00670         POP     HL              ;HL==> Number to sort
00680         LDDEHL                  ;Get number in DE
00690         LD      (SIZE),DE       ;Save the number
00700 RL02    EQU     $-2
00710 ;---------------
00720 ;       Now calculate starting gap size
00730 ;---------------
00740         LD      HL,1            ;Starting size
00750 SETHL1  MUL3                    ;HL = HL * 3
00760         INC     HL              ;HL = HL * 3 + 1
00770         CALL    DEHLCMP         ;HL < DE ?
00780 RL03    EQU     $-2
00790         JR      C,SETHL1        ;Yes -- loop back
00800 ;
00810         LD      DE,4            ;HL => 4 ?
00820         CALL    DEHLCMP         ;Compare HL, DE
00830 RL04    EQU     $-2
00840         JR      NC,SORT10       ;Go of HL => 4
00850         LD      HL,4            ;Else HL = 4
00860 ;---------------
00870 ;       Now start the sort
00880 ;---------------
00890 SORT10  LD      C,3             ;Calculate GAP\3
00900         SVC     @DIV16          ;Let TRSDOS do the math
00910         LD      (GAP),HL        ;Save the GAP size
00920 RL05    EQU     $-2
00930         LD      A,H             ;Down to 0?
00940         OR      L               ;Merge bytes
00950         RET     Z               ;Back to Basic if 0
00960 ;
00970         INC     HL              ;HL = loop counter
00980         LD      (COUNT),HL      ;Save this also
00990 RL06    EQU     $-2
01000         LD      E,L             ;Copy to DE
01010         LD      D,B             ;DE = top element
01020 SORT20  LD      BC,(GAP)        ;P/u gap size
01030 RL07    EQU     $-2
01040         OR      A               ;Clear carry flag
01050         SBC     HL,BC           ;HL = bottom element
```

Listing continued

One problem with the Shell sort is that it is impossible to analyze completely; the only way to select a "best" series of gap sizes seems to be by trial and error. Many books use a Shell sort algorithm that divides the total number of items in the list by 2 to find the first gap size, and then divides each gap size by 2 to find the next gap size. Some of the same books describe a Shell sort that uses a bubble-sort technique to order each sublist. While you'll find such an algorithm easy to implement, it doesn't produce an efficient sort.

The gap sizes used in Listing 1 are, in reverse order, one, four, 13, 40, 121, and so on. You can determine each number in the series by multiplying the previous value by 3 and then adding 1. The first gap size in the sort is the largest number in the series that is less than the number of items in the array. The first part of Listing 1 calculates the correct starting gap size. After that, the program finds each lower gap by dividing the previous value by 3 and discarding the remainder.

I used an insertion sort instead of a bubble sort on each sublist. According to Donald Knuth's *The Art of Programming*, Volume 3, this implementation of the Shell sort is about twice as fast as the divide-by-2 method. Using an insertion sort instead of a bubble sort should speed things up by a factor of six or more.

Parts of Listing 1 deserve special comment. Basie's string array is a complex data structure. The program stores the array in memory with some informational bytes and then a 3-byte descriptor pointing to the text of each string, which it stores in high memory. The first byte of the descriptor is the length of the string; the next 2 bytes represent the string's address in Basic's string memory area.

The sorting program must be able to keep track of each string's position in the array, of the address of each string's descriptor, and of the address of the actual string in high memory. When the program knows the element number of the string it wants to find, it can multiply that number by 3 and add it to the address of the first element of the array to find the address of the descriptor. It must then use the address stored in the descriptor bytes to find the string.

To compare the third and seventh elements of the array, for example, the program must first find the descriptors of each string, then find the addresses of each string, and finally compare the two strings. The only complicated part of Listing 1 is the shifts from array element number to descriptor address to string address which begins each comparison.

The constant change between addressing modes slows the program

Listing continued

```
01060           LD      (BOTTOM),HL     ;Save lower element #
01070 RL08      EQU     $-2
01080 SORT30    MUL3                    ;HL = HL * 3
01090           LD      BC,(BASE)       ;Get base address
01100 RL09      EQU     $-2
01110           ADD     HL,BC           ;HL==> varptr of lower element
01120           EX      DE,HL           ;HL = top element
01130           MUL3                    ;HL = HL * 3
01140           LD      BC,(BASE)       ;Get base address
01150 RL10      EQU     $-2
01160           ADD     HL,BC           ;HL==> varptr of upper element
01170 ;---------------
01180 ;         Now compare the two strings and swap if necessary
01190 ;---------------
01200           LD      A,(DE)          ;Get length of lower element
01210           LD      C,A             ;Into C
01220           LD      B,(HL)          ;Length of upper in B
01230           PUSH    HL              ;Save ptr. to upper element
01240           PUSH    DE              ;Save ptr. to lower element
01250           PUSH    DE              ;Save it again.
01260           INC     HL              ;HL==> addr. of upper element
01270           LDDEHL                  ;Move address to DE
01280           EX      DE,HL           ;HL==> upper element
01290           EX      (SP),HL         ;HL has ptr. to lower element
01300           INC     HL              ;HL==> addr. of lower element
01310           LDDEHL                  ;Move address to DE
01320           POP     HL              ;HL==> upper / DE==> lower
01330 STRCMP    INC     B               ;Test upper element length
01340           DEC     B               ;Was it 0?
01350           JR      NZ,CMP10        ;No -- go
01360           INC     C               ;Test lower element length
01370           DEC     C               ;Was it 0?
01380           JR      NZ,SWAP         ;Upper=0,lower<>0 then swap
01390           JR      NOSWAP          ;Else no swap
01400 ;
01410 CMP10     INC     C               ;Test lower element length
01420           DEC     C               ;Was it 0?
01430           JR      Z,NOSWAP        ;Lower=0, upper<>0 then no swap
01440           LD      A,(DE)          ;Both non-zero
01450           CP      (HL)            ;  So compare characters
01460           JR      NZ,NOTEQ        ;Not equal -- end loop
01470           INC     HL              ;Else point to next
01480           INC     DE              ;  chars. in strings
01490           DEC     B               ;And reduce length counters
01500           DEC     C
01510           JR      STRCMP          ;And test again
01520 NOTEQ     JR      C,NOSWAP        ;Upper is greater -- don't swap
01530 ;---------------
01540 ;         Swap the strings' pointers
01550 ;---------------
01560 SWAP      POP     DE              ;DE has ptr. to lower element
01570           POP     HL              ;HL has ptr. to upper element
01580           LD      B,3             ;3 bytes to change
01590 SWAP10    LD      A,(DE)          ;Get byte from lower
01600           LD      C,(HL)          ;And byte from upper
01610           LD      (HL),A          ;Lower's byte to upper
01620           LD      A,C             ;Upper's byte to A
01630           LD      (DE),A          ;And move to descriptor
01640           INC     HL              ;Point both regs. to
01650           INC     DE              ;  next byte
01660           DJNZ    SWAP10          ;Loop back
01670 ;---------------
01680 ;         Keep comparing
01690 ;---------------
01700           LD      HL,(BOTTON)     ;Get old bottom rec. #
01710 RL11      EQU     $-2
01720           LD      E,L             ;Copy into
01730           LD      D,H             ;  DE
01740           LD      BC,(GAP)        ;Get gap value
01750 RL12      EQU     $-2
01760           OR      A               ;Clear carry flag
01770           SBC     HL,BC           ;HL = new bottom
01780           LD      (BOTTON),HL     ;Save it
01790 RL13      EQU     $-2
01800           JR      C,NOSW10        ;Go if HL < 0
01810           JR      NZ,SORT30       ;Loop if bottom =>1
01820           JR      NOSW10          ;Skip pops
01830 ;---------------
01840 ;         Increment counter until counter > size
01850 ;---------------
01860 NOSWAP    POP     HL              ;Clear the stack
01870           POP     HL              ;  by popping 2 values
01880 NOSW10    LD      DE,(COUNT)      ;Get counter
01890 RL14      EQU     $-2
01900           INC     DE              ;Counter = counter + 1
01910           LD      (COUNT),DE      ;And save again
01920 RL15      EQU     $-2
01930           LD      HL,(SIZE)       ;Get size
01940 RL16      EQU     $-2
01950           CALL    DEHLCMP         ;And compare them
01960 RL17      EQU     $-2
01970           LD      L,E             ;Copy count to HL
01980           LD      H,D             ;DE = HL = new count
01990           JR      NC,SORT20       ;Loop if SIZE => COUNT
02000 ;---------------
02010 ;         Done with one gap setting
02020 ;---------------
02030           LD      HL,(GAP)        ;Get the old gap
```

Listing continued

Listing continued

```
02040 RL18    EQU     $-2
02050         JP      SORT10          ;And loop back
02060 RL19    EQU     $-2
02070 ;---------------
02080 ;       Compare DE & HL
02090 ;       Return results in flags:
02100 ;                 Z:      HL = DE
02110 ;               NZ &  C:  HL < DE
02120 ;               NZ & NC:  HL > DE
02130 ;---------------
02140 DEHLCMP LD      A,H             ;Compare
02150         SUB     D               ;  H & D
02160         RET     NZ
02170         LD      A,L             ;Compare
02180         SUB     E               ;  L & E
02190         RET
02200 ;---------------
02210 BASE    DW      $-$
02220 SIZE    DW      $-$
02230 GAP     DW      $-$
02240 BOTTOM  DW      $-$
02250 COUNT   DW      $-$
02260 ;---------------
02270 PROGEND EQU     $-1             ;Define end of program
02280 PROGLEN EQU     $-ENTRY         ;Length of program
02290 ;
02300 ;---------------------------------------
02310 ;       Install in high memory, protect, and
02320 ;       put entry address in USTOR$
02330 ;---------------------------------------
02340 ;
02350 INSTALL LD      HL,SIGNON       ;HL==> Hello message
02360         SVC     @DSPLY          ;Say hello
02370         LD      HL,0            ;Function: get current value
02380         LD      B,L             ;B=0:  use HIGH$
02390         SVC     @HIGH$          ;Get current value
02400         LD      (OLDHI),HL      ;Save in program header
02410         JR      Z,RELOC         ;Go if okay
02420         LD      HL,MEMERR       ;HL==> error message
02430         SVC     @DSPLY          ;Report the error
02440         LD      HL,-1           ;Show extended error code
02450         RET                     ;Back to TRSDOS
02460 ;---------------
02470 ;       Relocate program
02480 ;---------------
02490 RELOC   LD      IY,RELTAB       ;IY==> Relocation Table
02500         LD      DE,PROGEND      ;DE==> End of program
02510         OR      A               ;Clear Carry Flag
02520         SBC     HL,DE           ;Calculate distance to move
02530         LD      C,L             ;Transfer
02540         LD      B,H             ;  to BC
02550 RELOC1  LD      L,(IY+0)        ;Get address to change
02560         LD      H,(IY+1)        ;  into HL
02570         LD      A,H             ;Get MSB
02580         OR      L               ;Is it 0?
02590         JR      Z,MOVE          ;Yes -- go
02600         LDDEHL                  ;DE = value to change
02610         EX      DE,HL           ;HL has value to change
02620         ADD     HL,BC           ;Add the offset
02630         EX      DE,HL           ;Put new value in DE
02640         LD      (HL),D          ;Put it back
02650         DEC     HL              ;  into the
02660         LD      (HL),E          ;  program
02670         INC     IY              ;Bump table pointer
02680         INC     IY              ;  to next entry
02690         JR      RELOC1          ;Repeat until done
02700 ;---------------
02710 ;       Move to high memory and protect
02720 ;---------------
02730 MOVE    LD      DE,(OLDHI)      ;DE==> Destination address
02740         LD      HL,PROGEND      ;HL==> Current end of program
02750         LD      BC,PROGLEN      ;BC = # of bytes to move
02760         LDDR                    ;Move it all
02770         EX      DE,HL           ;Move new HIGH$ to HL
02780         LD      B,0             ;B=0 : use HIGH$
02790         SVC     @HIGH$          ;Set new HIGH$ value
02800         INC     HL              ;HL==> ENTRY-point
02810         LD      (USTOR$),HL     ;Save in USTOR$
02820         LD      HL,SUCCESS      ;HL==> Success message
02830         SVC     @DSPLY          ;Display it
02840         LD      HL,0            ;Show success
02850         RET                     ;Back to TRSDOS
02860 ;---------------
02870 ;       Installation messages
02880 ;---------------
02890 SIGNON  DB      LF,'Fast String Sort for Basic',CR
02900 SUCCESS DB      'Installation in high memory successful.',LF
02910         DB      'Entry address is stored at &H0013',LF,CR
02920 MEMERR  DB      'High memory not available for installation',LF
02930         DB      'Installation aborted',LF,CR
02940 ;---------------
02950 ;       Relocation Table
02960 ;---------------
02970 RELTAB  DEFW    RL01,RL02,RL03,RL04,RL05,RL06,RL07,RL08
02980         DEFW    RL09,RL10,RL11,RL12,RL13,RL14,RL15,RL16
02990         DEFW    RL17,RL18,RL19,0000
03000 ;
03010         END     INSTALL
```

End

down; it could make comparisons much faster if the strings had fixed lengths and locations in memory. Fortunately, swapping two strings in a Basic array is fast and easy, and somewhat compensates for the complexity of comparing two strings. All that the program needs to do is swap two string descriptors, not the text of the strings, which does not have to move at all.

On Location

When you move a program such as the main routine in Listing 1 to protected high memory, you can't guarantee in advance where it will be located, because you don't know what filters or other programs are currently installed. One of the problems I had designing the sort routine was finding an efficient way to pass its address to a Basic program.

I came up with several possible solutions. The most obvious was to include another small machine-language routine in the Basic program that would use the @GTMOD supervisory call to find the address of the sort routine. However, writing one machine-language routine just to find the address of another seems inherently inefficient.

Another option is to have the sort routine leave its address at some fixed location in memory so that the Basic program can find it. However, since TRSDOS 6.X has few fixed addresses—almost anything is likely to move to a different address if and when a new version of the DOS is released—it is difficult to find a place to leave the sort routine address.

Some addresses, however, will not or cannot move, most of them in the first page of memory between 0000 hexadecimal (hex) and 0100 hex. For example, the Z80 RST instructions always look to specific addresses, and the *Radio Shack Technical Reference Manual* says that four of the eight 3-byte restart vectors are available for user programs.

The manual also warns that some programs, such as Basic, may use some of those vectors. However, Basic version 1.1 doesn't seem to do so, and you could probably store the address of the sort routine in one of the restart vectors without any problem.

Roy Soltoff's *Programmer's Guide to LDOS/TRSDOS Version 6* briefly references 5 bytes in the first page of memory called USTOR$. The *Guide* states that those 5 bytes are a "user application storage area." The USTOR$ area was included in TRSDOS 6.X to maintain compatibility with Model I/III LDOS and is designed to allow one program to leave information in memory that another program can later find.

I have been assured that the USTOR$ area will "probably" be included, at the

same address, in any future release of TRSDOS, and I have not found or heard of any other filters or programs that use it, so it seems to be safe to use for passing a machine-language routine's address to Basic.

The initialization section of Listing 1 puts the address of the sort routine into the first 2 bytes of USTOR$, and the Basic program in Program Listing 2 finds that address with two PEEK commands (line 110).

The only other peculiarity of using the sort routine in Basic is that you must initialize the variable ADDRESS% before you use it, and your program cannot use any new variables after ADDRESS% has been loaded with the address of the first element of the array you want to include in the sort.

If you create any new variables after calling the VARPTR function, the address that you pass to the sort routine will be incorrect and the results of the sort are likely to be a very strange combination of errors.

The sort routine doesn't do any error-checking before it starts to work. If you tell it to sort more elements than exist in the array, it will happily destroy other arrays or part of Basic's memory area. It is up to you to insure that the values you pass to it are correct. Program Listing 2 demonstrates how the sort routine will normally be called.

As I said at the beginning of this column, my original program can also sort integer and single-precision arrays. It does so by receiving from Basic an indication of what type of array is to be sorted, and by having separate comparison and swap routines for each type. If enough people are interested, I'll include a numeric sort in a future column. However, you can always change a numeric array into a string array with clever use of STR$ and RSET, so Listing 1 should serve most purposes. ■

Program Listing 2. Test routine.

```
10 'Test Routine for Machine-Language Sort
20 'Use *Only* with Basic 1.1.0 or later
30 '
40 CLS
50 DIM ARRAY$(1000), SORT%, ADDRESS%, NUMBER%
60 INPUT "Number of strings to sort (2-1000)";NUMBER%
70 IF NUMBER% < 2 OR NUMBER% > 1000 THEN GOTO 60
80 'Build random strings
90 FOR K% = 1 TO NUMBER%:SIZE% = RND(7):FOR J% = 1 TO SIZE%:       ARRAY$(K%) =
ARRAY$(K%) + CHR$(96+RND(26)):NEXT J%:PRINT ARRAY$(K%),:NEXT K%
100 'Find address of sort routine--store in SORT%
110 SORT% = CVI(CHR$(PEEK(&H13)) + CHR$(PEEK(&H14)))
120 CLS:INPUT "Press <RETURN> to begin sorting ";X$:CLS:PRINT "Sort begins:    ";
TIME$
130 'Call Sort
140 ADDRESS% = VARPTR(ARRAY$(1))
150 CALL SORT%(ADDRESS%,NUMBER%)
160 PRINT "Sort finished:  ";TIME$
170 INPUT "Press <RETURN> to display sorted list  ";X$
180 CLS:FOR K% = 1 TO NUMBER%:PRINT ARRAY$(K%),:NEXT K%
```

End

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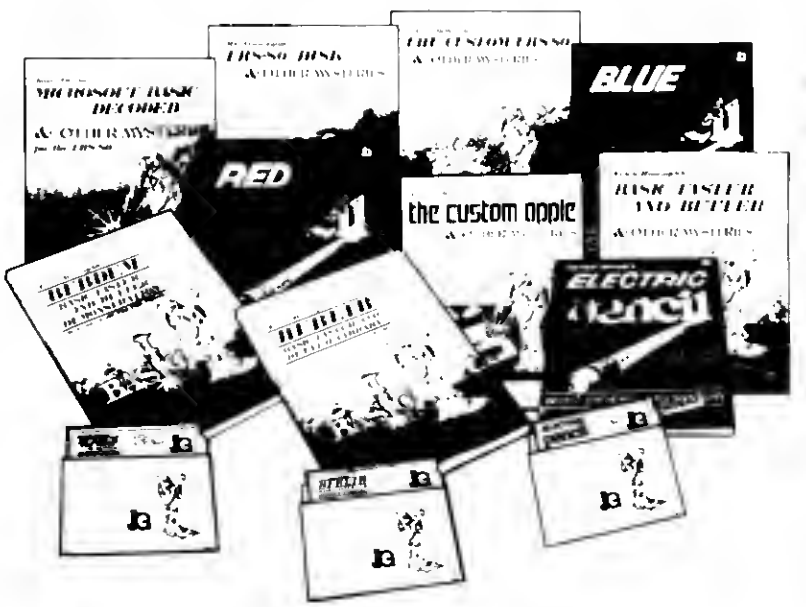

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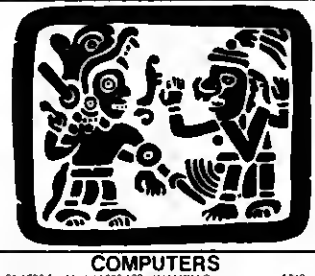

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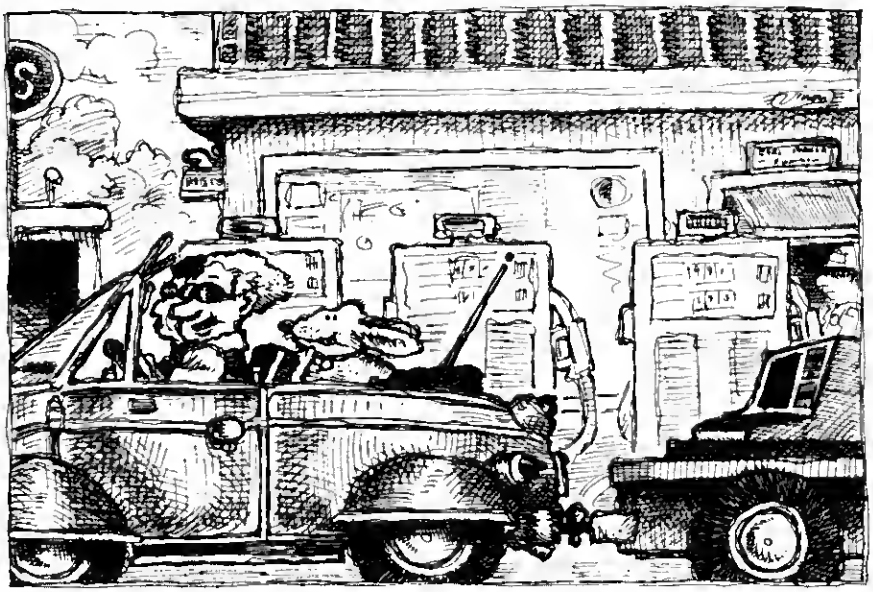

This month's template was submitted by Guy T. Wicks, Bernville, PA.

I like to keep track of my cars' performance to quickly spot a loss of efficiency that might signal maintenance problems. The best way to determine this is by monitoring fuel consumption and computing the miles per gallon (mpg) on a regular basis. I also like having an up-to-date account of yearly performance and vehicle costs; it's a great help at tax time. Although I've recorded mileage, fuel purchased, and costs for years, I could never seem to find time to do the necessary calculations until I built my CarFuel template.

Template Structure

I divided CarFuel into three sections: data entry, fuel consumption, and year-to-date costs (see the Figure). The first section contains the template's basic data: refueling dates, mileage, gallons purchased, and cost. The column labeled "Tank" lets me note when I completely fill the tank. CarFuel uses the figures entered in the first section to calculate the results for the fuel consumption and year-to-date areas.

The first column under "Fuel Consumption" computes and displays the miles per gallon you averaged after each refueling stop. If you fill the tank each time you gas up, you'll get an accurate fuel consumption rate. The next column uses a "moving" average to offset any fluctuation in fuel efficiency calculations caused by not filling the tank completely. CarFuel doesn't begin calculating the moving mpg until you've made five entries; thereafter it "moves" with the newest data, always computing the average

	1	2	3	4	5	6	7	8	9	10	11
1	Auto Data										
2											
3	Vehicle:	Jimmy	Year:		1983		Purchased:	4/6/84			
4											
5	/----------Data Entry----------/					•-----Fuel Consumption-----•			//------Year to Date-------//		
6	Date	Mileage	Gallons	Tank	Cost	Current	Moving	Annual	Miles	Gallons	Cost
7						MPG	Average	MPG			
8											
10	01/01/85	24,400.0		F							
11	01/04/85	24,781.7	17.40		$20.50	21.94		21.94	381.7	17.40	$20.50
12	01/10/85	25,107.3	8.48		$10.00	38.40		27.33	707.3	25.88	$30.50
13	01/22/85	25,269.2	14.40	F	$17.00	11.24		21.58	869.2	40.28	$47.50
14	01/30/85	25,565.1	4.25		$5.00	69.62		26.16	1,165.1	44.53	$52.50
15	02/08/85	25,705.5	16.27	F	$19.50	8.63	21.47	21.47	1,305.5	60.80	$72.00
16	02/15/85	25,872.3	6.25	F	$7.50	26.69	21.97	21.96	1,472.3	67.05	$79.50
17	02/24/85	26,017.2	5.80	F	$7.00	24.98	19.37	22.20	1,617.2	72.85	$86.50
18	03/05/85	26,152.0	5.65	F	$7.00	23.86	23.10	22.32	1,752.0	78.50	$93.50
19	03/14/85	26,272.7	5.05	F	$6.25	23.90	18.13	22.41	1,872.7	83.55	$99.75
20	03/26/85	26,576.2	7.95		$10.00	38.18	28.36	23.78	2,176.2	91.50	$109.75
21	04/04/85	26,706.7	8.48		$10.00	15.39	25.34	23.07	2,306.7	99.98	$119.75
22	04/15/85	26,788.4	7.70		$9.00	10.61	22.14	22.18	2,388.4	107.68	$128.75

Figure. Spreadsheet template for CarFuel.

Illustration by Vinoy Laughner

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Cell	Formula
R8C1	REPT(" – ",110)
R11:22C6	INT(((RC[– 4] – R[– 1] C[– 4])/RC[– 3])*100) + 0.5)/100
R15:22C7	INT(((RC[– 5] – R[– 5] C[– 5])/SUM(RC[– 4]: R[– 4]C[– 4]))*100) + 0.5)/100
R11:22C8	INT(((RC[– 6] – R10C2)/SUM(R10C3: RC[– 5]))*100) + 0.5)/100
R11:22C9	RC[– 7] – R10C2
R11:22C10	SUM(R10C3:RC[– 7])
R11:22C11	SUM(R10C5:RC[– 6])

Table 1. Multiplan formulas for CarFuel.

Cells	Format
Default Template Format	(K;DG0G10) General formatting and alignment of data follows Multiplan rules. Default cell width is 10 characters; the Display Commas option is enabled.
R1:4C1:11	(COD) Formatted in the Continuous Text mode with default alignment.
RSC1:11 R6:7C1:5 R10-22C4	(COC) Formatted in the Continuous Text mode with centered alignment.
R6:7C6:11	(COR) Formatted in the Continuous Text mode with right-justified alignment.
R10:22C3 R10:22C:10	(F2D) Formatted in Fixed Decimal mode with two digits of precision displayed in the default alignment.

Table 2. Multiplan formats for CarFuel.

of the five most recent entries. You can easily change the number of entries averaged by altering the cell designations used in the moving average formula.

The last column under "Fuel Consumption" provides the mpg rating for the entire year. It encompasses too much data to be useful in predicting mechanical deficiencies, but it can give you a means of comparing vehicles. That's especially helpful when you're buying a new car and want to estimate how real performance might compare to Environmental Protection Agency ratings. Similarly, you can use this information to predict annual vehicle costs for a future budget.

The final section of the template provides a summary of the year's performance. CarFuel gives you the rundown on the total miles traveled, amount of fuel consumed, and total cost after each fuel stop.

Construction Business

The Figure represents my sample template data; Tables 1 and 2 are, respectively, the formulas and formats used in building the spreadsheet. I used Multiplan to construct this template, but you can adapt it to any other spreadsheet by making appropriate changes in the formulas and cell formatting instructions. Table 3 contains the formulas for setting up a similar template using VisiCalc.

My template also assumes that you have a printer capable of printing 132 characters per line. If your printer requires special codes, you can use Multiplan's Print and Options commands to send the appropriate control codes to the printer each time you print the template. Don't forget to use the Print Margins command to set the right margin correctly, or you'll print only half the template lines on a page.

Begin by using the top eight rows as label areas. Multiplan requires that you format the text area for continuous display if the text will exceed one column width. For easy viewing, I formatted the entire area prior to entering the data by using the command sequence Format, Cells, Continuous.

Entering the formulas for CarFuel is easy: You enter a single formula and then copy it down the column, covering the cells you expect to fill. (You might want to increase the size of the sheet a few rows at a time—the larger the spreadsheet, the longer it takes to recalculate.) But make sure that you enter the absolute cell references (e.g., R10C2 in the formula in cell R11C8) so that the formulas work correctly when you copy them.

You can still "point" to the appropriate cell using the arrow keys, but don't forget to hit the @ key before moving the key again. This converts the relative cell reference to its absolute equivalent; you need absolute references for computing the year-to-date totals and averages.

Multiplan and most other spreadsheets store the numerical values as binary numbers. If you use decimal fractional digits (as you do when you work with money), your decimal representations might be inaccurate.

In writing CarFuel's formulas, I used a special technique to round the displayed numerical values to two decimal digits. While this still gives a binary value, it minimizes accumulated errors. For example, to round a numerical expression

Column	Formula
E	/F$
F	@INT((((B9 – B8)/C9)*100 + .5)/100
G	@INT((((B13 – B8)/(@SUM (C8. . .C13)))*100 + .5)/100
H	@INT((((B9 – B8)/@SUM (C8. . .C9))*100) + .5/100
I	(B9 – B8)
J	@SUM(C8. . .C9)
K	/F$ @SUM(E8. . .E9)

Table 3. Formulas for reworking CarFuel using VisiCalc. VisiCalc uses letter designations for the columns, so columns 1–11 of the Multiplan worksheet would become columns A–K on a VisiCalc worksheet.

to two decimal digits, CarFuel uses the following Multiplan formula:

INT((numerical expression)*100 + 0.5)/100

This equation first multiplies the numerical expression by 100 to move the first two fractional digits to the left of the decimal point. Next it adds 0.5 to round any remaining fractional value and uses the INT function to truncate the number to an integer value. Finally, the formula divides the truncated result by 100 to correct the two fractional digits.

One final point—the formula in cell R8C1 contains the string function REPT, which repeats the string (a hyphen in this case) 110 times. It's an easy way of drawing a dividing line across all 11 columns.

Final Tips

Enter the data from each vehicle refueling as soon as possible, and this template will provide a convenient way to track your cars' performance. Like any other tool, it will get "rusty" if you don't use it frequently.

Maintain a separate record for each vehicle to facilitate data entry and retrieval, and keep in mind that you'll spend less time recalculating the formulas if the spreadsheet is small. When you enter a lot of information, you can further reduce your waiting time by setting the recalculation mode to manual using the Options command.

My "car watcher" has been instrumental in managing my vehicle resources. With simple changes, you'll find a permanent home for it also.■

Write to Spreadsheet Beat c/o John B. Harrell III, 80 Micro, 80 Pine St., Peterborough, NH 03458. We'll pay $50 for each template we publish. In addition, we'll publish your questions and print advice on using your spreadsheets more efficiently.

Continued from page 43

Program Listing 1. Main/BAS.

```
1 ' Generalized Data Base System
2 '   Written by Hardin Brothers
8 SYSTEM "System (Break=No)"
9 '        Initialize & Define Variables
10 OPTION BASE 1: DEFINT A-Z:
20 FALSE = 0: TRUE = NOT FALSE
30 EQUAL.LINE$ = STRING$(80,"="):
40 BLANK.LINE$ = STRING$(79," ")
50 DIM KEY$(2)            'strings for index of used records
60 DIM F$(40)             'Fielding variables for random file
70 DIM FIELDS(2,40)       '(1,n) = length of field / (2,n) =
                           type of field
80 DIM IN(2,40)           '(1,n) = field # / (2,n) = condensed
                           x,y loc
90 DIM PRONPT$(40)        'prompt for input field
100 DIM TYPE(6)           'type for Selection comparisons
110 DIM LVAL(6)           'Field # for left side of
                           comparisons
120 DIM COMP(6)           'Comparison operator
130 DIM RVAL$(6)          'Field # or constant for right side
                           of comparisons
140 DIM CONJ(6)           'Conjunctions for
                           comparisons/selection
150 DIM RESULT(6)         'Results of individual comparisons
160 DEF FN CONDATE$(A$) = CHR$(VAL(MID$(A$,7,2))) +
    CHR$(VAL(MID$(A$,1,2))) + CHR$(VAL(MID$(A$,4,2)))
170 DEF FN EXPONE$(A$) = RIGHT$("0"+MID$(STR$(ASC(A$)),2),2)
180 DEF FN EXPDATE$(A$) = FN EXPONE$(MID$(A$,2,1))+ "/"+
    FN EXPONE$(MID$(A$,3,1))+"/"+FN EXPONE$(MID$(A$,1,1))
190 DEF FN CHKDATE(A$) = (MID$(A$,3,1)="/") AND
(MID$(A$,6,1)="/") AND (VAL(MID$(A$,1,2))=>1) AND
(VAL(MID$(A$,1,2))<=12) AND (VAL(MID$(A$,4,2))=>1) AND
(VAL(MID$(A$,4,2))<=31) AND (VAL(MID$(A$,7,2))<=99) AND
(LEN(A$)=8)
200 DEF FN ROOMEXIST = ((INSTR(KEY$(1),"0")+
    INSTR(KEY$(2),"0"))>0)
210 DEF FN NEXTREC = INSTR(KEY$(1),"0") +
    TRUE*(INSTR(KEY$(1),"0")=0)*(LEN(KEY$(1))+
    INSTR(KEY$(2),"0"))
220 DEF FN NUMERIC(X$) = (X$=>"0" AND X$<="9") OR (X$=".")
    OR (X$="-")
221 DEF FN CHARACTER(X$) = (" "<=X$) AND (X$<="z")
230 '  Main menu (230 - 310)
240 CLS
250   PRINT , "BASIC Data Base System":  PRINT: PRINT
260   PRINT , "1. Definitions":
      PRINT , "2. Use Existing Data Base":
      PRINT , "3. Add Records to Data Base"
270   PRINT , "4. Read/Search/Modify Records":
      PRINT , "5. Build Selection Key ":
      PRINT , "6. Build Sort Index File"
280   PRINT , "7. Print Reports":
      PRINT , "8. Release and Close Data Base":
      PRINT , "9. End Program":PRINT:
      PRINT , "   Your choice ==> ";
290   MAIN.MENU$ = " ":
      WHILE MAIN.MENU$ < "1" OR MAIN.MENU$ > "9":
      MAIN.MENU$ = INPUT$(1): WEND: PRINT MAIN.MENU$;
300   ON VAL(MAIN.MENU$) GOTO 700,500,700,700,700,700,700,
      600
```

```
310 IF FILE$<>"" THEN CLS: PRINT
    "You must close your database (menu choice 8) first":
    GOSUB 1012: GOTO 240
320 CLOSE: SYSTEM "System (Break=Yes)": CLS: END
490 '    Open a database for use
500 CLS: IF FILE$ <> "" THEN PRINT
    "There is a database already in use.":    PRINT
    "You must release and close one database before you can"
    ; PRINT "open another one.": GOSUB 1012: GOTO 240
502 PRINT "Enter database name -- maximum of 8 characters ":
    INPUT "   ==> ",FILE$
504 IF LEN(FILE$)<1 OR LEN(FILE$)>8 OR INSTR(FILE$,"/") THEN
    502
506 PRINT "Drive number (0-7) containing database ==> ";:
    DRIVE$ = " ": WHILE DRIVE$<"0" OR DRIVE$>"7":
    DRIVE$ = INPUT$(1): WEND: PRINT DRIVE$
508 TEST$ = FILE$ + "/DEF:" + DRIVE$: GOSUB 1000
510 IF TEST.FLAG = -1 THEN GOTO 516
512 IF TEST.FLAG = 0 THEN PRINT
    "That database does not exist on that drive"
    ELSE IF TEST.FLAG = 1 THEN PRINT "Illegal file name"
    ELSE IF TEST.FLAG = 2 THEN PRINT "Disk Error"
514 FILE$="": GOSUB 1012: GOTO 240
516 CLS: PRINT "Opening ";FILE$;" database.":
    OPEN "I",1,TEST$:INPUT #1, TOTAL.FIELDS:INPUT #1, RECLEN
518 FOR LOOP = 1 TO 40: INPUT #1, FIELDS(1,LOOP),
    FIELDS(2,LOOP): NEXT LOOP
520 INPUT #1, KEY$(1): INPUT #1, KEY$(2): CLOSE: GOTO 240
598 '    Close & Release an active database
600 CLS: IF FILE$ = "" THEN PRINT
    "There is no database presently active":GOSUB 1012:
    GOTO 240
602 PRINT "Close and Release an Active Database":  PRINT
    "If you continue, the current database will be closed.":
    PRINT: PRINT "Do you want to continue ";: GOSUB 1018:
    IF YN$="N" THEN GOTO 240
604 CLS: CLOSE: GOSUB 1054: FILE$ = "": GOTO 240
698 ' Call up overlay if not presently active
700   IF MAIN.MENU$="1" THEN OVL$="DEFINE" ELSE IF
MAIN.MENU$="3" THEN OVL$="ADD" ELSE IF MAIN.MENU$="4" THEN
OVL$="READ" ELSE IF MAIN.MENU$="5" THEN OVL$="SELECT"  ELSE
IF MAIN.MENU$="6" THEN OVL$="INDEX"
702       IF MAIN.MENU$="7" THEN OVL$="REPORT"
704 IF OLD.OVL$ = OVL$ THEN GOTO 2000
    ELSE PRINT: PRINT , "Loading program overlay ..."
706 OLD.OVL$ = OVL$:
    CHAIN MERGE OVL$+"/OVL",2000,ALL,DELETE 2000-3000
995 'z  Common Subroutines
998 '   Does File TEST$ exist?
        Return TEST.FLAG = -1 (file exists),
        = 0 (file doesn't exist)
        = 1 (illegal file name), = 2 (other error)
1000 TEST.FLAG = -1: ON ERROR GOTO 1004: OPEN "I",1,TEST$
1002 ON ERROR GOTO 0: CLOSE 1: RETURN
1004 IF ERL <> 1000 THEN TEST.FLAG=2: RESUME NEXT
1006 IF ERR = 53 THEN TEST.FLAG=0
    ELSE IF ERR = 64 TNEN TEST.FLAG = 1 ELSE TEST.FLAG = 2
1008 RESUME NEXT
1010 '     Pause & prompt for key to continue
1012 PRINT @(23,22),"Press any key to continue";
1014 WHILE INKEY$<>"": WEND: WHILE INKEY$= "": WEND: RETURN
1016 '     Yes/No Routine
```

Listing 1 continued

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Listing 1 continued

```
1018 PRINT "(y/n) ==> ";
1020 YN$=" ": WHILE INSTR("YN",YN$) = 0:
     YN$ = CHR$(ASC(INPUT$(1)) AND &HDF): WEND: PRINT YN$;:
     RETURN
1022 '        Open & Read the /INP file
1024 OPEN "I",1,FILE$+"/INP:"+DRIVE$: INPUT #1,I.HEAD$:
     FOR LOOP = 1 TO TOTAL.FIELDS: INPUT #1, PROMPT$(LOOP),
     IN(1,LOOP),IN(2,LOOP): NEXT LOOP
1026 CLOSE 1: RETURN
1028 '     Open & Field the /DAT file
        NOTE: buffer #2 is reserved for the /DAT file
1030 OPEN "R",2,FILE$+"/DAT:"+DRIVE$,RECLEN
1032 FIELD 2, FIELDS(1,1) AS F$(1): TEMP = FIELDS(1,1)
1034 FOR LOOP = 2 TO TOTAL.FIELDS: FIELD 2, TEMP AS DUMMY$,
     FIELDS(1,LOOP) AS F$(LOOP):
     TEMP = TEMP + FIELDS(1,LOOP): NEXT LOOP
1036 RETURN              'NOTE: /DAT file is left open!
1038 '     Display blank form on screen
1040 CLS: PRINT I.HEAD$:  PRINT @ 00,EQUAL.LINE$;:
     FOR LOOP = 1 TO TOTAL.FIELDS:   PRINT @ IN(2,LOOP),
     PROMPT$(LOOP);:   NEXT LOOP
1042 PRINT @ (22,0), EQUAL.LINE$;:  RETURN
1044 '     Display record with current buffer data on screen
1046 CLS: PRINT I.HEAD$:  PRINT @ 60,;:
     PRINT USING "Record: ###";LOC(2);:
     PRINT @ 80,EQUAL.LINE$;:    FOR LOOP = 1 TO
     TOTAL.PIELDS:  PRINT @ IN(2,LOOP),PROMPT$(LOOP);
1040   IF FIELDS(2,LOOP) = 1  THEN PRINT F$(LOOP);
       ELSE IF FIELDS(2,LOOP) = 2 THEN PRINT CVS(F$(LOOP));
       ELSE IF FIELDS(2,LOOP) = 3 THEN PRINT
        PN EXPDATE$(F$(LOOP));
1050 NEXT LOOP: PRINT @(22,0), EQUAL.LINE$;: RETURN
1052 '  Write /DEF file to disk
1054 OPEN "O",1,FILE$+"/DEF:"+DRIVE$: WRITE #1,
     TOTAL.FIELDS: WRITE #1,RECLEN: FOR LOOP=1 TO 40:
     WRITE #1,FIELDS(1,LOOP),FIELDS(2,LOOP):  NEXT LOOP
1056 WRITE #1,KEY$(1): WRITE #1,KEY$(2): CLOSE #1: RETURN
1058 'Return number of active records in database in
        num.recs
1060 NUM.RECS=0: FOR LOOP = 1 TO LEN(KEY$(1)):  NUM.RECS=
     NUM.RECS+VAL(MID$(KEY$(1),LOOP,1))+
     VAL(MID$(KEY$(2),LOOP,1)): NEXT LOOP: RETURN
1062 ' Formatted character input. Enter both input routines
     with Q = max. length of input. Result returned in Q$
1064 DEF FN OKAY(X$) = FN CHARACTER(X$): GOTO 1070
1066 '        Formatted numeric input
1068 DEF FN OKAY(X$) = FN NUMERIC(X$)
1070 Q1 = 0:Q$ = "": PRINT STRING$(Q,".");:FOR QLP = 1 TO Q:
     PRINT CHR$(24);: NEXT QLP
1072 Q1$=INPUT$(1): IF FN OKAY(Q1$) AND Q1<Q THEN Q$=Q$+Q1$:
     Q1=Q1+1: PRINT Q1$;: GOTO 1072
1074 IF Q1$=CHR$(13) THEN RETURN
1076 IF Q1$=CHR$(31) THEN FOR QLOOP = 1 TO Q1:
     PRINT CHR$(24); "."; CHR$(24);:NEXT QLOOP: Q$="": Q1=0
1078 IF Q1$=CHR$(8) THEN IF Q1 > 1 THEN PRINT CHR$(24);".";
     CHR$(24);: Q$=LEFT$(Q$,LEN(Q$)-1): Q1=Q1-1 ELSE IF Q1 =
     1 THEN PRINT CHR$(24);".";CHR$(24);:  Q$="": Q1=0
1080 GOTO 1072
1084 ' Handle alphanumeric input of current (LOOP) field and
       store in buffer
1086 Q = FIELDS(1,LOOP): GOSUB 1064: LSET F$(LOOP) = Q$:
     RETURN
1088 ' Handle numeric input of current (LOOP) field and
```

Listing 1 continued

```
       atore in buffer
1090 Q = IN(1,LOOP): GOSUB 1060:
     LSET F$(LOOP) = MKS$(VAL(Q$)): RETURN
1092 '  Handle date input of current (LOOP) field and store
      in buffer
1094 OKAY = FALSE:  WHILE NOT OKAY: Q = 0: GOSUB 1064:
     OKAY = FN CHKDATE(Q$)
1096   IF NOT OKAY THEN PRINT @
       IN(2,LOOP)+LEN(PROMPT$(LOOP)),;: WEND
1098 LSET F$(LOOP) = FN CONDATE$(Q$): RETURN
1100 '       Number fields on input screen
1102 PRINT CHR$(16);:  FOR N.LOOP = 1 TO TOTAL.FIELDS:
     PRINT @ IN(2,N.LOOP)+LEN(PROMPT$(N.LOOP)),;:
     PRINT USING "##_.";N.LOOP;: NEXT N.LOOP:
     PRINT CHR$(17);: RETURN
1104 'Update PTR and move next phyeical record into buffer 2
1106 PTR = PTR + 1: IF PTR <= LEN(KEY$(1)) THEN
     IF MID$(KEY$(1),PTR,1)<>"1" THEN GOTO 1106
1108 IF PTR > LEN(KEY$(1)) THEN
     IF MID$(KEY$(2),PTR-LEN(KEY$(1)),1)<>"1" THEN GOTO 1106
1110 GET 2,PTR: RETURN
1112 '  Read next pointer from /SEL or /IND file & move
       record to buffer
1114 INPUT #3,PTR:  GET 2,PTR:  RETURN
1116 '       Strip blanks from end of Q$ string
1118 IF LEN(Q$)=0 THEN RETURN  ELSE IF RIGHT$(Q$,1)<>" "
     THEN RETURN: ELSE POKE VARPTR(Q$),PEEK(VARPTR(Q$))-1:
     GOTO 1110
2000 'This line is necessary for the merge/delete routine
3000 'This line is necessary for the merge/delete routine
```

End

Program Listing 2. Define/OVL.

```
1990 ' Save as "DEPINE/OVL",A after debugging
2000 CLS:
     PRINT"Enter data base name -- maximum of 8 characters "
     :PRINT "     ==> ";: Q=8: GOSUB 1064: PRINT: FILE$=Q$
2002 IF LEN(FILE$)<1 OR LEN(FILE$)>8 OR INSTR(FILE$,"/")
     THEN 2000
2004 PRINT "Drive number (0-7) to hold data base ==> ";:
     DRIVE$=" ": WHILE DRIVE$<"0" OR DRIVE$>"7":
     DRIVE$ = INPUT$(1): WEND: PRINT DRIVE$
2006 TEST$ = FILE$ + "/DAT:" + DRIVE$:  GOSUB 1000
2008 IF TEST.FLAG <= 0 THEN GOTO 2016
2010 IF TEST.FLAG = 1 THEN PRINT "Illegal File Name":
     GOSUB 1012: GOTO 2000   ELSE IF TEST.FLAG = -2
     THEN PRINT "Disk Error"
2012 FILE$="": GOSUB 1012: GOTO 240
2014 '   Definitions Menu
2016 DEF.MENU$ = " ":  WHILE DEF.MENU$ <> "9":  CLS
2018 PRINT , "Definitions Menu":    PRINT :
     PRINT , "1. Define Data Base":
     PRINT , "2. Define Input Screen":
     PRINT , "3. Define Report Form"
2020 PRINT: PRINT: PRINT
2022 PRINT , "9. Return to Main Menu": PRINT :
     PRINT , "   Your choice ==> ";
2024 DEF.MENU$ = " ": WHILE DEF.MENU$ < "1" OR
     DEF.MENU$ > "9": DEF.MENU$ = INPUT$(1): WEND:
```

Listing 2 continued

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Listing 2 continued

```
      PRINT DEF.MENU$
2026 ON VAL(DEF.MENU$) GOSUB 2030,2070,211B: WEND:
     FILE$="": CLOSE: GOTO 240
2020 '    Define Data Base
2030 CLS: TEST$ = FILE$+"/DEF:"+DRIVE$: GOSUB 1000
2032 IF TEST.FLAG = -1 THEN PRINT FILES
     " Data Base already defined!":  GOSUB 1012: RETURN
2034 TOTAL.FIELDS = 0: WHILE TOTAL.FIELDS < 1 OR
     TOTAL.FIELDS > 40: INPUT "Total number of fields in
     data base (1-40)"; TOTAL.FIELDS:  WEND
2036 CLS: PRINT "Field Types: A = All keyboard characters":
     PRINT "                N = Numeric":
     PRINT "                D = Date":  PRINT
2030 FOR LOOP = 1 TO 40: FIELDS(1,LOOP) = 0:
     FIELDS(2,LOOP) = 0: NEXT LOOP
2040 LENGTH = 256: FOR LOOP = 1 TO TOTAL.FIELDS:
     PRINT USING "Field characters remaining: ###";LENGTH:
     PRINT USING "Field ##: ";LOOP
2042 TYPE$ = " ":  PRINT "     Field type ==> ";:
     WHILE INSTR("AND",TYPE$) = 0:
     TYPE$ = CHR$(ASC(INPUT$(1)) AND &HDF):WEND: PRINT TYPE$
2044 FIELDS(2,LOOP) = INSTR("AND",TYPE$): IF TYPE$ = "D"
     THEN PRINT "     Field length ==> 3":
     FIELDS(1,LOOP) = 1: LENGTH = LENGTH - 1
2046 IF TYPE$ = "N" THEN PRINT "     Field length ==> 8":
     FIELDS(1,LOOP) = 8: LENGTH = LENGTH - 8
2048 IF TYPE$ = "A" THEN WHILE FIELDS(1,LOOP) < 1 AND
     (LENGTH - FIELDS(1,LOOP) => 8):INPUT "     Field length
     ==> ",FIELDS(1,LOOP):WEND:LENGTH=LENGTH-FIELDS(1,LOOP)
2050 IF LENGTH < 0 THEN PRINT: PRINT "No more record room":
     LOOP = TOTAL.FIELDS
2052 PRINT: NEXT LOOP
2054 CLS: PRINT TAB(20) "Data Field Definitions":  PRINT
"Field   Type   Length"; TAB(40) "Field   Type   Length":
 PRINT "=====   ====   ======"; TAB(40) "=====   ====
======"
2056 PIC$ ="  ##      !       ###": FOR LOOP = 1 TO 20
2B57 PRINT USING PIC$;LOOP,
     MID$(" AND",FIELDS(2,LOOP)+1),FIELDS(1,LOOP);:
     PRINT TAB(40);: PRINT USING PIC$;LOOP+20,
     MID$(" AND",FIELDS(2,LOOP+20)+1),FIELDS(1,LOOP+20)
2058 NEXT LOOP
2B60 PRINT TAB(20) "Is this okay ";:  GOSUB 10I8:
     IF YN$ = "N" THEN GOTO 2036
2062 CLS: MAX = 0: WHILE MAX<10 OR MAX>500: INPUT
     "Maximum number of records (10-500) ==> ",MAX: WEND
2064 KEY$ = STRING$((MAX+1)\2,"0"): KEY$(1) = KEY$:
     KEY$(2) = KEY$
2066 CLS: PRINT "Writing data bsse definition to disk"
2068 RECLEN = 256 - LENGTH:  GDSUB 1054
2B70 CLOSE:  PRINT "Creating data file on disk":
     DAT.FILE$ = FILE$ + "/DAT:" + DRIVE$
2072 OPEN "R",1,DAT.FILE$,RECLEN:PUT 1,LEN(KEY$(1))*2:CLOSE
2074 RETURN
2076 '     Dafine Input Screen
2070 CLS: TEST$ = FILE$ + "/INP:" + DRIVE$:  GDSUB 1000:
     IF TEST.FLAG = 0  THEN GOTO 2082
2080 IF TEST.FLAG = -1 THEN
     PRINT "Screen file slready exists. Replace it ";:
     GOSUB 1010: IF YN$ = "N" THEN RETURN
2082 TEST$ = FILE$ + "/DEF:" + DRIVE$:  GOSUB 1000:
     IF TEST.FLAG <> -1  TNEN PRINT
```

Listing 2 continued

Listing 2 continued

```
     "Dats Base Definition file not found": GOSUB 1012:
     RETURN
2084 OPEN "I",1,TEST$:INPUT #1, TOTAL.FIELDS:INPUT #1,RECLEN
2086 FDR LOOP = 1 TD TOTAL.FIELDS: INPUT #1, FIELDS(1,LOOP),
     PIELDS(2,LOOP):   NEXT LOOP:  CLOSE
2088 PRINT "Enter Screen Definitions": PRINT:
     INPUT "Screen Heading ==> ",I.HEAD$
2090 IF LEN(I.HEAD$) > 0  THEN PRINT "Center heading ";:
     GOSUB 1010:  IF YN$ = "Y"    THEN I.HEAD$ =
     STRING$(40-(LEN(I.HEADS)\2)," ") + I.HEAD$
2092 PICS = "Field: ##      Type: !":  PRINT:
     FOR LOOP = 1 TO TOTAL.FIELDS:
     TYPE$ = MID$("AND",FIELDS(2,LOOP),1):
     PRINT USING PIC$; LOOP, TYPE$
2094 INPUT "Prompt string ==> ",PROMPT$(LOOP)
2096 IF TYPE$="D" THEN PRINT "Input length ==> 8":
     IN(1,LOOP) = 8  ELSE IF TYPE$ = "A" THEN
     PRINT "Input length ==>";FIELDS(1,LOOP):
     IN(1,LOOP) = FIELDS(1,LOOP)
2098 IP TYPE$ = "N" THEN IN(1,LOOP)=0:   WHILE
     IN(1,LOOP)<1 OR IN(1,LOOP)>(79-LEN(PHOMPT$(LOOP))):
     INPUT "Input length ==> ",IN(1,LODP):   WEND
2100 X.COORD = -1:  WHILE X.COORD < 0 DR X.COORD >
     79-IN(1,LOOP)-LEN(PROMPT$(LOOP)): PRINT
     "Horizonsl posn.(0-";
     79-IN(1,LOOP)-LEN(PROMPT$(LOOP));")";
2101 INPUT " ==> ",X.COORD:    NEND
2102 Y.COORD = -1:  WHILE Y.COORD < 2 OR Y.COORD > 21:
     INPUT "Vertical posn. (2 - 21) ==> ",Y.COORD:  WEND
2104 IN(2,LOOP) = X.COORD + Y.COORD*80
2106 PRINT: NEXT LOOP
2100 GOSUB 1040: PRINT @(23,30),"Is this okay ";: GOSUB 1018
2110 CLS: IF YN$="N" THEN GOTO 2000 ELSE
     PRINT "Saving screen definitions on disk"
2112 OPEN "O",1,FILE$+"/INP:"+DRIVE$:  WRITE #1,I.HEADS:
     FOR LOOP = 1 TO TOTAL.FIELDS:  WRITE #1,
     PRONPT$(LOOP)+" ",IN(1,LOOP),IN(2,LOOP): NEXT LOOP
2114 CLOSE: RETURN
2116 '   Define Report Form
2110 CLS: TEST$=FILE$+"/DEF:"+DRIVE$: GOSUB 1000:
     IF TEST.FLAG <> -1  THEN PRINT  "You must define a
     datsbase before creating a report form":
     GOSUB 1012: RETURN
2120 DPEK "1",1,TEST$:INPUT #1,TOTAL.PIELDS:INPUT #1,RECLEN
2122 FOH LOOP = 1 TO TOTAL.PIELDS:
     INPUT #1,FIELDS(1,LOOP),PIELDS(2,LOOP):NEXT LOOP:CLOSE
2124 TEST$=FILE$+"/RPT:"+DRIVE$:  GOSUB 1000:
     IF TEST.FLAG = -1 THEN  PRINT
     "Report definition already exists.  Replace it ";:
     GOSUB 1010:  IF YN$="N" THEN RETURN
2126 CLS:PRINT"Lines per printed page (66 is 'normal') ==>";
     : Q=2: GOSUB 1B60: PAGE.LINES = VAL(Q$):  PRINT
2128 CLS:  PRINT "Lines in page hesder ==> ";:  Q=2:
     GDSUB 1060: HEADER.LINES = VAL(Q$): IF HEADER.LINES > 0
     THEN DIM HEADER$(HEADER.LINES):  PRINT
213B IF HEADER.LINES < 1 THEN GOTO 213B
2132 CLS: FOH LOOP = 1 TO HEADER.LINES:   PRINT USING
     "Enter hesder line ##";LOOP: Q=79: GOSUB 1064:
     HEADER$(LOOP) = Q$:  PRINT:  NEXT LOOP
2134 CLS: FOR LOOP = 1 TO HEADER.LINES:PRINT HEADER$(LOOP):
     NEXT: PRINT:PRINT:  PRINT "Is this header okay ";:
     GOSUB 1010: IF YN$="N" THEN GDTO 2132
```

Listing 2 continued

Listing 2 continued

```
2136 '   Define form for each record
2138 CLS:PRINT"Number of blank lines between records ==> ";:
     Q=2: GOSUB 1060: PRINT:     IF VAL(Q$)<0 OR
     VAL(Q$)>(PAGE.LINES - HEADER.LINES-1) THEN GOTO 2138
     ELSE BLANK.LINES = VAL(Q$)
2140 PRINT "Number of database fields to use in the report
     ==> ";:  Q=2: GOSUB 1068: PRINT:   IF VAL(Q$)<1 OR
     VAL(Q$)>TOTAL.FIELDS THEN GOTO 2140
     ELSE FIELDS = VAL(Q$)
2142 CLS: PRINT "Use 'PRINT USING' symbols to define report
     fields": PRINT: FOR LOOP = 1 TO FIELDS:  PRINT USING
     "Enter information for report field ##:";LOOP
2144 PRINT "Use which database field ==> ";:Q=2:GOSUB 1068:
     PRINT: IF VAL(Q$)<1 OR VAL(Q$)>TOTAL.FIELDS THEN PRINT:
     GOTO 2144 ELSE FIELD.NUMBER(LOOP)=VAL(Q$)
2146 PRINT "Enter report field format:": Q=79: GOSUB 1064:
     PRINT: LABEL$(LOOP)=Q$:
2148 PRINT "Enter carriage return after this field ";:
     GOSUB 1010: EOL(LOOP) = (YN$="Y"): PRINT: PRINT:
     NEXT LOOP: EOL(FIELDS)=TRUE
2150 CLS: FOR LOOP = 1 TO FIELDS: PRINT LABEL$(LOOP);:
     IF EOL(LOOP) THEN PRINT
2152 NEXT LOOP: PRINT: PRINT "Is this okay ";: GOSUB 1018:
     IF YN$="N" THEN GOTO 2142
2154 CLS: REPORT.LINES = BLANK.LINES:FOR LOOP = 1 TO FIELDS:
     REPORT.LINES = REPORT.LINES - EOL(LOOP): NEXT LOOP
2156 PRINT USING "The report form for each record requires
     ## lines including blanks";REPORT.LINES
2158 MAX.REC = ((PAGE.LINES-HEADER.LINES)\ REPORT.LINES):
     PRINT USING "Number of records to print per page
     (maximum; ##) ==> "; MAX.REC
2160 Q=2: GOSUB 1068:     RECORDS.PER.PAGE = VAL(Q$): PRINT:
     IF RECORDS.PER.PAGE<1 OR RECORDS.PER.PAGE > MAX.REC
     THEN GOTO 2150
2162 '   Now find out about totals
2164 CLS: PRINT "You can total numeric fields and count
     string or date fields": PRINT: PRINT "Number of fields
     to be totaled or counted ==> ";: Q=2: GOSUB 1060: PRINT
2166 IF VAL(Q$)<0 OR VAL(Q$)>TOTAL.FIELDS THEN GOTO 2164
     ELSE FIELD.SUMS = VAL(Q$)
2168 IF FIELD.SUMS < 1 OR FIELD.SUMS > FIELDS THEN GOTO 2190
     ELSE DIM SUM.FIELDS(FIELD.SUMS):   PRINT: PRINT
     "Enter database fields to be counted or totaled ==> ";
2170 FOR LOOP=1 TO FIELD.SUMS:IF LOOP <> 1 THEN PRINT ", ";
2172 Q=2: GOSUB 1068: IF VAL(Q$)<1 OR VAL(Q$)>TOTAL.FIELDS
     THEN FOR LP = 1 TO LEN(Q$): PRINT CHR$(24);: NEXT LP:
     GOTO 2172:   ELSE SUM.FIELDS(LOOP) = VAL(Q$)
2174 NEXT LOOP:  CLS: PRINT "Count or sum these fields: ";
2176 FOR LOOP = 1 TO FIELD.SUMS:  PRINT USING
     "Field ##_, "; SUM.FIELDS(LOOP);:   NEXT LOOP
2178 PRINT: PRINT "Is this okay ";: GOSUB 1018:
     IF YN$="N" THEN ERASE SUM.FIELDS:  GOTO 2164
2180 CLS: DIM SUM.FIELDS$(FIELD.SUMS): PRINT "Enter label
     and 'PRINT USING' string for each totaled or counted
     field": PRINT:  FOR LOOP = 1 TO FIELD.SUMS
2182 PRINT USING "Field ##: ";LOOP;: Q=70: GOSUB 1064:
     PRINT: IF INSTR(Q$,"#") = 0 THEN GOTO 2182
     ELSE SUM.FIELDS$(LOOP) = Q$
2184 NEXT LOOP: CLS: PRINT "Example of total/count output:";
     PRINT: FOR LOOP = 1 TO FIELD.SUMS:
     PRINT USING SUM.FIELDS$(LOOP);LOOP: NEXT LOOP: PRINT
2186 PRINT "Is this okay ";:  GOSUB 1010:
```

Listing 2 continued

Listing 2 continued

```
     IF YN$="N" THEN ERASE SUM.FIELDS$: GOTO 2180
2188 '      Save it all on disk
2190 CLS: PRINT "Saving report definition on disk":
     OPEN "O",1,FILE$ + "/RPT:" + DRIVE$
2192 WRITE #1, PAGE.LINES:   WRITE #1, HEADER.LINES:
     FOR LOOP = 1 TO HEADER.LINES: WRITE #1, HEADER$(LOOP):
     NEXT LOOP
2194 WRITE #1,RECORDS.PER.PAGE: WRITE #1,BLANK.LINES:
     WRITE #1, REPORT.LINES: WRITE #1,FIELDS:
     FOR LOOP = 1 TO FIELDS:   WRITE #1,
     LABEL$(LOOP),FIELD.NUMBER(LOOP),EOL(LOOP):  NEXT LOOP
2196 WRITE #1, FIELD.SUMS:  FOR LOOP = 1 TO FIELD.SUMS:
     WRITE #1, SUM.FIELDS(LOOP):
     WRITE #1, SUM.FIELDS$(LOOP):  NEXT LOOP
2198 CLOSE:  IF HEADER.LINES > 0 THEN ERASE HEADER$
2200 ERASE LABEL$,FIELD.NUMBER,EOL
2202 IF FIELD.SUMS > 0 THEN ERASE SUM.FIELDS, SUM.FIELDS$
2204 RETURN
3000 'This line needed for merge/chain routine
```

End

Program Listing 3. Add/OVL.

```
1998 '  Save as "ADD/OVL",A   after debugging
2000 CLS: IF FILE$="" THEN   PRINT "You must open a file
     (menu choice 2) before you can add to it": GOSUB 1012:
     GOTO 240
2002 IF NOT FN ROOMEXIST THEN PRINT "There is no room in the
     database for more information":  GOSUB 1012: GOTO 240
2004 TEST$=FILE$+"/INP:"+DRIVE$: GOSUB 1000:
     IF TEST.FLAG <> -1 THEN   PRINT
     "Screen input file not found.": GOSUB 1012: GOTO 240
2006 YN$="Y": GOSUB 1024: GOSUB 1030:  WHILE YN$<>"N"
     'Read /INP file & open /DAT file
2008 YN$="N": WHILE YN$="N": GOSUB 1040
       'Display blank form on screen
2010 FOR LOOP = 1 TO TOTAL.FIELDS:
     PRINT @ IN(2,LOOP) + LEN(PROMPT$(LOOP)),;:
     ON FIELDS(2,LOOP) GOSUB 1086,1090,1094:  NEXT LOOP
2012 PRINT @(23,30),"Is this okay ";: GOSUB 1018: WEND
2014 HERE = FN NEXTREC: PUT 2,HERE: IF HERE <= LEN(KEY$(1))
     THEN MID$(KEY$(1),HERE)="1"   ELSE
     MID$(KEY$(2),HERE-LEN(KEY$(1)))="1"
2016 IF NOT FN ROOMEXIST THEN PRINT @(23,0),STRING$(79,32);:
     PRINT @(23,23),"The database if full -- Press a key";:
     WHILE INKEY$="": WEND:  GOTO 2020
2018 PRINT @(23,0),STRING$(79,32);: PRINT @(23,27),
     "Add another record ";:  GOSUB 1018:  WEND
2020 CLOSE:  GOSUB 1054:  GOTO 240
3000 ' This line is needed for the merge/delete routine
```

End

Program Listing 4. Select/OVL.

```
1998 ' Save as  "READ/OVL",A  after debugging
2000 CLS: IF FILE$="" THEN PRINT "You must select a database
       (Main Menu choice 2) first":  GOSUB 1B12: GOTO 240
2002 SRC.MENU$=" ": WHILE SRC.MENU$<>"9":  CLS
2004 PRINT,"Read & Modify Menu -- Pick Record Selection
     Mode": PRINT : PRINT, "1. Use Selection File":
     PRINT, "2. Use Sort Index": PRINT, "3. Use Physical
```

Listing 4 continued

Listing 4 continued

```
     Storage Order":PRINT: PRINT: PRINT
2006 PRINT, "9. Return to Main Menu":  PRINT :
     PRINT , "   Your choice ==> ";
2008 SRC.MENU$=" ":WHILE SRC.MENU$ < "1" OR SRC.MENU$ > "9":
     SRC.MENU$ = INPUT$(1):      WEND: PRINT SRC.MENUS
2010 ON VAL(SRC.MENU$) GOSUB 2014,2010,2034: WEND: CLOSE:
     GOSUB 1054: GOTO 240
2012 '        Use selection file
2014 TEST$=FILE$+"/SEL:"+DRIVE$:  GOSUB 1000:
     IF TEST.FLAG = -1 THEN GOTO 2022  ELSE CLS:
     PRINT "Selection file not found": GOSUB 1012: RETURN
2016 '       Use Index File
2018 TEST$=FILE$+"/IND:"+DRIVE$:   GOSUB 1000:
     IF TEST.FLAG <> -1  THEN CLS:
     PRINT "Index file not found": GOSUB 1012: RETURN
2020 '      Common code
2022 OPEN"I",3,TEST$: INPUT #3,R.COUNT: IF R.COUNT < 1
     THEN CLS: PRINT "That file is empty":GOSUB 1012: RETURN
2024 DIM RD(R.COUNT): FOR LOOP = 1 TO R.COUNT:
     INPUT #3,RD(LOOP): NEXT LOOP: CLOSE #3
2026 GOSUB 1024: GOSUB 1030
2028 MORE = TRUE:  PTR = 1:  WHILE MORE
2030 IF PTR <= R.COUNT THEN REC = RD(PTR): GOSUB 2052:
     PTR = PTR + 1: ELSE CLS: PRINT "End of records in
     Selection or Index file.": GOSUB 1012: MORE = FALSE
2032 WEND: ERASE RD: CLOSE: RETURN
2034 '     Use physical disk arrangement
2036 GOSUB 1024: GOSUB 1030
2038 PTR = 1: MORE = TRUE:  WHILE MORE
2040 IF PTR > LEN(KEY$(1))*2 THEN MORE = FALSE:  CLS:
     PRINT "No more records in this database.";
     GOSUB 1012:GOTO 2040
2042 IF PTR <= LEN(KEY$(1)) THEN IF MID$(KEY$(1),PTR,1)="1"
     THEN REC = PTR: GOSUB 2052: GOTO 2046
2044 IF PTR > LEN(KEY$(1))  THEN
     IF MID$(KEY$(2),PTR-LEN(KEY$(1)),1) = "1" THEN
     REC = PTR: GOSUB 2052
2046 PTR = PTR + 1
2048 WEND:     CLOSE: RETURN
2050 '        Display record info & prompt for changes,
continue, stop
2052 GET 2,REC:     GOSUB 1046
2054 MOD.CHOICE$ = " ":     WHILE INSTR("NQ",MOD.CHOICE$) =
0:       PRINT @ (23,8),BLANK.LINE$;:       PRINT @
(23,0),"M)odify   E)rase record   N)ext record   J)ump
S)earch   Q)uit";:
2056   MOD.CHOICE$=" ":       WHILE
INSTR("MENJSQ",MOD.CHOICE$) = 0:          MOD.CHOICE$ =
CHR$(ASC(INPUT$(1)) AND 223):       WEND
2058   IF MOD.CHOICE$="N" THEN MORE=TRUE          ELSE IF
MOD.CHOICE$="Q" THEN MORE=FALSE          ELSE IF
MOD.CHOICE$="M" THEN GOSUB 2072          ELSE IF
MOD.CHOICE$="E" THEN GOSUB 2066
2060          IF MOD.CHOICE$="J" THEN GOSUB 2080:
ELSE IF MOD.CHOICE$="S" THEN GOSUB 2100
2062 WEND: RETURN
2064 '     Erase current record
2066 IF REC <= LEN(KEY$(1)) THEN MID$(KEY$(1),REC,1)="0"
     ELSE MID$(KEY$(2),REC-LEN(KEY$(1)),1)="0"
2068 GOSUB 1040: RETURN
2070 '      Modify current record
2072 GOSUB 1102
```

Listing 4 continued

Listing 4 continued

```
2074 LP = 0:  WHILE LP < 1 OR LP > TOTAL.FIELDS:
     PRINT @ (23,0),BLANK.LINE$;:
     PRINT @ (23,0), "Modify which field ==> ";: Q = 2:
     GOSUB 1060:  LP = VAL(Q$): WEND
2076 GOSUB 1046:LOOP = LP:
     PRINT @ IN(2,LOOP)+LEN(PROMPT$(LOOP)),;:
     ON FIELDS(2,LOOP) GOSUB 1006,1090,1094:
     PUT 2,REC: GOSUB 1046: RETURN
2078 '      Jump to new record
2080 OKAY = FALSE: WHILE NOT OKAY:
     PRINT @ (23,0),BLANK.LINE$;:
     PRINT @ (23,0),"Jump to what record ==> ";:
     Q=3: GOSUB 1060: JUMP = VAL(Q$)
2082 IF SRC.MENU$<>"3" THEN GOTO 2080 ELSE
     IF JUMP < 1 OR JUMP > LEN(KEY$(1))*2
     THEN OKAY = FALSE: GOTO 2090
2084 IF JUMP <= LEN(KEY$(1)) THEN
     IF MID$(KEY$(1),JUMP,1)="1" THEN OKAY = TRUE ELSE
     OKAY = FALSE ELSE IF (KEY$(2),JUMP-LEN(KEY$(1)),1)="1"
     THEN OKAY = TRUE ELSE OKAY = FALSE
2086 GOTO 2090
2088 IF JUMP < 1 OR JUMP > R.COUNT THEN OKAY = FALSE ELSE
     OKAY = TRUE
2090 IF NOT OKAY THEN PRINT @(23,0),BLANK.LINE$;:
     PRINT @(23,0), "Record not active or number out of
     bounds. Press any key";: WHILE INKEY$="":WEND
2092 WEND
2094 PTR = JUMP: IF SRC.MENU$="3" THEN REC = PTR
     ELSE REC = RD(PTR)
2096 GET 2,REC: GOSUB 1046:  RETURN
2098 '   Search forward for data
2100 GOSUB 1040:GOSUB 1102: SEARCH =0: WHILE SEARCH < 1 OR
     SEARCH > TOTAL.FIELDS:  PRINT @(23,0),BLANK.LINE$;:
     PRINT @(23,0),"Search which field ==> ";:
2102 Q=2: GOSUB 1060: SEARCH = VAL(Q$): WEND: GOSUB 1040
2104 PRINT @(23,0),BLANK.LINE$;:
     PRINT @(23,0), "Enter search key";:
     PRINT @ IN(2,SEARCH)+LEN(PROMPT$(SEARCH)),;
2105 HOLD1 = REC: HOLD2 = PTR:
     ON FIELDS(2,SEARCH) GOSUB 2112,2116,2120
2106 IF NOT FOUND THEN REC = HOLD1: PTR = HOLD2: GET 2,REC
2108 GOSUB 1046: RETURN
2110 '       Search for alphanumeric string
2112 Q = FIELDS(1,SEARCH): QQ$=STRING$(Q," "): GOSUB 1064:
     LSET QQ$=Q$: Q$ = QQ$: GOTO 2120
2114 '       Search for numeric value
2116 Q = FIELDS(1,SEARCH): GOSUB 1060: Q$=MKS$(VAL(Q$)):
     GOTO 2120
2118 '       Search for date string
2120 OKAY = FALSE: WHILE NOT OKAY: Q=0:GOSUB 1064:
     OKAY = FN CHKDATE(Q$)
2122 IF NOT OKAY THEN
     PRINT @ IN(2,SEARCH)+LEN(PROMPT$(SEARCH)),;:
     ELSE Q$=FN CONDATE$(Q$)
2124 WEND: GOTO 2120
2126 '       Search forward for key: Q$
2128 FOUND = FALSE: IF SRC.MENU$="3" THEN GOTO 2136
2130 WHILE FOUND = FALSE AND PTR < R.COUNT: PTR = PTR + 1:
     REC = RD(PTR)
2132 GET 2,REC: IF Q$=F$(SEARCH) THEN FOUND = TRUE
2134 WEND: RETURN
2136 WHILE PTR < LEN(KEY$(1))*2 AND FOUND = FALSE:
```

Listing 4 continued

Listing 4 continued

```
        NXT = FALSE: PTR = PTR + 1: IF PTR <= LEN(KEY$(1))
        THEN IF MID$(KEY$(1),PTR,1)="1" THEN NXT = TRUE
   2130 IF PTR > LEN(KEY$(1)) THEN
        IF MID$(KEY$(2),PTR-LEN(KEY$(1)),1)="1" THEN NXT = TRUE
   2140 IF NXT THEN REC = PTR: GET 2,REC:
        IP Q$=F$(SEARCH) THEN FOUND = TRUE
   2142 WEND: RETURN
   3000 ' This line necessary for the merge/delete routine
```

End

Program Listing 5. Select/OVL.

```
   1998 ' Save as  "SELECT/OVL",A  after debugging
   2000 CLS: IF FILE$="" THEN PRINT "You must choose a database
        (menu choice 2) first": GOSUB 1012: GOTO 240
   2002 SEL.MENU$=" ": WHILE SEL.MENU$<>"9": CLS:  PRINT,
        "Selection Menu -- Select from active records": PRINT:
          PRINT, "1. Establish Selection Criteria":
          PRINT, "2. Read Selection Criteria from disk"
   2004   PRINT, "3. Select from Records in Index File":
          PRINT, "4. Select from old Selection File":
          PRINT, "5. Select from All Records": PRINT: PRINT:
          PRINT: PRINT, "9. Return to Main Menu": PRINT
   2006   PRINT, "Your choice ==> ";: SEL.MENU$=" ": WHILE
          SEL.MENU$<"1" OR SEL.MENU$>"9": SEL.MENU$ = INPUT$(1):
          WEND: PRINT SEL.MENU$
   2008   ON VAL(SEL.MENU$) GOSUB 2020,2014,2140,2154,2160: WEND
   2010   CLOSE: GOTO 240
   2012   '       Read Criteria from disk file /SLC
   2014   TEST$ = FILE$+"/SLC:"+DRIVE$: GOSUB 1000:
          IP TEST.FLAG <> -1 THEN CLS:  PRINT
          "Selection Criteria File not found": GOSUB 1012: RETURN
   2016   CLS: CLOSE:OPEN "I",3,TEST$: FOR LOOP = 1 TO 6:
          INPUT#3, TYPE(LOOP), LVAL(LOOP), COMP(LOOP),
          AL$(LOOP), CONJ(LOOP): NEXT LOOP: CLOSE:  RETURN
   2018   '       Define Selection Criteria
   2020   CLS: GOSUB 1024: GOSUB 1030
   2022   CONJ = 0: S.PTR = 1: WHILE CONJ<>3 AND S.PTR <=6:
            GOSUB 2038: GOSUB 2048: GOSUB 2056:
            IF YN$="N" THEN GOTO 2024
   2026   GOSUB 2002: S.PTR = S.PTR + 1: WEND
   2028   GOSUB 2100: IF YN$="N" THEN GOTO 2022
   2030   CLS: PRINT "Save selection criterie to disk";:
          GOSUB 1010
   2032   IF YN$="Y" THEN OPEN "O",3,FILE$+"/SLC:"+DRIVE$:
          FOR LOOP = 1 TO 6: WRITE #3, TYPE(LOOP), LVAL(LOOP),
          COMP(LOOP), RVAL$(LOOP), CONJ(LOOP): NEXT LOOP
   2034   RETURN
   2036   '       Get field for left side of comparison
   2038   GOSUB 1040: GOSUB 1102
   2040   LVAL = 0: WHILE LVAL < 1 OR LVAL > TOTAL.FIELDS:
          PRINT @ (23,0), BLANK.LINE$;:  PRINT @ (23,0),;:
          PRINT USING "Test # -- Enter comparison field ==> ";
          S.PTR;
   2042   Q = 2: GOSUB 1060: LVAL = VAL(Q$): WEND
   2044   TYPE = FIELDS(2,LVAL):  RETURN
   2046   '       Get comparison operator
   2048   CLS: PRINT, "Pick comparison operator": PRINT:
          PRINT, "1.  Less Than                    <";
          PRINT , "2.  Less Than or Equal          <="
```

Listing 5 continued

Listing 5 continued

```
2049 PRINT , "3.  Equal                    =":
     PRINT , "4.  Greater Than or Equal  >="
2050 PRINT , "5.  Greater Than             >":
     PRINT , "6.  Not Equal                <>":
     PRINT:  PRINT , "Your choice ==> ";
2052 COMP = 0: WHILE COMP < 1 OR COMP > 6:COMP$ = INPUT$(1):
     COMP = VAL(COMP$): WEND: RETURN
2054 '       Get Right value -- either literal or field
2056 CLS:PRINT "Compare with Constant or snother Field (C/F)
     ==> ";: CMP$ = " ": WHILE CMP$<>"C" AND CMP$ <>"F":
     CMP$ = CHR$(ASC(INPUT$(1)) AND 223): WEND
2058 IF CMP$ = "F" THEN GOTO 2060
2060 PRINT: PRINT "Enter constant for comparison ==> ";:
     Q = IN(1,LVAL): IF TYPE = 2 THEN GOSUB 1060:
     RVAL$=STR$(VAL(Q$))
2062 IF TYPE = 1 THEN GOSUB 1064: RVAL$=Q$
2064 IF TYPE = 3 THEN GOSUB 1064: IF NOT FN CHKDATE(Q$)
     THEN GOTO 2060 ELSE RVAL$=FN CDNDATE$(Q$)
2066 GOTO 2074
2068 GOSUB 1040: GOSUB 1102
2070 RVAL = 0: WHILE RVAL<1 OR RVAL>TOTAL.FIELDS:
     PRINT @(23,0),BLANK.LINE$;:
     PRINT @(23,0), "Enter field to compare with ==> ";:
     Q=2: GOSUB 1060: RVAL=VAL(Q$): WEND
2072 IF TYPE <> FIELD$(2,RVAL) THEN RVAL = 0: GOTO 2070:
     ELSE RVAL$ = "z"+Q$
2074 CLS: PRINT "Comparison you defined: ": PRINT: PRINT,:
     GOSUB 2092
2076 PRINT: PRINT "Is this okay ";: GOSUB 1010: IF YN$="N"
     THEN CLS: PRINT "Redo definition for this comparison":
     GOSUB 1012
2078 RETURN
2080 '       Get conjuction to next comparison
2082 IF S.PTR = 6 THEN CONJ = 3: GOTO 2088 ELSE CLS:
     PRINT, "Select Conjunction to add another comparison":
     PRINT: PRINT, "1.  AND": PRINT , "2.  OR "
2084 PRINT: PRINT , "3. End Selection Criterle Definition":
     PRINT:  PRINT, "Your choice ==> ";
2086 CONJ = 0: WHILE CONJ < 1 OR CONJ > 3:
     CONJ = VAL(INPUT$(1)): WEND
2088 TYPE(S.PTR) = TYPE: LVAL(S.PTR) = LVAL:
     COMP(S.PTR) = COMP: RVAL$(S.PTR)= RVAL$:
     CONJ(S.PTR) = CONJ: RETURN
2090 '       Print one comparison equation
2092 PRINT USING "Field ## ";LVAL;:
     PRINT MID$("< <== >=> <>",(COMP-1)*2+1,2);" ";
2094 IP LEFT$(RVAL$,1)="z"  THEN PRINT USING
     "Field ##";VAL(MID$(RVAL$,2)) ELSE PRINT CHR$(34);:
     IF TYPE=3 THEN PRINT FN EXPOATE$(RVAL$);CHR$(34)
     ELSE PRINT RVAL$;CHR$(34)
2096 RETURN
2098 '       Show complete critsria defined
2100 CLS: PRINT, "Your selection criteria: ": PRINT
2102 CONJ=0: S.PTR=1: WHILE CONJ <> 3: TYPE=TYPE(S.PTR):
     LVAL=LVAL(S.PTR): COMP=COMP(S.PTR):
     RVAL$=RVAL$(S.PTR): CONJ=CONJ(S.PTR)
2104 GOSUB 2092:
     PRINT TAB(9) MID$("ANDOR ENO",(CONJ-1)*3+1,3):
      S.PTR = S.PTR + 1:      WEND
2106 PRINT: PRINT "Is this okay ";: GOSUB 1010
2108 IF YN$="N" THEN CLS: PRINT "Redo selection criteria
```

Listing 5 continued

Listing 5 continued

```
     definitions from the beginning": GOSUB 1012
2110 CLOSE:  RETURN
2112 '       String comparisons
2114 RESULT(S.PTR) = (LVAL$ <  RVAL$): RETURN
2116 RESULT(S.PTR) = (LVAL$ <= RVAL$): RETURN
2118 RESULT(S.PTR) = (LVAL$ =  RVAL$): RETURN
2120 RESULT(S.PTR) = (LVAL$ >= RVAL$): RETURN
2122 RESULT(S.PTR) = (LVAL$ >  RVAL$): RETURN
2124 RESULT(S.PTR) = (LVAL$ <> RVAL$): RETURN
2126 '   Numeric comparisons
2128 RESULT(S.PTR) = (LVAL! <  RVAL!): RETURN
2130 RESULT(S.PTR) = (LVAL! <= RVAL!): RETURN
2132 RESULT(S.PTR) = (LVAL! =  RVAL!): RETURN
2134 RESULT(S.PTR) = (LVAL! >= RVAL!): RETURN
2136 RESULT(S.PTR) = (LVAL! >  RVAL!): RETURN
2138 RESULT(S.PTR) = (LVAL! <> RVAL!): RETURN
2140 '   Conjunctions
2142 SELECT = (SELECT AND RESULT(S.PTR+1)): RETURN
2144 SELECT = (SELECT OR  RESULT(S.PTR+1)): RETURN
2146 '       Use Index File
2148 CL6: TEST$ = FILE$ + "/IND:" + DRIVE$: GOSUB 1000:
     IF TEST.FLAG <> -1 THEN PRINT "Index File not found":
     GOSUB 1012: RETURN
2150 CLOSE:OPEN "I",1,TEST$: INPUT #3,NUM.RECS: GOTO 2164
2152 '       Use old Selection File
2154 CLS: TEST$ = FILE$ + "/SEL:" + DRIVE$: GOSUB 1000:
     IF TEST.FLAG <> -1 THEN PRINT "Old Selection File not
     found": GOSUB 1012: RETURN
2156 CLOSE:OPEN "1",3,TEST$: INPUT #3,NUM.RECS: GOTO 2164
2158 '      Use all rscords in database
2160 GOSUB 1060
2162 '      Main processing loop
2164 IP NUM.RECS=0 THEN CLS: PRINT "There are no records to
     select from": CLOSE #3: GOSUB 1012: RETURN
2166 IF TYPE(1) < 1 THEN CLS: PRINT "Selection criteria are
     not in memory": CLOSE #3: GOSUB 1012: RETURN
2168 DIM SEL(NUM.RECS): SEL.COUNT = 0: GOSUB 1030: CLS:
     PRINT "Records selected:";
2170 PTR = 0: FOR LOOP = 1 TO NUM.RECS: IF SEL.MENU$ = "5"
     THEN GOSUB 1106 ELSE GOSUB 1114
2172 S.PTR = 1: CONJ=0: WHILE CONJ <> 3
2174 IF TYPE(S.PTR)=2 THEN LVAL!=CVS(F$(LVAL(S.PTR))):
     IP LEFT$(RVAL$(S.PTR),1)="z"  THEN
     RVAL!=CVS(P6(VAL(MID$(RVAL$(S.PTR),2))))
      ELSE RVAL!=VAL(RVAL$(S.PTR))
2176 IF TYPE(S.PTR)<>2 THEN LVAL$=F$(LVAL(S.PTR)):
     IP LEPT$(RVAL$(S.PTR),1)="z" THEN
     RVAL$=F$(VAL(MID$(RVAL$(S.PTR),2)))
     ELSE RVAL$ = RVAL$(S.PTR)
2178 IF TYPE(S.PTR)=2 THEN ON COMP(S.PTR)
     GOSUB 2128,2130,2132,2134,2136,2138 ELSE
     ON COMP(S.PTR) GOSUB 2114,2116,2118,2120,2122,2124
2180 CONJ = CONJ(S.PTR): S.PTR = S.PTR+1:  WEND
2182 S.PTR = 1:CONJ = 0:SELECT = RESULT(1):WHILE CONJ <> 3:
     CONJ = CONJ(S.PTR): ON CONJ(S.PTR) GOSUB 2142,2144:
     S.PTR = S.PTR+1: WEND
2184 IF SELECT THEN PRINT LOC(2);:SEL.COUNT = SEL.COUNT + 1:
     SEL(SEL.COUNT) = LOC(2)
2186 NEXT LOOP
2188 PKINT: PRINT "Writing Selection File to disk": CLOSE:
```

Listing 5 continued

Listing 5 continued

```
    OPEN "O",1,FILE$+"/SEL:"+DRIVE$: WRITE #1,SEL.COUNT
2190 FOR LOOP = 1 TO SEL.COUNT: WRITE #1,SEL(LOOP): NEXT:
    CLOSE: ERASE SEL: RETURN
3000 ' This line is needed for the merge/delete routine
```

End

Program Listing 6. Index/OVL.

```
1990 'Save as  "INDEX/OVL",A  after debugging
2000 'This line is necessary for the merge/delete routine
2002 IND.MENU$=" ": WHILE IND.MENU$<>"9": CLS: PRINT
     "Index Menu -- Pick Record Group to Index": PRINT :
     PRINT , "1. Use Records in Selection File": PRINT ,
     "2. Index All Records in the Database"
2004 PRINT : PRINT : PRINT
     "9. Return to Main Menu": PRINT : PRINT ,
     " Your choice ==> ";: IND.MENU$ = " ":
2006 WHILE IND.MENU$ < "1" OR IND.MENU$ > "9":
     IND.MENU$ = INPUT$(1): WEND: PRINT IND.MENU$
2000 ON VAL(IND.MENU$) GOSUB 2012, 2010: WEND: CLOSE: GOTO
     240
2010 'Index via /SEL file
2012 TEST$ = FILE$+"/SEL:"+DRIVE$: GOSUB 1000: IF TEST.FLAG
     <> -1 THEN CLS: PRINT "Selection File Not Found": GOSUB
     1012: RETURN
2014 OPEN"I",3,TEST$: INPUT #3,NUM.RECS: GOTO 2022
2016 'Index all physical records
2018 GOSUB 1060 'Get number of records in database
2020 'Common Code
2022 IF NUM.RECS < 2 THEN CLS: PRINT "I can't sort less than
     2 records": GOSUB 1012: RETURN
2024 GOSUB 1024: GOSUB 1030: GOSUB 1040: GOSUB 1102
2026 IND.FLD = 0: Q$ = " ": WHILE IND.FLD < 1 OR IND.FLD >
     TOTAL.FIELDS: PRINT @ (23,0), BLANK.LINE$;: PRINT @
     (23,0), "Enter field to sort on or 'Q' to quit ==> ";:
2028 Q=2: GOSUB 1064: IND.FLD = VAL(Q$): IF CNR$(ASC(Q$) AND
     223) = "Q" THEN RETURN
2030 WEND:IF FIELDS(2,IND.FLD) = 2 THEN GOSUB 2036 ELSE
     GOSUB 2056 'numeric & string sorts
2032 RETURN
2034 'Sorting on numeric field
2036 DIM SORT!(NUM.RECS): DIM INDEX(NUM.RECS): CLS:
     PRINT "Reading data from disk"
2038 PTR = 0: FOR LOOP = 1 TO NUM.RECS: IF IND.MENU$ = "2"
     THEN GOSUB 1106: ELSE GOSUB 1114
2040 SORT!(LOOP) = CVS(P$(IND.FLD)): INDEX(LOOP) = LOC(2):
     NEXT: CLS: CLOSE: PRINT "Sorting.";
2042 GAP = 1: WHILE GAP < NUM.RECS: GAP = GAP * 3 + 1:
     WEND: IF GAP < 4 THEN GAP = 4
2044 WHILE GAP > 1: GAP = GAP \ 3: FOR SORTLOOP = GAP + 1 TO
     NUM.RECS: PTR = SORTLOOP
2046 IF SORT!(PTR) => SORT!(PTR-GAP) THEN GOTO 2050 ELSE
     SWAP SORT!(PTR),SORT!(PTR-GAP): SWAP
     INDEX(PTR),INDEX(PTR-GAP)
2048 PTR = PTR - GAP: IF PTR > GAP THEN GOTO 2046
2050 PRINT ".";: NEXT SORTLOOP: WEND
2052 GOSUB 2070: ERASE SORT!: RETURN
2054 'Sort on a string or date field
2056 DIM SORTS(NUM.RECS): DIM INDEX(NUM.RECS): DUMMY$ =
```

Listing 6 continued

Listing 6 continued

```
      STRING$(FIELDS(1,IND.FLD)," "): FOR LOOP = 1 TO
      NUM.RECS: SORT$(LOOP)=DUMNY$: NEXT LOOP
2058  CLS: PRINT "Reading data from disk"
2060  PTR = 0: FOR LOOP = 1 TO NUM.RECS: IF IND.MENU$ = "2"
      THEN GOSUB 1106 ELSE GOSUB 1114
2062  LSET SORT$(LOOP) = F$(IND.FLD): INDEX(LOOP) = LOC(2)
2064  NEXT LOOP: CLS: CLOSE: PRINT "Sorting ";
2066  GAP = 1: WHILE GAP < NUM.RECS: GAP = GAP * 3 + 1:
      WEND: IF GAP < 4 THEN GAP = 4
2068  WHILE GAP > 1: GAP = GAP \ 3: FOR SORTLOOP = GAP + 1 TO
      NUM.RECS: PTR = SORTLOOP
2070  IF SORT$(PTR) => SORT$(PTR-GAP) THEN GOTO 2074 ELSE
      SWAP SORT$(PTR),SORT$(PTR-GAP): SWAP
      INDEX(PTR),INDEX(PTR-GAP)
2072  PTR = PTR - GAP: IF PTR > GAP THEN GOTO 2070
2074  PRINT ".";: NEXT SORTLOOP: WEND: ERASE SORT$
2076  ' Write index file
2078  OPEN "O",1,FILE$+"/IND:"+DRIVE$: WRITE #1,NUM.RECS:
      FOR LOOP = 1 TO NUM.RECS: WRITE #1,INDEX(LOOP): NEXT
      LOOP: CLOSE #1: ERASE INDEX: RETURN
3000  'This line is necessary for the merge/delete routine
```

End

Program Listing 7. Report/OVL.

```
1998  ' Save as  "REPORT/OVL",A  after dabugging
2000  CLS: IF FILE$="" THEN PRINT "You must open a file (menu
      choice 2) before creating a report": GOSUB 1012: GOTO
      240
2002  TEST$ = FILE$ + "/rpt:" + DRIVE$: GOSUB 1000: IF
      TEST.FLAG <> -1 THEN CLS: PRINT "Report Definitions not
      found": GOSUB 1012: GOTO 240
2004  RPT.MENU$=" ": WHILE RPT.MENU$<>"9": CLS: PRINT ,
      "Choose Record Set for Report": PRINT
2006  PRINT , "1. Uae Selection File": PRINT ,
      "2. Use Index File": PRINT ,
      "3. Use all active records": PRINT: PRINT: PRINT: PRINT
      , "9. Return to Msin Menu": PRINT: PRINT , "Your choice
      ==> ";
2008  RPT.MENU$ = " ": WHILE RPT.MENU$<"1" OR RPT.MENU$>"9":
      RPT.MENU$ = INPUT$(1): WEND: PRINT RPT.MENU$: ON
    VAL(RPT.MENU$) GOSUB 2014,2020,2026
2010  WEND: CLOSE: GOTO 240
2012  'Use Selection file
2014  TEST$=FILE$ + "/SEL:" + DRIVE$: GOSUB 1000: IF
      TEST.FLAG <> -1 THEN CLS: PRINT "Selection File not
      found": GOSUB 1012: RETURN
2016  OPEN "I",3,TEST$: INPUT #3, NUM.RECS: GOTO 2030
2018  'Use Index File
2020  TEST$=FILE$ + "/IND:" + DRIVE$: GOSUB 1000: IF
      TEST.FLAG <> -1 THEN CLS: PRINT "Index File not found":
      GOSUB 1012: RETURN
2022  OPEN "I",3,TEST$: INPUT #3, NUM.RECS: GOTO 2030
2024  'Use all active records
2026  GOSUB 1060
2028  'Common code
2030  GOSUB 1030: CLS: PRINT "Reading Report definition
      file": OPEN "I",1,FILE$ + "/RPT:" + DRIVE$: INPUT #1,
```

Listing 7 continued

Listing 7 continued

```
    PAGE.LINES: INPUT #1, HEADER.LINES: IF HEADER.LINES > 0
    THEN DIM HEADER$(HEADER.LINES)
2032 FOR LOOP = 1 TO HEADER.LINES: INPUT #1, HEADER$(LOOP):
    NEXT LOOP: INPUT #1, RECORDS.PER.PAGE: INPUT #1,
    BLANK.LINES: INPUT #1, REPORT.LINES: INPUT #1, FIELDS:
    DIM LABEL$(FIELDS),F.NUMBER(FIELDS),EOL(FIELDS)
2034 FOR LOOP = 1 TO FIELDS: INPUT
    #1,LABEL$(LOOP),F.NUMBER(LOOP),EOL(LOOP): NEXT LOOP
2036 INPUT #1,FIELD.SUMS: IF FIELD.SUMS > 0 THEN DIM
    SUM.FIELDS(FIELD.SUMS), SUM.FIELDS$(FIELD.SUMS): DIM
    SUMS.COUNT!(FIELD.SUMS)
2038 FOR LOOP = 1 TO FIELD.SUMS: INPUT #1,SUM.FIELDS(LOOP):
    INPUT #1,SUM.FIELDS$(LOOP): NEXT LOOP: CLOSE #1
2040 PADS = PAGE.LINES - (RECORDS.PER.PAGE * REPORT.LINES) -
    HEADER.LINES
2042 'Get output destination
2044 CLS: PRINT ,"Send Report to: ": PRINT: PRINT ,
    "1. Printer"; PRINT ,"2. Disk File": PRINT ,
    "3. Video display"; PRINT: PRINT ,"Your choice ==> ";
2046 OUTPUT$ = "": WHILE OUTPUT$ < "1" OR OUTPUT$ > "3":
    OUTPUT$ = INPUT$(1): WEND: PRINT OUTPUT$
204B CLS: IF OUTPUT$ = "1" THEN OUTFILE$ ="*PR": PRINT
    "Set printer to the top of a page and turn it on":
    GOSUB 1012
2050 IF OUTPUT$ = "2" THEN PRINT "Enter full name of output
    file ==> ";: Q = 23: GOSUB 1064: OUTFILE$ = Q$: GOSUB
    1000: IF TEST.FLAG = 1 OR TEST.FLAG = 2 THEN GOTO 2050
2052 IF OUTPUT$ = "3" THEN OUTFILE$ = "*DO"
2054 OPEN "O",1,OUTFILE$: REPT.REC = 1: PTR = 0
2056 WHILE REPT.REC <= NUM.RECS: IF REPT.REC MOD
    RECORDS.PER.PAGE = 1 THEN FOR LOOP = 1 TO HEADER.LINES:
    PRINT #1, HEADER$(LOOP): NEXT LOOP
2058 IF RPT.MENU$ = "3" THEN GOSUB 1106 ELSE GOSUB 1114
2060 FOR LOOP = 1 TO BLANK.LINES: PRINT #1,: NEXT LOOP
2062 FOR LOOP = 1 TO FIELDS: IF FIELDS(2,F.NUMBER(LOOP)) = 1
    THEN Q$=F$(F.NUMBER(LOOP)): GOSUB 1110: PRINT #1, USING
    LABEL$(LOOP);Q$;
2064 IF FIELDS(2,F.NUMBER(LOOP)) = 2 THEN PRINT #1, USING
    LABEL$(LOOP);CVS(F$(F.NUMBER(LOOP))); ELSE IF
    FIELDS(2,F.NUMBER(LOOP)) = 3 THEN PRINT #1, USING
    LABEL$(LOOP); FN EXPDATE$(F$(F.NUMBER(LOOP)));
2066 IF EOL(LOOP) THEN PRINT #1,:
2068 NEXT LOOP: FOR LOOP = 1 TO FIELD.SUMS
2069 IF FIELDS(2,SUM.FIELDS(LOOP))=2 THEN
    SUMS.COUNT!(LOOP)=SUMS.COUNT!(LOOP)+
    CVS(F$(SUM.FIELDS(LOOP))) ELSE
    SUMS.COUNT!(LOOP)=SUMS.COUNT!(LOOP)+1
2070 NEXT LOOP: REPT.REC = REPT.REC + 1:IF REPT.REC MOD
    RECORDS.PER.PAGE = 1 THEN FOR LOOP = 1 TO PADS:
    PRINT #1,: NEXT LOOP
2072 WEND
2074 FOR LOOP = 1 TO BLANK.LINES: PRINT #1,: NEXT LOOP:
    FOR LOOP = 1 TO FIELD.SUMS: PRINT #1,USING
    SUM.FIELDS$(LOOP);SUMS.COUNT!(LOOP): NEXT LOOP
2076 IF OUTPUT$="3" THEN PRINT:PRINT: GOSUB 1012
2078 CLOSE: IF HEADER.LINES > 0 THEN ERASE HEADER$
2080 ERASE LABEL$,F.NUMBER,EOL: IF FIELD.SUMS > 0 THEN ERASE
    SUM.FIELDS,SUM.FIELDS$,SUMS.COUNT!
2082 RETURN
3000 'This line is needed for the chain/merge routine
```

End

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TIDBIT #35

Use this Model I/III/4 routine to print out Basic programs saved in ASCII format (SAVE "filename",A). It prints each statement on a separate line for easier reading and debugging.

Brian Bischof
Louisville, KY

```
10 REM * EASY - LISTER
20 CLEAR 1000
30 INPUT "NAME OF FILE TO LIST";F$
40 OPEN "I",1,F$
50 LINEINPUT #1,L$
60 G=0
   :LPRINT "  "
70 FOR S=1 TO LEN(L$)
   : IF MID$(L$,S,1)<>" " THEN NEXT S
80 FOR P=1 TO LEN(L$)
   :M$=MID$(L$,P,1)
90 IF M$=":" THEN 120
100 IF M$=CHR$(34) THEN 140
110 LPRINT M$;
    :NEXT P
    :IF EOF(1) THEN 160 ELSE 50
120 IF G=0 THEN LPRINT " "
    :LPRINT STRING$(S,32);
130 GOTO 110
140 IF G=0 THEN G=1 ELSE G=0
150 GOTO 110
160 CLOSE 1
170 LPRINT " "
180 INPUT "ANOTHER FILE TO LIST ";Q$
    :IF LEFT$(Q$,1)="Y" THEN 30
190 END
```

End

TIDBIT #36

The Model III's INKEY$ statement lets you enter a response without pressing the enter key. However, unlike the standard Input statement, it doesn't provide a blinking cursor prompt to remind the user the program is waiting for a keystroke. Here's a short routine offering the best of both statements: the quick response of an INKEY$ statement and a blinking cursor. Save it in ASCII, merge it with each program in which you'll use it, and call it as necessary using GOSUB. Leave the main program with a Print statement followed by semicolon, then add the GOSUB call. For example:

```
100 PRINT "What is your choice?";:GOSUB 50000
```

The initial call should be GOSUB 50000; subsequent calls within the same program, GOSUB 50005.

Bud Myers
Washburn, ME

```
49995 END
50000 P0$="("+CHR$(176)+")":Q0$=P0$:R
0$=" ":S0$=STRING$(3,8)
50005 PRINT Q0$;
50010 K0$=INKEY$: IF K0$=""THEN X0=X0
+1 ELSE 50030
50015 IF X0<12 THEN 50010
50020 X0=0: IF Q0$=P0$ THEN Q0$=R0$ E
LSE Q0$=P0$
50025 PRINT S0$;:GOTO 50005
50030 PRINT S0$;:PRINT "("K0$")";:K0=
VAL(K0$)
50035 FOR Z0=1 TO 222:NEXT:RETURN
```

End

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Continued from p. 31

level of operators. This is the basis for the entire language. Think of SYSVOC as the assembler used to write the compiler (LANGVOC). The compiler is then used to write the application primitives (TOPICVOC). These primitives are bound together into the application system (Rove).

You are allowed to use data types of both integers and strings. Integers can be declared as ordinal values (unsigned 16 bits), characters (lower 7 bits), or flags (Boolean flag) and contain only positive numbers. Double integer values have double the normal precision (32 bits) and, unlike ordinals, may contain negative numbers. You may declare arrays of either word ordinals or double integers.

You can use sophisticated looping control statements and other control features which allow development of fully structured programs. Other features allow recursion, redefinition of operators, and command string definition as macros. Programs can be keyed in directly from the command interpreter or may be entered into a leaf text.

Other Topics

KAMASOFT has provided a detailed list of some other applications that are possible. KAMASOFT cites possible uses in an office environment such as managing correspondence files, appointment calendars, meeting agendas, speech notes, client records, and so on.

KAMAS is perfect for developing, indexing, and cataloging notes. You could develop the outline for a book and catalog the notes of all of your references within the outline itself.

Conciusion

I have used Framework on an IBM PC/XT for applications identical to those I can accomplish in KAMAS. It's easier to move around in KAMAS than in Framework and reorganizing data is painless.

For all of KAMAS' seeming complexity, it really is a simple program. But much of its power will be wasted if you only use it to develop outlines and topics.

The documentation provided with the system is excellent and well organized.

KAMASOFT has also released three utility disks for KAMAS. The most recent adds such features as topic output with WordStar print formatting and decimal outline numbers, printing with headers, footers, and page numbers, copying and resizing topics. The disks are available as public domain software for the cost of reproduction and shipping ($10).

KAMAS is a great productivity tool and it certainly has breathed new life into my Model 4P. But I have two questions: Why did it take so long to be developed, and where is the MS-DOS version?■

REF: Knowing Where to Go

by Mark D. Goodwin

★ ★

REF runs on the Model 4 (64K) and requires one disk drive. Salsbury Assoc. Inc., 610 Madam Moore's Lane, New Bern, NC 28560. $24.95.

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

Modifying a Basic program can be slow and arduous, particularly if someone else wrote it. And before you change anything, you need to understand three things: the program's function, the program's flow, and the function of the program's variables. If you can figure these out, changing a program can be fairly simple.

Although you have to do most of this work manually, a cross-reference program can be of great assistance. REF, a Model 4 utility, can cross-reference program line numbers, variables, integers, and strings of characters. While REF offers some good features, it also has certain constraining limitations that hinder it. For example, it lumps together references for integers and line numbers, without telling you which ones belong to integers and which to line numbers.

REF's abilities to cross-reference line numbers and variables is probably its most useful feature. Having a cross-reference list of the line numbers helps you understand program flow. For example, any line number with a considerable number of references indicates that the corresponding program line is probably the first line in a subroutine. Knowing all the locations of a specific variable hints at the variable's intended function.

Using REF

REF is a machine-language program that resides in high memory. You install it by running the REF/JCL file, which also lets you optionally load a Basic program automatically. Once it's installed, you can execute REF any time by calling it from Basic as a machine-language subroutine. For example, entering X = USR(0) from within Basic passes control from the Basic interpreter to REF.

Once you pass program control to it, REF locates and sorts the Basic program's variables. Next, REF displays a menu with options to display and print a cross-reference list for a string of characters, display the full cross-reference list, display and print the full cross-reference list starting with a specific variable, display and print a cross-reference list starting with a specific variable, display and print a cross-reference list for a single variable, and return to Basic.

Features and Limitations

Some of REF's features include tagging simple and array variables, indicating variable type, listing variable names without the referenced line numbers, and doing case-sensitive string searches. Although it has some nice features, REF also has a few limitations: Only the first eight characters of a variable name are significant, you can reference only 300 items at a time, and references for integers and line numbers are listed together.

Of these limitations, the combined listing of integers and line numbers is a serious problem. Because the referenced item doesn't tell you whether it's an integer or a line number, the cross-reference list is almost useless for understanding program flow.

REF uses scroll protection while displaying cross-reference listings to indicate how you can pause, continue, or abort the list. Although this is a good feature, REF unfortunately doesn't disengage the scroll protection before it returns control to the Basic interpreter. Therefore, displays can be somewhat confusing.

One problem with REF is the way it interacts with the Basic program pointers. REF uses these program pointers to locate and cross-reference the listing. However, Basic resets these pointers when you run a program. And after running a program, REF can't properly cross-reference it.

While this problem is described in the documentation as a limitation, it's actually faulty programming. All versions of Microsoft Basic maintain pointers to a Basic program's start and end addresses. And these pointers are constantly maintained by the interpreter. REF isn't using the proper pointers to determine the Basic program's location. Otherwise, executing a program wouldn't cause problems.

Conciusion

The REF documentation consists of a completely inadequate four-page manual. Since REF is fairly easy to use, experienced computer users shouldn't have too many problems. However, novices won't find the manual much help should problems arise. Simply put, the REF manual is a good example of what documentation shouldn't be.

Overall, it's hard to recommend REF. It needs a better manual and its limitations need to be addressed.■

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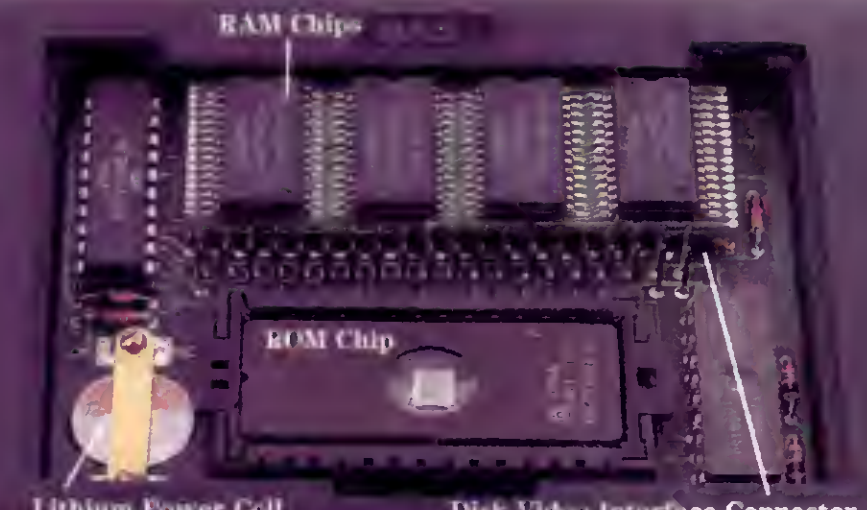

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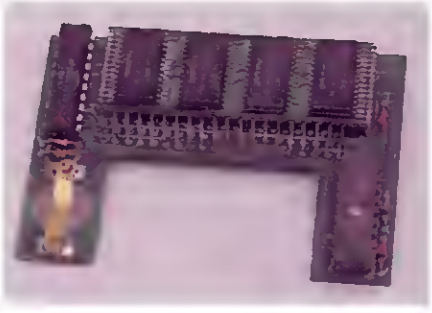

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Infoscan: Easy to Use, Hard to Get Used To

by Wynne Keller

★ ★ ★

Infoscan runs on the Models I and III (48K) and requires one disk drive. DiskCount Data, 2701-C W. 15 Suite 612, Plano, TX 75075. $49.95.

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

For most people, setting up a data base program—with its data fields, screen designs, and report formats—is intimidating, but using it is a breeze once the installation work gets done. Infoscan, however, is the reverse: While its predefined records and report generator simplify setup, they don't provide the flexibility of a full-featured data base. Infoscan is simply an inexpensive information retrieval system.

Setup

Infoscan comes on a Model I disk. Model III users must convert the disk with a DOS utility; if you have only one drive, DiskCount Data will make the conversion for you. This is a needless nuisance—the company should put the Model I format on one side of the disk and Model III format on the other.

Infoscan presents a readable screen display with two windows. One lists Infoscan's functions, the other explains them. After you load infoscan, it prompts you for a file name. If the file you specify doesn't exist, Infoscan offers to create it. That's all there is to setting up the data base: You don't have to supply field names or lengths, or design reports. A file cannot exceed 350 records, and each record can hold 1,792 characters.

Adding Records

Infoscan makes adding data tedious because, for each record, you must specify a key word, sort group, and screen size. The key word goes into a disk-based index Infoscan creates so it can relocate the record. Each file consists of both a data file and an index file, which you can put on separate disks. You can search records by key words of up to 17 characters.

The sort group is a subdivision of key words that adds a second dimension by which you can sort. For example, if you were entering recipes, one key word might be CHICKEN and the sort group would be MEAT. However, since Infoscan limits the size of sort groups to three characters, your group in this case would be MEA. You design one data-entry form per sort group. To use it, you must recall it from disk each time you add a record.

You can select a full-screen display of 58 characters by 34 lines or a smaller screen of 36 characters by 56 lines. You may enter text freestyle or superimpose a form on the blank data-entry screen. It is unusual for a data base to allow this much text per record.

To jump from one field to another in a record, you press the shift/enter keys. No matter how many times I did this, I couldn't get used to it. Almost all data bases require that you press the enter key to move from one field to another; I found the need to add the shift key annoying.

Other Functions

Infoscan's report function sends one record at a time to a line printer from the Add, Change, or Scan modes. It prints only the current, on-screen record. You can't get a complete report of all the records in the file as a one-step operation.

Change and Scan operate similarly. While both display a record of choice (found via a key word), Scan won't let you make corrections but Change will. You enter the correct key word directly or find it by going through the key words with the arrow keys.

You delete a record by deleting its key word. Since the program uses variable-record-length disk files, any changes or deletions will free up an equivalent amount of disk space. However, you could run out of space during the Add or Change processes, in which case serious problems occur. For this reason, the manual warns that you must have spare formatted disks always available.

Infoscan could minimize the seriousness of "Disk full" errors, power outages, or pressing the reset key if it provided a reindexing utility to permit a file's recovery if the index is damaged by a power loss. However, infoscan doesn't reindex on command. If you lose your index, you lose your data, even though it's still on the disk. Understandably, DiskCount Data warns about back-ups in the strongest terms.

Conclusion

Infoscan works best for unstructured data in small batches, permitting a large number of characters in each record. While it uses nice screen displays and is easy to set up, it doesn't allow enough records for business applications, and its report functions are limited. You'll find any data management project time-consuming to enter into the computer. InfoScan is easy to use, but it falls short in other areas.■

REVIEWS

Mister Editor

by Richard Ramella

★ ★ ★ ★

Micro Memo runs on the Model 4 (64K) and requires one disk drive. The Alternate Choice, 9505 W. Brown Deer Road, Milwaukee, WI 53224, 414-355-4544, $49.95.

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

As a line-oriented screen editor, Micro Memo works best reshaping and streamlining Basic listings. Like a Swiss Army knife, it offers the right tools for the problem at hand. The Alternate Source touts Micro Memo as a text editor as well, and it handles brute-force operations, like global search and replace, better than it does fine-tuning tasks, like inserting single characters. If you work within its bounds, Micro Memo is a capable little program.

Numbered Lines

Micro Memo lets you create text, so in theory you can use it to write. Since it's line-oriented, it numbers the 255-character lines it displays. To insert a new line of text into an existing document, you type in an appropriately numbered line. If you run out of line space, you renumber the lines.

I tried using Micro Memo as a limited note writer and found my efforts printed with line numbers. Still, I was able to save the text to a Scripsit file without numbers.

It's obvious that Micro Memo was meant primarily as a program listing editor, for it provides over 30 commands for reshaping Basic listings. In addition to global search and replace, Micro Memo can display all lines with a specified string or all lines not having the string. It shifts material left or right; sets tabs; prints, saves, loads, deletes, and inserts records; and changes characters from upper- to lowercase or vice versa.

It also copies material from one location to another. You can delete or insert material as a continuing operation (without pressing the enter key), an improvement over the Model 4's line-editing system.

Conclusion

Micro Memo's documentation is clear, and it's augmented by a help menu explaining the many options. A special note for Model 4/4P users states that error-handling in BASCOM, used to compile Memo's utilities, doesn't work correctly. This means a syntax or disk error can dump you out of Memo into DOS. I tried to force some of these mistakes on the program but couldn't crash out of it.■

Disk Detail

by Thomas L. Quindry

★★★★

Interactive File Control (IFC) runs on the Models I/III (48K) under LDOS and Model 4 (64K) under TRSDOS 6.X. It requires one disk drive. Misosys Inc., P.O. Box 239, Sterling, VA 22170, 703-450-4181. $24.95.

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

At times, you have no choice but to bite the bullet and reorganize your disk files. Moving, purging, or renaming files requires repetitive and monotonous commands like Directory, Copy, Kill/Remove, Purge, Rename, and List. IFC takes the drudgery out of these operations with a simple and convenient utility that competently handles them all.

Mass Operations

Type in IFC from DOS Ready, and it asks you which drive (zero to 7) you want to access. IFC displays an alphabetized directory for the selected drive, along with the disk name, the amount of free space, the amount of tagged memory, and file information such as protection status, back-up status, approximate file size, and directory date of the file.

IFC provides several one-key commands for individual and universal operations. You can copy, delete, or rename a file from a disk individually by scrolling through the file list and issuing the proper command. You can do the same operations on a series of files with a universal command.

Before you act on a series of files, you have to tag them individually, by attribute or by a wildcard template. You then invoke the universal function command on either the tagged or untagged files. IFC displays a running total of tagged file space at the head of the screen display.

The multiple copying command is IFC's most useful. It is also much safer to use than the LDOS/TRSDOS back-up command for making duplicate copies. The DOS back-up provides a strict sector-for-sector copy and will make a bad copy without so indicating. IFC copies files much like the DOS Copy command does; however if it can't read any file, you have a chance to try again and, if necessary, copy a back-up file from another disk. An added advantage is that IFC will store files in a more contiguous manner.

To execute a mass renaming of files, you must use a renaming template, which uses question-mark and asterisk characters as wildcard indicators when you rename files so you can control individual, though related, file names.

A help utility lists all IFC commands available, and after a few sessions you won't need the documentation except for wildcard designations. Most of the 19 commands relate to copying, deleting, or renaming files. The others include executing DOS commands, determining free space on a drive, selecting a new drive number, and exiting IFC.

You can list a file in either ASCII or hexadecimal (hex) format with a supplied program you call through IFC or from DOS. When called through IFC, you can only list a file in ASCII or hex. When called from DOS, additional parameters let you control several functions, like sending the output to the printer, numbering each line, expanding tab characters on output, and pausing.

Another IFC feature lets you run the program without a system disk in drive zero. Although the documentation tells you how to do this, it makes no mention of how to set up the necessary system overlays in memory. A README/TXT file supplied on the distribution disk gives rather sketchy information, saying only that you have to SYSRES selected DOS modules. You should refer to the DOS manual to see how to do this.

A Few Problems

IFC works with only a few noticeable problems. The only serious one was its inability to invoke the wildcard command if you entered by way of a JCL file. The program crashes. Also, when returning to the system disk, a crash occurs if the last disk read in drive zero differs in format from the system disk.

I found one minor, annoying flaw and one bug with the ASCII/hex list program. When I used it with IFC, the message, "Press any key to return to IFC," is not preceded by a carriage return. Consequently, this message appeared directly after the last line of ASCII text.

The bug I experienced is related to this flaw and occurred when using IFC's list program from DOS rather than from IFC. When using the printer output option for an ASCII list of a file saved in ASCII format, the last line won't print out unless the file ends with a carriage-return character. The reason, of course, is that the printer must have the carriage-return character to print the line. The list program should compensate for this.

Conclusion

In spite of these nagging flaws, IFC is a must program. It is easy to use, takes up little space, and makes file maintenance a breeze. IFC can make your life a lot easier.■

The Home Accountant

★★★★

The Home Accountant runs on the Model III (48K) and requires one disk drive. Tandy/Radio Shack, One Tandy Plaza, Fort Worth, TX 76102. Catalog number 26-1511. $99.95.

Setting up your personal finances is no fun, but The Home Accountant does a good job of keeping track of how your money comes in and where it goes out. It's a versatile program that can easily manage a budget. Unfortunately, The Home Accountant is written in Model III Basic and it can be torturously slow at times, particularly during disk access.

When you boot up the Home Accountant disk, it automatically goes into Basic and runs the program. It's easy to use, with menus leading you through every step of the way. As you move through the menus, an asterisk appears beside the next item you'll need to properly set up a budget. Many of the screens that accept information are similarly designed, simplifying the start-up process.

You can set up from one to five checkbooks, and budget a certain amount of money for each month (and checkbook). The program shows how closely you followed your budget, and you can track any monthly asset, liability, expense, or income. The budget categories include house and car payments, credit cards, and even food. You can also display a bar graph for each category comparing your actual spending to the amount budgeted.

You can set up payments that The Home Accountant will automatically subtract each month; you have to key in others manually. Each "check" requires certain information, such as the date, to whom you wrote the check and why, and whether or not it has cleared the bank. You can also print checks on your printer with specially made checks you can order. The Home Accountant keeps track of the balances in each checking account as well as the other budget categories as you add to and subtract from them.

You can automatically figure a percentage increase or decrease in spending over a certain period of time. You can get a printout of budgeted and actual amounts for all the budget categories, a personal balance sheet, and a list of what checks you wrote for any or all checkbooks.

If you use LDOS, you can put The Home Accountant and its files on a hard disk. The manual shows how and how to back up the hard disk with floppies.

The program comes with a 154-page manual in a three-ring binder. The introductory section is good, displaying screen diagrams from the program and leading

The File Transfer Program is like two halves that don't add up to a whole.

you through the process of setting up and maintaining your checkbooks.

While the Home Accountant has a somewhat high price, it does a good job of tracking your accounting operations. It may be slow, but it's also flexible enough to handle almost any number of transactions you may have.

—Edward Spitzbarth III

The File Transfer Program

★ ★

The File Transfer Program runs on the Models III and 4 and the Tandy 1000/1200. Personal Computer Products, 3080 Olcott Drive, Suite 130B, Santa Clara, CA 95051, 408-988-0164. $149.95.

Many computer users need to transfer files between different computers. You can do this with a modem, a null modem cable, or a disk-based program. The File Transfer Program uses a null modem cable to move files from your TRS-80 to your MS-DOS machine. It is, however, slow and it doesn't include any error-checking. It also transfers files from your TRS-80 to your MS-DOS computer only, not the other way around.

The File Transfer Program comes with two disks and minimal documentation. The TRS-80 disk can only send files from your TRS-80 computer, and the MS-DOS disk only receives them. This is like buying two halves of a communication program—only it doesn't add up to a whole.

The program is written in Basic and it's easy to use. The TRS-80 end is set to a default baud rate of 9,600. To test it, I transferred a 19K file in 14 minutes. Using a different pair of communications programs, I transferred the same file in only 28 seconds at 9,600 baud. Actually, the transfer rate of The File Transfer Program is effectively no more than 450 baud. The default on the PC side of the program is set at a more realistic 300 baud.

The PC side of the program does contain four useful utilities. These add or strip combinations of carriage return and line feed characters (CRLF), strip off control codes, strip off the high bit, limit your maximum line length by adding CRLF (but doesn't word-wrap the line), and puts spaces between key words to aid file conversion from the Model III.

Even with the utilities, The File Transfer Program is a poor value. Other programs have far more capability and operate much faster to boot.

—Thomas L. Quindry

Word Processing Simplified for SuperScripsit

★ ★ ★

Word Processing Simplified for SuperScripsit (for the Models III and 4). Rosemary Kelly-Bekaert, Softcover, 190 pp., Kelly Enterprises, P.O. Box 247, Holt, MI 48842, 517-694-1799. $19.95.

Anyone who has used SuperScripsit is well acquainted with the terrible manuals that come with the program. The tutorial is long and difficult, and the reference manual is inadequate in preparing you to use SuperScripsit efficiently and effectively. *Word Processing Simplified for SuperScripsit* is the perfect solution for the accomplished word processor user who doesn't want to wade through all the rhetoric of the Tandy manuals. While this book is neither dull nor intimidating, it is confusing at times.

Word Processing Simplified is divided into five major sections: General Information, Basic Functions, TRSDOS File Management Commands, Working With Blocks, and Advanced Skills. These are followed by summary sheets of the various SuperScripsit commands, instructions on changing the system defaults, an index, and an answer section for the review quizzes in each section. Each of the sections is subdivided into chapters.

One of the book's drawbacks is that the different sections have independent page-numbering schemes, each starting with page 1. This makes it awkward to thumb through the book looking for a particular page. However, balancing this is a clear and well-designed table of contents, which practically eliminates the need for an index.

The book is laid out more like a reference manual than a tutorial. Each page contains the specific instructions on how to do something (such as make a back-up disk) in a simple and straightforward manner. After each lesson, an exercise lists a couple of practice tasks to make sure you understand what you just read.

One good feature of the book is the description of commands at the start of each section, which in many cases also makes a good glossary. Each section ends with a review quiz, a fill-in-the-blank affair that tests your knowledge of the section you just read.

The primary fault with the book is the poorly designed format. There is no introduction to explain how to use the manual or its layout. It took me several minutes to figure out that the first exercise wasn't just a part of the rest of the text. Trying to separate where text ends and the exercises start (and end) isn't always simple. They aren't adequately set apart.

Similarly, the various chapters should be clearly separated, perhaps by making each one start on a right-hand page rather than just the page after a completed exercise.

Only after finishing the first section did I discover that the book contained review quizzes. Careful inspection of the table of contents revealed that the answers were in the back of the book, but there isn't any mention of them in the quizzes themselves.

The instructions, exercises, and quizzes are well done. While I found the book to be far superior to Tandy's reference manual as a reference manual, as a tutorial it falls far short of being clear and simple. In the exercises, for example, some typing assignments have deliberate errors. You are expected to type them in, then correct them with SuperScripsit. To guide you, the typed assignment is reproduced with corrective editing marks in red (so you have two copies, one you type in and the other you use as a guide). This is good, especially the use of the red to indicate changes.

Unfortunately, the book uses standard copy-editor signs to indicate what you are supposed to do. This isn't a problem if you are familiar with copy editing, but if you aren't (and most people are not professional copy editors), you haven't the foggiest idea what these cryptic messages want you to do. A glossary of them, or a reference as to where you can find an explanation of their uses, would have been very helpful.

Word Processing Simplified for SuperScripsit is a good reference work for the SuperScripsit user, or a good tutorial for the accomplished word processor user who is switching to SuperScripsit. It even makes a good exercise book to use with the Tandy tutorial manual. But it isn't recommended for novices looking for a good tutorial to replace Tandy's, or as a book that tells you how to do things that Tandy's manuals don't.

—Terry Kepner

A Fine Fix

by Alain Dussault and Luc Jacob

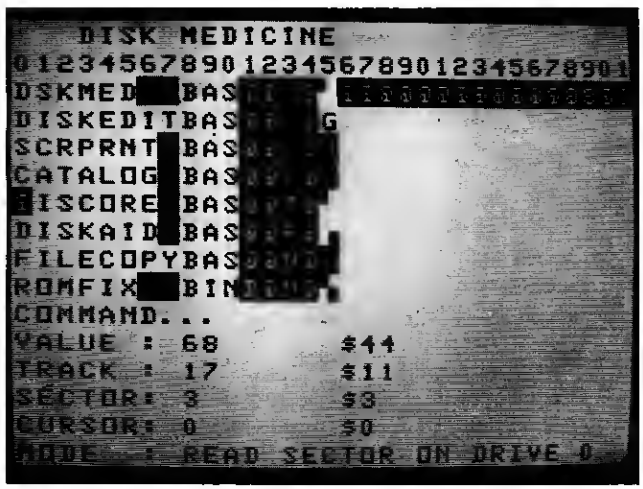

Photo 1. Example directory viewed in the edit mode.

Photo 2. FAT for Photo 1.

When your car's transmission goes, you don't get rid of the car and buy a new one, you fix what's wrong. The same holds true for disks—rather than chuck a glitched disk, it's cheaper to do some repair work and resurrect it. My program, ZapZ, lets you do just that. With ZapZ, you can examine and modify disks by track or by sector (see Program Listing 1).

ZapZ runs under RSDOS 1.0 and 1.1, JDOS 1.07 and up, and OS-9. You can also use ZapZ on Flex-formatted disks (except for the single-density track zero) and with Xex Flex.

Zapped Out

Put the ZapZ disk in drive zero and boot it up. When you run the program, it presents you with a menu of three options: program explanation, sector examination, and end. The first and last selections are self-explanatory.

When you select option 2 to examine and modify disk sectors, ZapZ automatically displays the directory track (track 17, sector 3) for the disk in drive zero and puts you in the command mode. It displays a line of identifying information, a row of numbers representing bytes zero to 31 of the directory, and an eight-line window displaying file data in ASCII format (see Photo 1).

A command line appears below the window. The remaining lines provide hexadecimal (hex) or decimal equivalents labeled "Value," "Track," "Sector," "Cursor," and "Drive." They display, respectively, the hex or decimal value of the data at the current cursor location, the current track number, the current sector number, the current cursor position, and the current drive number.

To view the next eight directory lines in the window, first press the enter key to invoke the edit mode. Then press the shift and down-arrow keys simultaneously. Pressing the shift and up-arrow keys restores the original window; pressing the enter key returns you to the command mode.

Commanding Presence

ZapZ supports 21 commands (listed in the Table). From the command mode, you can type in TRACK, SECTOR, or DRIVE and the cursor moves to a position beside that word. If you then type in a value and invoke the Read command by typing in READ, the program displays data for that track, sector, or drive.

One of ZapZ's most useful features is its ability to produce screen dumps with the Gemini 10X printer, which accommodates the extended ASCII graphics characters used in ZapZ's display. If you have an LP VII or a DMP-100 printer, use the screen print routine, Printout (see Program Listing 2). Printout sidesteps problems with special characters by putting the printer in graphics mode whenever it encounters a graphics character.

System Requirements

32K RAM
Disk Extended Color Basic
Gemini 10X printer optional

Disk Basics

To successfully alter a disk, you must understand the fundamentals of disk organization. On a standard RSDOS disk for Disk Extended Color Basic, each of the 35 tracks (numbered zero to 34) contains 2 granules comprising 18 sectors (numbered 1–18). The first granule houses sectors 1–9; the second, sectors 10–18. Each sector stores up to 256 bytes.

RSDOS reserves 2 granules for the directory and the file allocation table (FAT). The directory resides on track 17 from sectors 3–11; the FAT lies on track 17, sector 2.

Photo 1 shows a typical ZapZ directory screen containing one killed file (indicated by an inverse @ character) and seven active ones. The program has reserved 256 video screen locations, each representing a byte of the directory sector.

To display a complete sector in the window, ZapZ prints the entries as a mixture of text and graphics characters. Bytes zero to 7 show the file name. If a file contains fewer than eight characters, unused bytes hold inverse @ symbols. Bytes 8–10 are the file extension; byte 11 specifies the file type, according to the key below:

Photographs by Frank Cordelle

Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
- **True lower case characters**
- **User-friendly full-screen editor**
- **Right justification**
- **Easy hyphenation**
- **Drives any printer**
- **Embedded format and control codes**
- **Runs in 16K, 32K, or 64K**
- **Menu-driven disk and cassette I/O**
- **No hardware modifications required**

THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...
— Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.
The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.
Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

...truly a state of the art word processor... outstanding in every respect.
— The RAINBOW, Jan. 1982

PROFESSIONAL WORD PROCESSING

You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.
Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)
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Now available at Radio Shack stores via express order.

Command	Description
Help	Briefly describes all available commands. Scroll by pressing the enter key; at the end, you return to the window screen in the command mode.
Menu	Returns you to the menu to choose another option.
Quit	Ends the program.
Dir	Reads track 17, sector 3 and displays the first eight directory entries.
Track	Changes the track number you want to read.
Sector	Changes the sector number you want to read.
Read	Updates the window after you use the Track, Sector, Drive, or Granule command.
Drive	Changes the drive number you want to read.
Granule	Lets you specify the granule you want to read.
Scan	Lets you scan the disk starting at the current track and sector. The program continually updates the window. Press the clear key to stop at a particular location.
Restore	Restores the head drive to position zero.
Write	Stores information from the window on disk, letting you modify or correct a sector.
Erase	Erases the window with a specified character, usually 255 or FF in hex.
Error	Scans a disk searching for errors and displays the sector of any error encountered. To scan an entire disk, position yourself on track zero, sector 1.
Lock	Locks out a damaged sector, letting you use the remainder of the disk.
Free	Indicates the number of free sectors.
Search	Lets you search for a certain string. If, for example, you wanted to find the string "TIME," you would enter the edit mode, type in TIME at cursor position zero, and return to the command mode.
Print	Performs a screen dump. The routine is for the Gemini 10X printer; all graphics characters are printed by its extended ASCII character set.
CODIR	Copies the directory to the last granule on the disk if that granule is free. Since most errors occur on track 17, this feature lets you recapture most information on a damaged disk.
REDIR	Recovers the directory by copying data from the last granule on track 17—the directory and the FAT table.
Number	Changes the number of tracks to read. It is useful if you use disks formatted for 40 or 80 tracks. Bear in mind that track numbers begin with track zero.

Table 1. Command summary.

Inverse @ = Basic program
Inverse A = Basic data file
Inverse B = Machine-language program
Inverse C = Text file

The ASCII flag in byte 12 displays an inverse @ for a binary file and a full pink graphics character for an ASCII file. Byte 13 locates the beginning granule for a file. If you've killed a file, that byte remains unchanged but the corresponding granule is free. Bytes 14 and 15 indicate the number of bytes used in the last sector of the file. Because a disk doesn't use the final 16 bytes of the directory, they contain inverse @ symbols or full pink graphics characters.

Photo 2 shows the FAT for the directory in Photo 1 (to display this information in ZapZ's window, press the enter key to call up the edit mode and scroll forward to sector 2 by pressing the shift/up-arrow keys). The disk uses only the first 68 bytes; the remaining bytes contain inverse @'s. When the value of a byte is 255, that byte displays a full pink graphics character, indicating that the granule is free or has been freed.

In Photo 1, for example, byte zero of the entry for HiScore (fifth line in the window) shows that you've killed the file. Checking byte 13 of the same entry gives you the starting granule number—20 in this case. If you then check the corresponding granule in Photo 2, you'll find that it's free. Once you locate the initial granule of a file, you can use the Granule command to read that sector and look at the file. It should be intact if you haven't saved anything since killing the file.

Properly used, ZapZ lets you circumvent disk errors.

Opening the Window

ZapZ's editing procedures let you change disk information. When you call up the edit mode, a flashing cursor appears on the first byte of the first line in the window. You move the cursor by pressing the arrow keys; ZapZ updates the cursor position and value of the byte shown at the bottom of the screen.

You can substitute a new character by positioning the cursor and typing in the replacement character. Unfortunately, this doesn't work for all characters because you can't reproduce certain byte values from the keyboard. To modify any byte, press the clear key (from the edit mode); this moves the cursor to the value line. When you type in a decimal or hexadecimal value, ZapZ changes the character at the cursor location accordingly. Be sure to precede hexadecimal values with a dollar sign.

You can also scroll between sectors from the edit mode. Press the shift/up-arrow or shift/down-arrow keys to view the previous or following 256 bytes, respectively. To exit to the command mode, press the enter key again.

Caveat

Properly used, ZapZ can end the input/output-error and lost-file blues. But you must exercise caution, especially with the Write, Erase, and Lock commands: Once you use them, you won't be able to recover the original information. Whenever possible, you should back up any disk you plan to zap, just in case something unexpected goes wrong.■

Write to Alain Dussault and Luc Jacob, 2165 Manon St., Laval, Quebec, Canada H7S 1V5.

Related Article

McLaughlin, Philip, "What's Disk," *HOT CoCo*, March 1984, p. 46. The basics of disk organization.

Program Listing 1. ZapZ.

```
1010 PCLEAR4:DIM COS(20),PA(40),
DS(10),ES(10)
1020 GOSUB1850:CLS0:ME=1024
1030 ME=1024+256
1040 RESTORE:FORXY=1024 TO 1535:
READAS:A=VAL("&H"+AS):POKEXY,A:N
EXT
1050 FORK=1 TO 200:NEXT K
1060 CLEAR3000,29999:DIM COS(20)
,PA(40)
1070 CLS:PRINT@142,"MENU"
1080 PRINT@199,"3...EXPLANATION"
1090 PRINT@233,"2...EXAMINE SECT
OR"
1110 PRINT@263,"3...END PROGRAM"
1120 PRINT@359,"";:PRINT"YOUR CH
OICE..."
1130 AS=INKEYS:IFAS=""THEN1130EL
SEIFAS<"1"ORAS>"3"THEN 1130
1140 IF AS="3" THEN CLS:END
1160 IF AS="1" THEN CH=3:GOTO 47
40
1170 CH=13:GOSUB 2530
1180 GOTO 1180
1190 '
1200 'CURSOR
1210 '
1220 IF CH<>0 THEN 1370
1230 ZZ=PEEK(PO)
1240 PC=255:CN=3
1250 IF ZZ=255 THEN PC=223
1260 AS=INKEYS:IFAS<>"" THEN 131
0
1270 IFPEEK(341)=247 THENAS=CHRS
(94)
1280 IFPEEK(342)=247 THEN AS=CHR
S(10)
1290 IFPEEK(343)=247 THEN AS=CHR
S(8)
1300 IFPEEK(344)=247 THEN AS=CHR
S(9)
1310 IFAS<>"" THEN 1360
1320 CN=CN-1:IFCN<>0THEN1260
1330 IFPEEK(PO)=ZZ THEN 1350
1340 POKEPO,ZZ:GOTO1240
1350 POKEPO,PC:GOTO1240
1360 POKEPO,ZZ:RETURN
1370 AS=CHRS(CH):CH=0:RETURN
1380 '
1390 'LINE INPUT
1400 '
1410 IF LN=0 THEN 1200
1420 IN=PO:BS=STRINGS(LN,32)
1430 PP=PO-1024
1440 CP=1
1450 PRINT@PP,BS;
1460 GOSUB 1200
1470 IF AS=CHRS(12) THEN 1560
1480 IF AS=CHRS(13) THEN 1550
1490 IF AS=CHRS(08) THEN 1530
1500 MIDS(BS,CP,1)=AS
1510 IF CP>=LN THEN 1450
1520 CP=CP+1:PO=PO+1:GOTO 1450
1530 IF CP<2 THEN 1450
1540 CP=CP-1:PO=PO-1:GOTO 1450
1550 PO=IN:RETURN
1560 PO=IN:GOTO 1390
1570 '
1580 ' INPUT DIGIT
1590 '
1600 GOSUB 1380
1610 IF MIDS(BS,1,1)<>"S"THEN16
0
1620 BS=RIGHTS(BS,LEN(BS)-1)
1630 BS="&H"+BS
1640 AN=VAL(BS)
1650 RETURN
1660 '
1670 ' DISK INPUT/OUTPUT
1680 '
1690 '
1700 DEFUSR0=OP*256+DR
1710 DEFUSR1=TR*256+SE
1720 DEFUSR2=ME
1730 EXEC DK
1740 '
1750 ST=PEEK(AD+6)
1760 IF ST=0 THEN RETURN
1770 FOR X=0 TO 7
1780 ST=INT(ST/2)
1790 IF ST<>0 THEN NEXT
1800 ST=X+1
1810 TR=PEEK(AD+2)
1820 SE=PEEK(AD+3)
1830 OP=PEEK(AD)
1840 RETURN
1850 '
1860 ' MAIN INITIALIZATION
1870 '
1880 AS(0)="RESTORE HEAD"
1890 AS(1)="NO OPERATION"
1900 AS(2)=" READ SECTOR"
1910 AS(3)="WRITE SECTOR"
1920 AA=PEEK(&HC006)*256
1930 POKE &HB0,AA
1940 BB=PEEK(&HC007)
1950 POKE &HB1,BB
1960 AD=AA*256+BB
1970 DK=PEEK(&HC004)*256
1980 DK=DK+PEEK(&HC005)
1990 OP=2:TR=17:SE=3:NT=35:LG=NT
*2-2
2000 DR=0:ME=1024+64
2010 ERS(0)="NO ERROR FOUND.."
2020 ERS(1)="DATA LOST......."
2030 ERS(2)="CRC ERROR......."
2040 ERS(3)="RECORD NOT FOUND"
2050 ERS(4)="WRITE FAULT....."
2060 ERS(5)="WRITE PROTECTED."
2070 ERS(6)="DRIVE NOT READY."
2080 COS(0)="SCAN"
2090 COS(1)="WRITE"
2100 COS(2)="RESTORE"
2110 COS(3)="DRIVE"
2120 COS(4)="TRACK"
2130 COS(5)="SECTOR"
2140 COS(6)="GRANULE"
2150 COS(7)="MENU"
2160 COS(8)="HELP"
2170 COS(9)="READ"
2180 COS(10)="DIR"
2190 COS(11)="ERASE"
2200 COS(12)="ERROR"
2210 COS(13)="LOCK"
2220 COS(14)="FREE"
2230 COS(15)="SEARCH"
2240 COS(16)="QUIT"
2250 COS(17)="PRINT"
2260 COS(18)="CODIR"
2270 COS(19)="REDIR"
2280 COS(20)="NUMBER"
2290 CLS
2300 PRINT@7,"DISK MEDICINE"
2310 PRINT@32,"01234567890123456
789012345678901"
2320 RETURN
2330 '
2340 ' REPORT
2350 '
2360 ZZ=PEEK(PO)
2370 PRINT@352,"VALUE :"ZZ,
2380 PRINT"S";HEXS(ZZ)
2390 PRINT@320,"COMMAND..."
2400 IF ST=0 THEN 2420
2410 PRINT@330,ERS(ST)"..."
2420 PRINT@384,"TRACK :"TR,
2430 PRINT"S";HEXS(TR)
2440 PRINT@416,"SECTOR:"SE,
2450 PRINT"S";HEXS(SE)
2460 PRINT@448,"CURSOR:"CS,
2470 PRINT"S";HEXS(CS)
2480 PRINT@480,"MODE  :"AS(OP)"
ON ";
2490 PRINT"DRIVE"DR;
2500 IFST=0THEN 2520
2510 :FORX=1TO1000:NEXTX
2520 RETURN
2530 '
2540 'SECTOR CHANGE
2550 '
2560 GOSUB 1850
2570 GOSUB 2330
2580 GOSUB 1660
2590 PO=ME:ZZ=PEEK(PO)
2600 CS=PO-ME:GOSUB2330:ST=0:GOS
UB 1190
2610 IFAS<>CHRS(12) THEN 2640
2620 Z=PO:PO=1024+360:LN=3:GOSUB
 1570:PO=Z:ZZ=AN
2630 POKE PO,AN:GOTO 2600
2640 IF AS=CHRS(13) THEN 2870
2650 IF AS<>CHRS(9) THEN 2680
2660 IF PO<ME+255 THEN PO=PO+1
2670 GOTO 2600
2680 IF AS<>CHRS(8) THEN 2710
2690 IF PO>ME THEN PO=PO-1
2700 GOTO 2600
2710 IF AS<>CHRS(10) THEN 2730
2720 IF PO<ME+224 THEN PO=PO+32:
GOTO2600
2730 IF AS<>CHRS(94)THEN2760
2740 IF PO>ME+31 THENPO=PO-32
2750 GOTO 2600
2760 IFAS<>CHRS(91)THEN2810
2770 SE=SE+1:IFSE<19THEN2800
2780 SE=1:TR=TR+1:IFTR<NT THEN 2
800
2790 TR=TR-1
2800 GOTO2580
2810 IFAS<>CHRS(95)THEN2850
2820 IF SE>1THEN SE=SE-1:GOTO280
0
2830 SE=18:IFTR>0THENTR=TR-1:GOT
O2800
2840 SE=1:TR=0:GOTO2800
2850 IF AS>=" "ANDAS<="z" THEN P
OKE PO,ASC(AS):GOTO2660
```

Listing continued

Listing continued

```
286Ø GOTO 26ØØ
287Ø '
288Ø ' COMMANDS
289Ø '
29ØØ Z=PO
291Ø PO=1Ø24+33Ø:LN=1Ø:GOSUB 157
Ø:PO=Z
292Ø FOR X=Ø TO 2Ø
293Ø IF INSTR(1,B$,CO$(X))=1 THE
N 295Ø
294Ø NEXT X:GOTO 259Ø
295Ø ON X+1 GOSUB 413Ø,338Ø,297Ø
,343Ø,353Ø,359Ø,366Ø,334Ø,3Ø3Ø,3
76Ø,424Ø,439Ø,428Ø,449Ø,469Ø,481
Ø,514Ø,518Ø,523Ø,528Ø,351Ø
296Ø GOTO 291Ø
297Ø '
298Ø ' RESTORE HEAD
299Ø '
3ØØØ OP=Ø:GOSUB 233Ø:GOSUB166Ø
3Ø1Ø OP=2:GOSUB 233Ø:TR=Ø:SE=1
3Ø2Ø GOSUB 166Ø:RETURN
3Ø3Ø '
3Ø4Ø ' HELP
3Ø5Ø '
3Ø6Ø CLS6
3Ø7Ø PRINT@32,"WRITE     WRITE TH
E BUFFER TO THE          CURRENT
TRACK AND SECT.";
3Ø8Ø PRINT"RESTORE  RESTORE HEAD
 TO TRACK Ø             SECTOR Ø."
3Ø9Ø PRINT"DRIVE    CHANGE OPERA
TIONAL                  DRIVE."
31ØØ PRINT"TRACK    CHANGE CURRE
NT TRACK."
311Ø PRINT"SECTOR   CHANGE CURRE
NT SECTOR."
312Ø PRINT"GRANULE  ADJUST TRACK
 AND SECTOR             ACCORDING TO
 GRANULE 4"
313Ø PRINT"HELP     DISPLAY BRIE
F COMMANDS              SUMMARY."
314Ø PRINT"READ     READ CURRENT
 SECTOR                 TRACK."
315Ø A$=INKEY$:IFA$="" THENJ315Ø
316Ø CLS6:PRINT@32,"SCAN      WIL
L SCAN ALL DISK           SEC
TOR FROM THE CURRENT      LOC
ATION."
317Ø PRINT"DIR      PLACE THE CU
RRENT TRACK             OVER THE DIR
ECTORY."
318Ø PRINT"ERASE    ERASES THE C
URRENT                  BUFFER WITH
THE                     CHARACTER SP
ECIFIED."
319Ø PRINT"ERROR    FINDS THE FI
RST TRACK               WITH AN ERRO
R FROM THE              CURRENT LOCA
TION."
32ØØ PRINT"LOCK     FINDS DEFECT
IVE TRACKS              AND LOCKS TH
EM ON THE               DIRECTORY."
3210 A$=INKEY$:IFA$=""THEN3210
3220 CLS6:PRINT@32,"FREE      PRI
NTS THE CURRENT           AMO
UNT OF FREE SECTORS       ON
THE DEFAULT DRIVE."
3230 PRINT"SEARCH   WILL FIND TE
E SPECIFIED             NUMBER OF CH
ARACTERS                FROM THE STA
RT OF THE               BUFFER THROU
GHOUT THE               DISK."
3240 PRINT"MENU     WILL RETURN
YOU TO                  THE MAIN MEN
U."
3250 PRINT"QUIT     TO END THIS
PROGRAM."
3260 PRINT"PRINT    SCREEN PRINT
ER ROUTINE              EVEN GRAPHIC
 CHARACTER."
3270 A$=INKEY$:IFA$=""THEN 3270
3280 CLS6:PRINT@32,"CODIR     TO
DUPLICATE THE DIREC-          TOR
Y ON GRANULE 68."
3290 PRINT"REDIR    TO RECOVER T
HE DIRECTO-             RY FROM GRAN
ULE 68 TO               COPY IT BACK
 ON TRACK               17."
3300 PRINT"NUMBER   TO CHANGE TH
E NUMBER OF             TRACK TO REA
D OR WRITE              TO."
3310 A$=INKEY$:IFA$=""THEN3310
3320 CLS:PRINT@7,"DISK MEDICINE"
:PRINT@32,"BY LDC JACOB AND ALAI
N DUSSAULT":GOSUB 1660
333Ø OP=2:GOSUB233Ø:RETURN
334Ø '
335Ø ' MENU
336Ø '
337Ø RUN 1Ø6Ø
338Ø '
339Ø ' WRITE SECTOR
34ØØ '
341Ø OP=3:GOSUB166Ø
342Ø OP=2:RETURN
343Ø '
344Ø ' DRIVE
345Ø '
346Ø Z=PO:LN=1
347Ø PO=5Ø9+1Ø24:GOSUB157Ø
348Ø IF AN<Ø OR AN>2 THEN 347Ø
349Ø PO=Z:DR=AN:RETURN
35ØØ '
351Ø ' CHANGE TOTAL NUMBER OF TR
ACKS
352Ø PRINT@33Ø,"";:INPUT"# OF TR
ACKS";NT:LG=NT*2-2:PRINT@33Ø,ST
RING$(2Ø,32):RETURN
353Ø ' TRACK
354Ø '
355Ø Z=PO
356Ø PO=1Ø24+392:LN=3:GOSUB157Ø
357Ø IFAN>NT-1 ORAN<Ø THEN356Ø
358Ø PO=Z:TR=AN:RETURN
359Ø '
36ØØ ' SECTOR
361Ø '
362Ø Z=PO
363Ø PO=1Ø24+424:LN=3:GOSUB157Ø
364Ø IFAN<1ORAN>18THEN363Ø
365Ø SE=AN:PO=Z:RETURN
366Ø '
367Ø ' GRANULE
368Ø '
369Ø Z=PO
37ØØ PRINT@32Ø,"GRANULE NUMBER ?
":PO=1Ø24+336:LN=4:GOSUB157Ø
371Ø IFAN<ØORAN>NT*2-3 THEN 37ØØ

372Ø TR=INT(AN/2)
373Ø SE=(AN-TR*2)*9+1
374Ø IFAN>NT-2 THENTR=TR+1
375Ø PO=2:OP=2:GOSUB233Ø:RETURN
376Ø '
377Ø ' READ SECTOR
378Ø '
379Ø OP=2:GOSUR166Ø:RETURN
38ØØ '
381Ø 'EXPLANATIONS
382Ø '
383Ø CLS6:PRINT@32,"-EXAMINE SEC
TOR IS A UTILITY     DESIGNED TO
 MODIFY DISK SECTORS YOU WILL EN
TER THE PROGRAM IN    THE COMMAND
 MODE. IN THIS MODE   ASK FOR 'HE
LP'. IF YOU PRESS     <ENTER> THE
 SCREEN EDITOR WILL   BE ACTIVATE
D."
384Ø PRINT:PRINT" YOU CAN CHANGE
 THE BUFFER BY     TYPING OVER IT
 OR CHANGE IT      VIA THE <CLEAR
> KEY FOLLOWED     BY A DIGIT REP
RESENTING THE     ASCII VALUE OF
 A CHARACTER       ('$' MEANS HEX
ADECIMAL)"
385Ø A$=INKEY$:IFA$=""THEN385Ø
386Ø RETURN
387Ø '
413Ø '
414Ø ' SCAN DISK
415Ø '
416Ø T1=TR:S1=SE
417Ø OP=2:GOSUB 166Ø:GOSUB233Ø
418Ø A$=INKEY$:IFA$<>""THEN423Ø
419Ø SE=SE+1:IF SE<19 THEN417Ø
42ØØ SE=1:TR=TR+1
421Ø IFTR<NT THEN417Ø
422Ø TR=T1:SE=S1
423Ø OP=2:GOSUB166Ø:GOSUB233Ø:RE
TURN
424Ø '
425Ø ' DIRECTORY
426Ø '
427Ø TR=17:SE=3:GOTO 423Ø
428Ø '
429Ø ' ERROR
43ØØ '
431Ø OP=2:GOSUB233Ø:GOSUB166Ø
432Ø A$=INKEY$:IFA$<>""THEN438Ø
433Ø IFST<>ØTHEN438Ø
434Ø SE=SE+1:IFSE<19THEN431Ø
435Ø SE=1
436Ø TR=TR+1:IFTR<NT THEN431Ø
437Ø TR=Ø
438Ø OP=2:GOSUB233Ø:RETURN
439Ø '
44ØØ ' ERASE BUFFER
441Ø '
442Ø Z=PO
443Ø PRINT@32Ø,"CHARACTER TO USE
 ?":LN=3:PO=1Ø24+338:GOSUB157Ø
444Ø IFAN<ØORAN>255THEN443Ø
445Ø FORX=ØTO255
446Ø POKE X+1Ø24+64,AN
447Ø NEXT
448Ø OP=2:GOSUB233Ø:RETURN
449Ø '
45ØØ ' LOCK TRACK
451Ø '
452Ø T4=TR:S4=SE
453Ø GOSUB 428Ø
454Ø IFST=Ø THEN 468Ø
455Ø IFTR<>17 THEN 458Ø
456Ø IF SE>1ANDSE<12 THEN468Ø
457Ø GOTO 453Ø
458Ø T3=TR:S3=SE:TR=17:SE=2
459Ø OP=2:GOSUB166Ø
46ØØ GR=T3*2+INT((S3-1)/9)
461Ø GR=GR+1Ø24+64
462Ø IF T3>17 THEN GR=GR-2
463Ø POKEGR,&HC9:OP=3:GOSUB166Ø
464Ø TR=T3:SE=S3:SE=SE+1
465Ø IF SE<19 THEN453Ø
466Ø SE=1:TR=TR+1
467Ø IF TR<NT THEN453Ø
468Ø OP=2:TR=T4:SE=S4:GOSUB233Ø:
RETURN
469Ø '
47ØØ ' FREE SPACE
471Ø '
472Ø PRINT@34Ø,FREE(DR)
473Ø RETURN
474Ø '
475Ø ' EXPLANATIONS
476Ø '
477Ø GOSUB 38ØØ
478Ø CLS6:PRINT@32," PRESSING <E
NTER> IN THE EDITOR  MODE RETURN
S TO THE COMMAND     MODE.":PRIN
T:PRINT"-THE EXAMINE GRAPHICS PR
OGRAM    ALLOWS YOU TO LOOK AT A
 GIVEN   SECTOR IN ANY GRAPHIC M
ODE.":PRINT
479Ø A$=INKEY$:IFA$=""THEN479Ø
48ØØ RUN 1Ø6Ø
481Ø '
482Ø ' SEARCH
483Ø '
484Ø Z=PO
485Ø PRINT@32Ø,"HOW MANY CHARACT
ERS?"
486Ø PO=1Ø24+341:LN=3:GOSUB157Ø
487Ø IF AN<1 ORAN>255 THEN485Ø
488Ø FORX=ØTOAN-1
489Ø A=PEEK(1Ø24+64+X)
49ØØ POKE 3ØØØØ+X,A
491Ø NEXT
492Ø A=VARPTR(A$)
493Ø POKE A,AN
494Ø POKE A+2,&H75
495Ø POKE A+3,&H3Ø
496Ø T1=TR:S1=SE:OP=2
497Ø GOSUR233Ø:GOSUB166Ø
498Ø GOSUB5Ø3Ø:IF INSTR(1,B$,A$)
<>Ø THEN T1=TR:S1=SE:GOTO513Ø
499Ø GOSUB5Ø8Ø:IF INSTR(1,B$,A$)
<>Ø THEN T1=TR:S1=SE:GOTO 513Ø
5ØØØ SE=SE+1:IF SE<19 THEN 497Ø
5Ø1Ø SE=1:TR=TR+1:IFTR<NT THEN 4
97Ø
5Ø2Ø GOTO 513Ø
5Ø3Ø A=VARPTR(B$)
5Ø4Ø POKE A,255
5Ø5Ø POKE A+2,&H8Ø4
5Ø6Ø POKE A+3,&N4Ø
5Ø7Ø RETURN
5Ø8Ø A=VARPTR(B$)
5Ø9Ø POKE A,255
51ØØ POKE A+2,&H8Ø4
511Ø POKE A+3,&H41
512Ø RETURN
513Ø TR=T1:SE=S1:OP=2:GOTO379Ø
514Ø '
515Ø ' QUIT
516Ø '
517Ø CLS:END
518Ø ' SCREEN PHINT ROUTINE
519Ø IFPEEK(65314)/2=INT(PEEK(65
314)/2)THEN52ØØELSEPHINT@33Ø,"PR
INTER NOT ON!":FORK=1TO1ØØØ:NEXT
:PRINT@33Ø,STRING$(2Ø,32):GOTO51
9Ø
52ØØ POKE15Ø,1:PRINT@33Ø,"";:LIN
EINPUT"DISK NAME:";N$:PRINT#-2,T
AB(14);"DISK IDENTIFICATION: ";N
$:PRINT#-2:PRINT@33Ø,STRING$(2Ø,
32);:PRINT@33Ø,"PRINTING"
521Ø FORX=ØTO15:FORY=ØTO31:C=PEE
K((X*32)+Y)+1Ø24):IFC>=96 ANDC<
=127 THENC=C-64 ELSEIFC>=Ø ANDC<
=31 THENC=C+96 ELSEIFC=255THENC=
32
522Ø PRINT#-2,CHR$(C);" ";:NEXTY
:PRINT#-2:NEXTX:PRINT#-2:PRINT#-
2:RETURN
523Ø ' SAVING DIRECTORY TO LAST
GRANULE
524Ø PRINT@33Ø,"SAVING DIRECTORY
";:FORS=2TO1Ø:DSKI$ DR,17,S,D$(S
),E$(S):NEXT
525Ø F$=MID$(D$(2),LG,1):IFNOT((
F$=CHR$(255))OR(F$=CHR$(2Ø8)))TH
ENPRINT@33Ø,"LAST GRANULE USED."
:FORK=1TO1ØØØ:NEXT:GOTO532Ø
526Ø FORS=2TO1Ø:IFS=2THENNID$(D$
(S),LG,1)=CHR$(2Ø8):DSKO$ DR,17,
S,D$(S),E$(S)
527Ø DSKO$ DR,NT-1,S+8,D$(S),E$(
S):NEXTS:PRINT@33Ø,"DIRECTORY SA
VED":FORK=1TO1ØØØ:NEXT:GOTO532Ø
528Ø ' RECOVERING DIRECTORY FROM
 LAST GRANULE
529Ø PRINT@33Ø,"RECOVERING DIR":
DSKI$ DR,17,2,D$,E$:IFMID$(D$,LG
,1)<>CHR$(2Ø8)THENPRINT@33Ø,"NO
DIR SAVED!":FORK=1TO1ØØØ:NEXT:GO
TO532Ø
53ØØ FORS=2TO1Ø:DSKI$ DR,NT-1,S+
8,D$(S),E$(S):NEXT
531Ø FORS=2TO1Ø:DSKO$ DR,17,S,D$
(S),E$(S):NEXT:PRINT@33Ø,"DIR RE
COVERED!":FORK=1TO1ØØØ:NEXT
532Ø PRINT@33Ø,STRING$(2Ø,32):RE
TURN
533Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
534Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
535Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
536Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
537Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
538Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
539Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
54ØØ DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
541Ø DATA FF,FF,FF,FF,FF,FF,2Ø,F
F
542Ø DATA FF,2Ø,FF,FF,2Ø,FF,FF,F
F
543Ø DATA FF,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
544Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
545Ø DATA 2Ø,2Ø,FF,FF,2Ø,2Ø,2Ø,F
F
546Ø DATA FF,2Ø,FF,FF,2Ø,FF,FF,2
Ø
547Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
548Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
549Ø DATA 2Ø,2Ø,FF,FF,2Ø,2Ø,2Ø,F
F
55ØØ DATA FF,FF,FF,FF,2Ø,FF,FF,F
F
551Ø DATA FF,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
552Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
553Ø DATA 2Ø,2Ø,FF,FF,2Ø,2Ø,2Ø,F
F
554Ø DATA FF,2Ø,FF,FF,2Ø,FF,FF,2
Ø
555Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
556Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
557Ø DATA 2Ø,2Ø,FF,FF,2Ø,2Ø,2Ø,F
F
558Ø DATA FF,2Ø,FF,FF,2Ø,FF,FF,F
F
559Ø DATA FF,2Ø,2Ø,FF,FF,2Ø,FF,F
F
56ØØ DATA 2Ø,FF,FF,2Ø,2Ø,2Ø,2Ø,2
Ø
561Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,14,Ø
8
562Ø DATA Ø5,2Ø,Ø4,Ø9,13,ØB,2Ø,Ø
D
563Ø DATA Ø5,Ø4,Ø5,Ø3,Ø9,ØE,Ø5,2
Ø
564Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
565Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
566Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,Ø
2
567Ø DATA 19,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
568Ø DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
```

Listing continued

It's not just

CHILD'S PLAY

but a total application software series.

It's a WORD PROCESSOR. It's a DATA BASE. It's a SPREADSHEET. And each program of the CHILD'S PLAY software series is available in three different levels of sophistication so you can custom fit CHILD'S PLAY to your individual needs.

Easy Is Better!

It took us a year and a half to complete the CHILD'S PLAY series. Our goal was to produce software easy enough for a child to use, yet versatile enough for the home or professional user. The end result is software so easy, so much fun for everyone to use, it's like CHILD'S PLAY.

A Mouse and Click-Down Menus

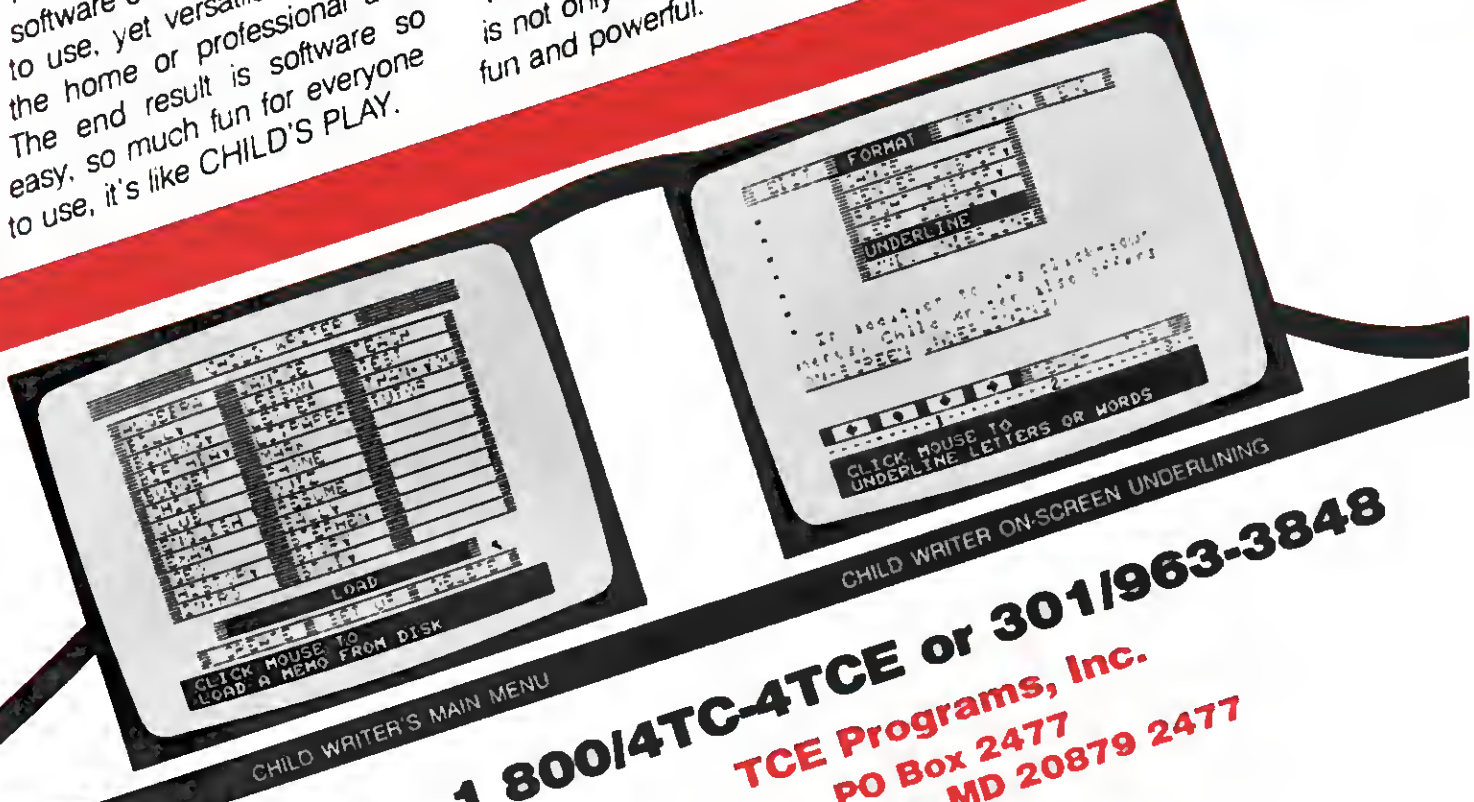
CHILD WRITER, our elementary word processor, is currently being used in schools by second grade children with amazing ease. Teachers tell us that kids are fascinated with the total control they have with a mouse. Just point and click! And we incorporated click-down menus to eliminate having to memorize dozens of commands. Simple instructions are right there on the screen, but only when you want them. Click the menu in when you need help and click it out when you don't. CHILD WRITER is not only easy to use, it's more fun and powerful.

Does your word processor underline text on the screen? All of the CHILD'S PLAY word processor programs do. For the first time you can reproduce on paper exactly what you've created on the screen. It's neat!

More Sophistication

We could have stopped developing when we completed CHILD WRITER, but we knew that someone always wants more. So we developed MEMO WRITER, designed for the home user. And soon, we will have BUSINESS WRITER, the ultimate word processor designed for professional use.

MOUSE



CHILD WRITER ON-SCREEN UNDERLINING

CHILD WRITER'S MAIN MENU

1 800/4TC-4TCE or 301/963-3848

TCE Programs, Inc.
PO Box 2477
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Listing continued

```
Ø
5690 DATA 2Ø,2Ø,ØC,15,Ø3,2Ø,ØA,Ø
1
5700 DATA Ø3,ØF,Ø2,2Ø,Ø1,ØE,Ø4,2
Ø
5710 DATA Ø1,ØC,Ø1,Ø9,ØE,2Ø,Ø4,1
5
5720 DATA 13,13,Ø1,15,ØC,14,2Ø,2
Ø
5730 DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
5740 DATA 2Ø,2Ø,2Ø,2Ø,FF,FF,FF,F
F
5750 DATA FF,F2,2Ø,F1,FF,FF,FF,F
F
5760 DATA F2,2Ø,F1,FF,FF,FF,FF,F
2
5770 DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
5780 DATA 2Ø,2Ø,2Ø,2Ø,FF,FF,F8,F
4
5790 DATA FF,FF,2Ø,FF,FF,F8,F4,F
F
5800 DATA FF,2Ø,FF,FF,F8,F4,FF,F
F
5810 DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
5820 DATA 2Ø,2Ø,2Ø,2Ø,FF,FF,2Ø,2
Ø
5830 DATA FF,FF,2Ø,FF,FF,2Ø,2Ø,F
F
5840 DATA FF,2Ø,FF,FF,2Ø,2Ø,2Ø,2
Ø
5850 DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
5860 DATA 2Ø,2Ø,2Ø,2Ø,FF,FF,F2,F
1
5870 DATA FF,FF,2Ø,FF,FF,F2,F1,F
F
5880 DATA FF,2Ø,FF,FF,F2,F1,FF,F
F
5890 DATA 2Ø,2Ø,FF,FF,2Ø,FF,FF,2
Ø
5900 DATA FF,FF,2Ø,2Ø,FF,FF,FF,F
F
5910 DATA FF,F8,2Ø,F4,FF,FF,FF,F
F
5920 DATA F8,2Ø,F4,FF,FF,FF,FF,F
8
5930 DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
5940 DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
5950 DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
5960 DATA 2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2Ø,2
Ø
```

End

Program Listing 2. Printout.

```
5ØØØ 'SCREEN PRINT FOR LPVII OR
DMP-1ØØ PRINTER
5Ø1Ø POKE 15Ø,87 'PROVISIOH TO C
HANGE BAUD RATE
5Ø2Ø FOR X=Ø TO 15 'EACH ROW
5Ø3Ø FOR Y=Ø TO 31 'EACH COLUMN
5Ø4Ø C=PEEK(((X*32)+Y)+1Ø24) 'GE
T CHARACTER
5Ø5Ø IF C>=96 AHD C<=127 THEN C=
C-64 'UPPERCASE
5Ø6Ø IF C>=Ø AND C<=31 THEN C=C+
96 'LOWERCASE
5Ø7Ø IF C>127 THEN 5Ø9Ø 'GRAPHIC
 CHARACTER
5Ø8Ø PRINT #-2,CHR$(C);" "; 'PRI
NT TEXT CHARACTER
5Ø9Ø PRINT #-2,CHR$(18)CHR$(128)
CHR$(C)CHR$(C)CHR$(C)CHR$(C)CHR$
(C)CHR$(3Ø);" "; 'PRINT GRAPHIC
CHARACTER
51ØØ NEXT X 'NEXT CHARACTER IN R
OW
511Ø PRINT #-2 'LINE FEED
512Ø NEXT Y 'NEXT ROW
```

End

Point Fixing

by Edward A. Kimble

High school students have been known to refer to graphing equations as "plodding" points. It's no wonder—figuring enough plotting points to draw a solid graph can require hundreds of time-consuming calculations, and simple jobs like drawing a line between data points can bog you down. Plotter does all this busywork for you. You type in an equation, Plotter does the calculations and then plots the results on a graph (see the Program Listing). Plotter also gives you a variety of options for formatting and printing out your graphs—you can specify color, resolution, size, and position; add grid and tick marks; plot discrete data points; and enter equations as the program runs.

Menu at Work

Carefully type in the program as it appears in the Listing, save it to disk, and type in RUN. An asterisk should appear on-screen as Plotter erases lines 70 and 90 and rewrites the letter "T" on each of these lines. This initializes the system and clears out any equation already stored there.

After a few seconds, Plotter's main menu appears (see the Table). At this point, you can type in an equation and have Plotter calculate and graph data points.

For example, plotting Y = X is literally as easy as ABC—you type in ABC and

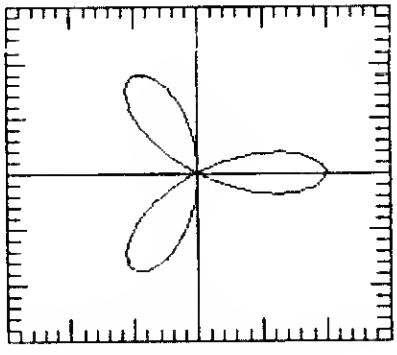

Figure. Sample plot of a polar equation.

press the enter key. Plotter clears the screen (function A); plots a grid, a crosshair, and tick marks (B); and plots the equation (C). A dash in the screen's lower left-hand corner tells you plotting is in progress. Press any key to return to the main menu.

To plot a function in the form Y = f(X), type in EABC and press the enter key. When prompted for your equation, type it in, substituting the variable T wherever you would normally use X. For example, you'd enter the equation Y = 3*X + SIN(X) as Y = 3*T + SIN(T). Using T as the equation variable throughout the program simplifies tokenization and lets you enter parametric equations if you choose. Asterisks should appear on-screen as Plotter tokenizes the equation and stores it in line 90.

System Requirements

32K RAM
Extended Color Basic
Printer optional

Connecting the Dots

To plot data points, type in N from the main menu. You choose from three plot symbols: a point, an "X," or an "O." Next, a prompt asks whether you want the points connected by a line. If you do, press the 1 key; Plotter asks for the points' X and Y coordinates and plots them on the screen, connecting each point with a straight line. Typing in the coordinate pair 99,99 returns you to the main menu.

If you make a fatal mistake when entering data, you can usually recover by typing in GOTO 600. This preserves your equations and most of your option choices, and returns you to the main menu after a Break or FC error.

To change the size of the plot, press J from the main menu. The coordinates for this option are the same as those for the Line or PSET commands: zero to 255 on the X axis and zero to 191 on the Y axis.

If you have the Radio Shack screen dump program as modified for 32K ma-

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chines, option K will print your graph on a dot-matrix printer. You can use any other screen dump routine as long as you modify lines 130 and 910 in the Listing. However, your routine must reside in the upper 16K of memory and can't conflict with array variable storage. Install a screen print program compatible with line 130, then remove the REM statement from line 910 to activate this option.

The L option provides a printout of your data. To display your data on-screen, press the M and enter keys. In addition to the equations, Plotter displays the limits of the graph for the X and Y axes. It also shows the range of values that the variable T will have during plotting. Since X = T and Y = T, it follows that Y must equal X.

Axis Powers

Pressing the enter key alone or choosing option F on the main menu brings up the axis menu. The A option in the axis menu lets you change the distance between grid or tick marks; when you do so, you must specify an origin within the range of plotted X and Y values. This origin specifies the default position of a plotted axis or crosshair and also represents the starting point for the grid and tick marks, with ticks at even intervals on either side of this position.

If you choose the axis (G) or crosshair (I) option from the axis menu, Plotter prompts you for offsets from this origin. You can use these options to place the axis or crosshair over a particular feature of the plot. Pressing the enter key twice resets the offset to the original default value of zero.

A	Erase.
B	Plot axis and tick marks.
C	Plot graph from equation.
D	Change equation options.
E	Enter new equation.
F	Enter axis data.
G	Change scale.
H	Change T limits.
I	Change number of iterations.
J	Change screen window.
K	Send plot to printer.
L	List data to printer.
M	List data to screen.
N	Plot data on graph.

Table. Main menu.

The axis menu's M option lets you accent tick marks. Specifying a value of 5 for the X and Y axes accents every fifth tick mark.

You can change the plot's color and resolution using the Z option. Pressing only the enter key leaves the present values unchanged.

Vector and Polar Equations

Since you can specify equations for X and Y independently, you can plot vector or parametric equations such as SIN(T)*I + COS(T)*J or X = SIN(T), Y = COS(T). For example, type in GDE from the main menu. Set the point range from −1.5 to 1.5 for both the X and Y axes, leave the origin at 0,0, and change T's range from zero to 6.29.

Next, choose the parametric equation option (option 3) and enter the equations X = SIN(T), Y = COS(T). If you type in ABC to initiate the plot, the computer should plot a circle on the screen. The variable T now becomes the angle of the sweep. If you set T's range from zero to 3.1415, the computer describes only half a circle. Remember that the computer interprets angles in radians, not in degrees.

You can also enter polar equations. If you type in DE from the main menu and then choose equation option 4, the computer prompts you for an equation for radius in terms of angle. Wherever you'd use an A in this equation, type in T, as before. Plotting the equation R = COS(3*A) produces the cloverleaf graph shown in the Figure. If you want to adjust the axis and grid at this point, press the enter key and adjust the tick spacing. Now press the enter key again and you're ready to replot your equation. ■

You can write to Edward A. Kimble at Box 10179, Fort Wayne, IN 46850.

Program Listing. Plotter.

```
10 CLS(0)
20 PRINT"************************
********"
30 PRINT"***EQUATION PLOTTING PR
OGRAM***"
40 PRINT"************************
********";
50 GOTO110
60 V=PEEK(47)*256+PEEK(48)+37:RE
TURN
70 X=++T+++++++++++++++++++++++++
++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++1-1
:RETURN
80 V=PEEK(47)*256+PEEK(48)+37:RE
TURN
90 Y=++T+++++++++++++++++++++++++
++++++++++++++++++++++++++++++++
++++++++++++++++++++++++++++1-1
:RETURN
100 REM*************************
*SET UP INFORMATION**************
**************
110 SL=5:SR=245:ST=5:SB=180:RR=1
:M=1:DIM R$(32),Q(32):XS="T":YS=
"T":X2=10:X1=-10:Y2=10:Y1=-10:B=
150:T1=-10:T2=10:E=151:NT$="ABCD
EFGHIJKLMNRSZ":BA=1:GD=1:XI=1:YI
=1:CH=1:BT=1
120 XM=5:X3=1:Y3=1:YM=5:V6=1:BV=
1:DD=1:V7=1:V8=0:V9=1:V10=4:PMOD
E,1:W8=1
130 DEFUSR0=31913
140 FORA=1 TO 32:READ R$(A):NEXT
:FORA=1 TO32:READQ(A):NEXT
150 DATA " ",0,1,2,3,4,5,6,7,8,9
,:,-,*,/,↑,(,),",",T,SQR,EXP,ATN,L
OG,TAN,SIN,COS,ABS,INT,SGN,RND,F
IX
160 DATA 32,48,49,50,51,52,53,54
,55,56,57,171,172,173,174,40,41,
175,46,84,155,151,148,153,150,13
3,149,130,129,126,132,152
170 REM*************************
*EQUATION ENTRY**************
**************
180 XS="":GOSUB200:YS="":GOSUB23
0:GOTO600
190 LINE INPUT"ENTER EQUATION FO
R X AS X=F(T)   (DEFAULT: X=T)
X=";XS
200 GOSUB600:GOSUB260:AS=XS:IF AS
="" THENAS="T":XS="T"
210 GOSUB270:RETURN
220 LINEINPUT"ENTER EQUATION FOR
 Y AS Y=F(T)  (DEFAULT: Y=T)   Y
=";YS
230 GOSUB800:GOSUB260:AS=YS:IF AS
="" THENAS="T":YS="T"
240 GOSUB270:RETURN
250 REM*************************
TOKENIZING ROUTINE**************
**************
260 FOR R=V TO V+30:POKE R,171:N
EXT:POKEV,84:RETURN
270 RR=1:M=1:Q=1:POKEV,171
280 T=0:FORA=1TO32:IF R$(A)=MIDS
(A$,M,RR) THEN T=A
290 NEXT:IFT=0 AND RR=3 THEN PLA
Y"D;G;B;G":RETURN
300 IF T=0 AND RR=1 THEN RR=3:GO
TO280
310 IF T=20 AND MIDS(A$,M,3)="TA
N" THEN T=25:RR=3
320 IFRR=1 THEN M=M+1
330 PRINT"";
340 IFRR=3 THEN M=M+3:RR=1
350 IF T<21 THEN POKEV+Q,Q(T) EL
SE POKEV+Q,255:Q=Q+1:POKEV+Q,Q(T
)
360 Q=Q+1
370 IF M>LEN(A$) THEN PRINT:RETU
RN ELSE 280
380 REM*************************
EQUATION PLOT ROUTINE***********
**************
390 SCREEN1,V11
400 COLOR V7,V8
410 LINE(5,190)-(10,190),PSET
420 FOR U=T1 TO T2 STEP (T2-T1)/
E
430 T=U:GOSUB 900:GOSUB720
440 IF W8>3 THEN W3=Y*COS(X):W4=
Y*SIN(X):X=W3:Y=W4
450 X=(X-X1)/(X2-X1)*(SR-SL)+SL
460 IFX>SR THEN X=SR:DA=1
470 IFX<SL THEN X=SL:DA=1
480 Y=(Y-Y1)/(Y2-Y1)*(ST-SB)+SB
490 IF Y>SB THEN Y=SB:DA=1
500 IF Y<ST THEN Y=ST:DA=1
510 IF DA=1 THEN 540
520 IF U=T1 OR DB>.5 THEN LINE(X
,Y)-(X,Y+.001),PSET
530 IF JE=1 THENPSET(X,Y,1) ELSE
LINE-(X,Y),PSET
540 DB=DA:DA=0
550 NEXT
560 LINE(5,190)-(10,190),PRESET
570 IF INKEY$="" THEN 570
580 RETURN
590 REM*************************
MAIN MENU***********************
**************
600 CLS(0):PRINT"MAIN MENU"
610 PRINT"A-ERASE"
620 PRINT"B-PLOT AXIS AND TIC MA
RKS
630 PRINT"C-PLOT GRAPH FROM EQUA
TION
640 PRINT"D-CHANGE EQUATION OPTI
ONS"
650 PRINT"E-ENTER NEW EQUATION(S
)"
660 PRINT"F-ENTER AXIS DATA"
670 PRINT"G-CHANGE SCALE"
680 PRINT"H-CHANGE T LIMITS"
690 PRINT"I-CHANGE NUMBER OF ITE
RATIONS"
700 PRINT"J-CHANGE SCREEN WINDOW
"
710 PRINT"K-SEND PLOT TO PRINTER
"
720 PRINT"L-LIST DATA TO PRINTER
"
730 PRINT"M-LIST DATA TO SCREEN"
:PRINT"N-PLOT DATA ON GRAPH"
740 INPUT2$:IF2$=""THEN Z$="F"
750 FOR O=1 TO LEN(2$)
760 M$=MID$(Z$,O,1):KB=INSTR(1,N
T$,M$)
770 ON KB GOSUB 790,1360,390,174
0,1750,980,860,900,800,810,910,9
20,820,1610
780 NEXT:GOTO600
790 PCLS(8):RETURN
800 INPUT"$=";E:RETURN
810 INPUT"LEFT,RIGHT,TOP,BOTTOM"
;SL,SR,ST,SB:RETURN
820 CLS:IFW8>3 THENPRINT"A=";X$;
PRINT"R=";YS ELSEPRINT"X=";X$:PR
INT"Y=";YS
830 PRINT"T-INC.";(T2-T1)/E:PRIN
T"XMIN";X1,"XMAX";X2:PRINT"YMIN"
;Y1,"YMAX";Y2:PRINT"TMIN";T1,"TM
AX";T2:PRINT"WINDOW-X FROM";SL;"
TO";SR:PRINT"       Y FROM";ST;"
TO";SB
840 PRINT"X-TIC=";X3;"Y-TIC=";Y
3:PRINT"# ITERATIONS=";E:PRINT"O
RIGIN-X=";IX;" Y=";IY
850 IF INKEY$=""THEN850ELSE RETU
```

Listing continued

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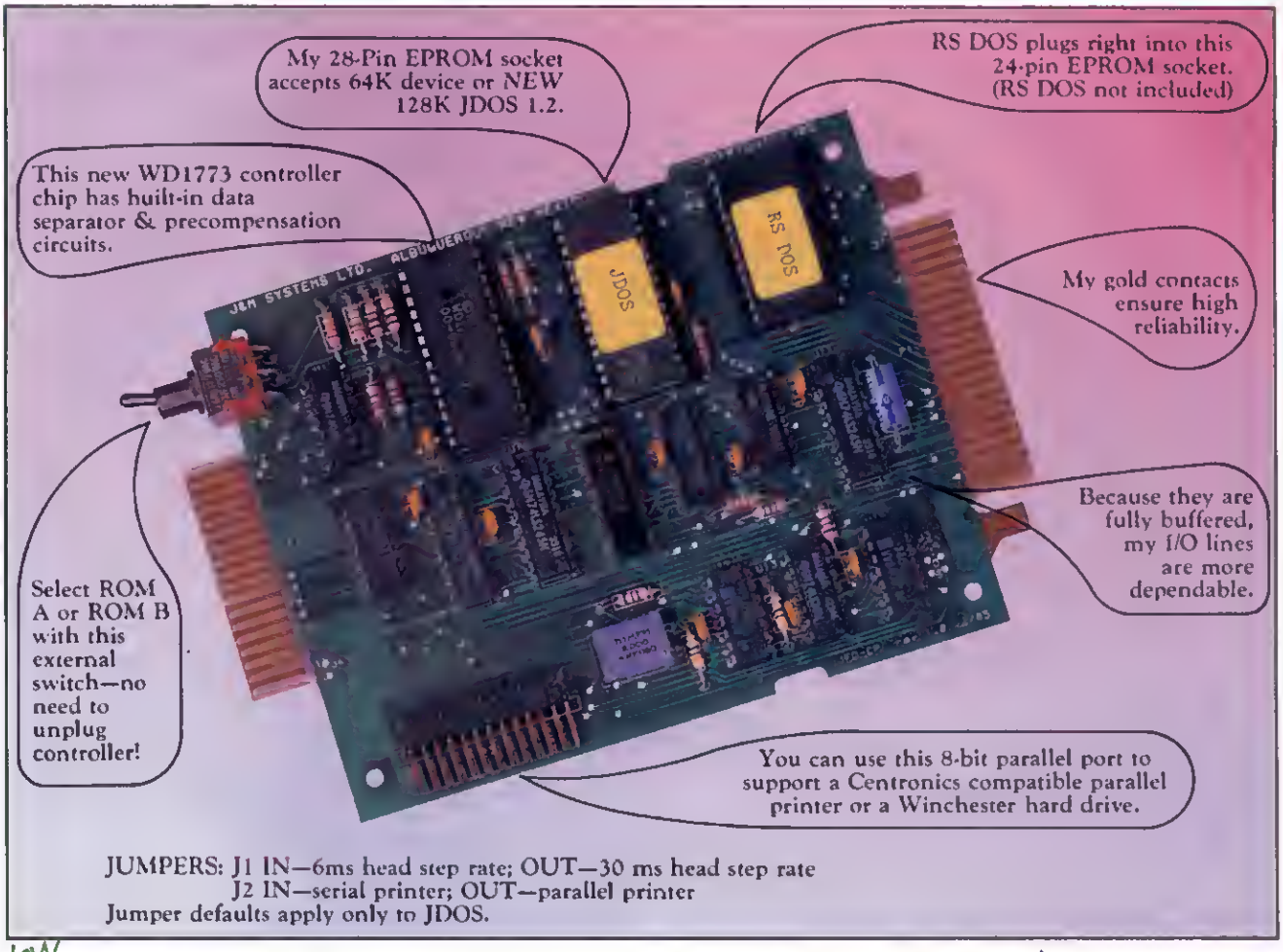

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Listing continued

```
RN
86Ø INPUT"X-MIN AND X-MAX";X1,X2

87Ø INPUT"Y-MIN AND Y-MAX";Y1,Y2
:GOSUB135Ø:PRINT"NEW LIMITS FOR
T (Y/N)?"
88Ø SE$=INKEY$:IF SE$="Y" THEN G
OSUB 9ØØELSE IF SE$="" THEN 88Ø

89Ø RETURN
9ØØ INPUT"T-MIN AND T-MAX";T1,T2
:RETURN
91Ø REM NY=USR(Ø):RETURN
915 RETURN
92Ø PRINT#-2," ";IF W8>3 THEN PR
INT#-2,"R=";YS,"A=";X$ ELSEPRINT
#-2,"X=";XS,"Y=";YS
93Ø PRINT#-2,"T-INCREMENT ";(T2-
T1)/E,"NUMBER OF ITERATIONS=";E:
PRINT#-2,"X-MINIMUM=";X1,"X-MAXI
MUM=";X2;
94Ø PRINT#-2,""(ORIGIN-";IX;",";
IY;")"(X-TIC";X3;";Y-TIC";Y3;")
95Ø PRINT#-2,"Y-MINIMUM=";Y1,"Y-
MAXIMUM=";Y2:PRINT#-2,"T-MINIMUM
=";T1,"T-MAXIMUM=";T2:PRINT#-2,"
WINDOW EXTENDS FROM ";SL;" TO ";
SR;" ON X AXIS. EACH UNIT EQUIVA
LENT TO ONE DOT.
96Ø PRINT#-2,"WINDOW EXTENDS FRO
M ";ST;" TO ";SB;" ON Y AXIS.":R
ETURN
97Ø REM**********************
GRID MENU**********************
**********
98Ø CLS:PRINT"AXIS MENU":PRINT"A
-TICS/ORIGIN   B-NO TICS
99Ø PRINT"C-GRID          D-NO G
RID
1ØØØ PRINT"E-COMPLETE       F-NO
BOTTOM
1Ø1Ø PRINT"      GRAPH      S-NO
SIDES
1Ø2Ø PRINT"G-AXIS           H-NO
AXIS
1Ø3Ø PRINT"I-CROSS HAIR     J-NO
X'HAIR
1Ø4Ø PRINT"K-POINTS         L-LIN
ES
1Ø5Ø PRINT"M-TIC ACCENT     N-NO
TIC ACCENT
1Ø6Ø PRINT"Z-CHANGE COLOR
1Ø7Ø PRINT"R-RETURN TO MAIN MENU
"
1ØØØ INPUT CS:IFCS=""THENCS="R"
1Ø9Ø FOR O1=1 TO LEN(CS):MS=MID$
(CS,O1,1):XB=INSTR(1,NT$,M$)
11ØØ ONKB GOSUB 113Ø,114Ø,115Ø,1
16Ø,117Ø,118Ø,119Ø,12ØØ,121Ø,122Ø,123
Ø,124Ø,125Ø,126Ø,127Ø,112Ø,118Ø,
128Ø
111Ø NEXT:IFTQ=1THENTQ=Ø:RETURNE
LSE98Ø
112Ø TQ=1:RETURN
113Ø BA=1:GOSUB 134Ø:RETURN
114Ø BA=Ø:RETURN
115Ø GD=1:RETURN
116Ø GD=Ø:RETURN
117Ø BT=1:DD=1:RETURN
118Ø DD=Ø:RETURN
119Ø BT=Ø:RETURN
12ØØ GOSUB136Ø:AX=1:RETURN
121Ø AX=Ø:RETURN
122Ø CH=1:INPUT"X & Y OFFSET FRO
M ORIGIN";XV,YV:RETURN
123Ø CH=Ø:RETURN
124Ø JE=1:RETURN
125Ø JE=Ø:RETURN
126Ø INPUT"ACCENT EVERY X-TH TIC
 MARK,X?,Y";XM,YM:BV=1:RETURN
127Ø BV=Ø:RETURN
128Ø CLS:PRINT"TYPE RETURN FOR N
O CHANGE":INPUT"PMODE?,1 (ENTER
# FROM1 TO 4)";ES:IFES=""THEN13Ø
ØELSEV1Ø=VAL(ES):IFV1Ø<Ø OR V1Ø>
4 THEN128Ø ELSEPMODEV1Ø,1
129Ø IF V1Ø=1 OR V1Ø=3 THENPRINT
"ENTER NUMBERS BETWEEN 1 AND 4"
ELSEPRINT"ENTER 1 OR Ø,EQN. MUST
 BE SAME  COLOR AS GRID"
13ØØ INPUT"GRID COLOR";ES:IFES="
" THEN 131Ø ELSEV9=VAL(ES):IFV9<
Ø OR V9>8 THEN13ØØ
131Ø INPUT"GRAPH COLOR";ES:IFES=
""THEN132ØELSEV7=VAL(ES):IFV7>8
OR V7<Ø THEN 131Ø
132Ø INPUT"BACKGROUND COLOR";ES:
IFES="" THEN 133ØELSEV8=VAL(ES):
IFV8>8 OR V8<Ø THEN 132Ø
133Ø INPUT"SCREEN 1,?   (ENTER Ø
 OR 1)";ES:IFES="" THEN RETURNEL
SEV11=VAL(ES):IF V11>1ORV11<Ø TH
EN 133ØELSERETURN:RETURN
134Ø GOSUB135Ø:INPUT "X TIC INCR
EMENT,Y INCREMENT";X3,Y3:RETURN
135Ø INPUT"ORIGIN-X,ORIGIN-Y";IX
,IY:RETURN
136Ø INPUT"X & Y OFFSET FROM ORI
GIN";CX,CY:RETURN
137Ø REM**********************
AXIS PLOT ROUTINE**************
************
138Ø XI=X3/(X2-X1)*(SL-SR):YI=Y3
/(Y2-Y1)*(ST-SB):XT=(IX-X1)/(X2-
X1)*(SR-SL)+SL:YT=(IY-Y1)/(Y2-Y1
)*(ST-SB)+SB:SCREEN1,V11:COLORV9
,V8
139Ø IF XT>SR OR YT>SB OR YT<(ST
) ORXT<(SL) THEN PLAY"G;B;G;B":R
ETURN
14ØØ IF AX=1 THEN LINE(XT+(CX)/(
X2-X1)*(SR-SL),ST)-(XT+CX/(X2-X1
)*(SR-SL),SB),PSET:LINE(SL,YT+CY
/(Y2-Y1)*(ST-SB))-(SR,YT+CY/(Y2-
Y1)*(ST-SB)),PSET
141Ø XQ=XV/(X2-X1)*(SL-SR):YQ=YV
/(Y2-Y1)*(ST-SB):IFCH=1 AND  (XT
-XQ+(SL-SR)/2Ø)>SL AND (YT+YQ-(S
B-ST)/2Ø)>ST THENLINE(XT-XQ-(SL-
SR)/2Ø,YT+YQ)-(XT-XQ+(SL-SR)/2Ø,
YT+YQ),PSET:LINE(XT-XQ,YT+YQ-(SB
-ST)/2Ø)-(XT-XQ,YT+YQ+(SB-ST)/2Ø
),PSET
142Ø IF BT=Ø THEN 151Ø
143Ø LINE(SL,SB)-(SR,SB),PSET:LI
NE(SL,ST)-(SR,ST),PSET
144Ø IFBA=ØTHEN155Ø
145Ø FE=1:FD=3Ø
146Ø FOR A=XT TO SR STEP-XI*FE
147Ø LINE(A,SB)-(A,SB+(ST-SB)/FD
),PSET:LINE(A,ST)-(A,ST+(SB-ST)/
FD),PSET:NEXT
148Ø FORA=XT TOSL STEPXI*FE
149Ø LINE(A,SB)-(A,SB+(ST-SB)/FD
),PSET:LINE(A,ST)-(A,ST+(SB-ST)/
FD),PSET:NEXT
15ØØ IF FD=15 OR BV=Ø THEN 151Ø
ELSE FD=15:FE=XM:GOTO146Ø
151Ø FE=1:FD=3Ø:IFDD=ØTHEN156Ø
152Ø FORA=YT TOSB STEP-YI*FE:LIN
E(SL,A)-(SL+(SR-SL)/FD,A),PSET:L
INE(SR,A)-(SR-(SR-SL)/FD,A),PSET
:NEXT
153Ø FORA=YT TOST STEP+YI*FE:LIN
E(SL,A)-(SL+(SR-SL)/FD,A),PSET:L
INE(SR,A)-(SR-(SR-SL)/FD,A),PSET
:NEXT
154Ø IF FD=2ØTHEN155ØELSEIF BV=Ø
THEN 155ØELSE FD=2Ø:FE=YM:GOTO15
2Ø
155Ø LINE(SL,ST)-(SL,SB),PSET:LI
NE(SR,ST)-(SR,SB),PSET
156Ø IF GD=Ø THEN159Ø
157Ø FORA=XT TO SR STEP-XI:FORBU
-YT TOSB STEP-YI:PSET(A,BU):NEXT
:FORBU=YT TOST STEP+YI:PSET(A,BU
):NEXT:NEXT
158Ø FORA=XT TO SL STEP+XI:FORBU
=YT TOSB STEP-YI:PSET(A,BU):NEXT
:FORBU=YT TOST STEPYI:PSET(A,BU)
:NEXT:NEXT:RETURN
159Ø RETURN
16ØØ REM**********************
DATA PLOT ROUTINE**************
**********
161Ø INPUT"POINT=1,X=2,O=3";FG:Y
R=Ø
162Ø INPUT"LINE=1,NONE=Ø";JS
163Ø INPUT"ENTER X&Y(RETURN=99,9
9)";AQ,AW
164Ø IF AQ=99 AND AW=99 THEN RET
URN
165Ø IF AQ>=X1 AND AQ<=X2 AND AW
>=Y1 AND AW<=Y2 THEN 166Ø ELSE16
3Ø
166Ø L1=(AQ-X1)/(X2-X1)*(SR-SL)+
SL:L2=(AW-Y1)/(Y2-Y1)*(ST-SB)+SB

167Ø SCREEN1,1
168Ø IF FG=3 THEN LINE(L1-2,L2-2
)-(L1+2,L2+2),PSET,B
169Ø IFFG=2 THEN LINE(L1-2,L2-2)
-(L1+2,L2+2),PSET:LINE(L1-2,L2+2
```

Listing continued

Listing continued

```
)-(L1+2,L2-2),PSET
170# IF FG=1THENPSET(L1,L2)
171# IF YR=1 AND JS=1 THEN LINE(
L3,L4)-(L1,L2),PSET
172# L3=L1:L4=L2:YR=1
173# IF INKEY$="" THEN 173#ELSE1
63#
```

```
1735 REM**********************
EQUATION OPTIONS***************
**************
174# CLS:PRINT"1=CARTESIAN, Y=F(
X)":PRINT"2=CARTESIAN, X=F(Y)":P
RINT"3=CARTESIAN,PARAMETRIC":PRI
NT"4=POLAR, R=F(A)":PRINT"5=POLA
R, A=F(R)":PRINT"6=POLAR,PARAMET
RIC":INPUTW8:IF W8>6 OR W8<1 THE
N 174# ELSE RETURN
```

```
175# ON W8 GOSUB 176#,177#,178#,
179#,18##,181#:RETURN
176# XS="":GOSUB2##:GOSUB22#:RET
URN
177# YS="":GOSUB23#:GOSUB19#:RET
URN
178# GOSUB19#:GOSUB22#:RETURN
179# XS="":GOSUB2##:GOSUB182#:GO
SUB23#:RETURN
18## YS="":GOSUB23#:GOSUB183#:GO
SUB2##:RETURN
181# GOSUB182#:GOSUB23#:GOSUB183
#:GOSUB2##:RETURN
182# LINE INPUT"POLAR EQN. FOR R
 AS R=F(T) R=";YS:RETURN
183# LINE INPUT"POLAR EQN. FOR A
NGLE A=F(T) A=";XS:RETURN
```

End

Ample Justification

by Milton T. Simpson

When it comes to making sense of pages of numbers, neatness counts. Computers and printers should be ideal for making columns of numerical data more intelligible. But, if you've ever tried to print more than one or two columns on Tandy's CoCo-compatible printers, you know that getting figures to line up isn't always a simple matter.

Getting Started with Extended Color Basic suggests converting data to strings, calculating each string's length, and adding spaces at the beginning or end of each string to produce neat columns. This approach has several drawbacks. First of all, the strings and computations use memory and slow down program execution. What's more, you must insert decimal points if you want to display data in decimal format. If you're dealing with money—dollars and cents—you must also add trailing zeros.

Getting an Alignment

Through experimentation, I've discovered a few techniques that make it easier to print columnar data. Both Color Basic and Extended Color Basic accept statements in the form:

PRINT# -2,TAB(tab number)data

Extended Color Basic also lets you use the following format:

PRINT# -2,USING,documented format;data

Columns1 (Program Listing 1) and the corresponding printout (Fig. 1) show that you can insert a Tab statement anywhere

System Requirements

16K RAM
Extended Color Basic

```
 1      $ 10     $ .1     $ 1.01
 4      $ 40     $ .4     $ 4.04
 7      $ 70     $ .7     $ 7.07
10      $ 100    $ 1      $ 10.1
13      $ 130    $ 1.3    $ 13.13
16      $ 160    $ 1.6    $ 16.16
19      $ 190    $ 1.9    $ 19.19
22      $ 220    $ 2.2    $ 22.22
25      $ 250    $ 2.5    $ 25.25
```

Figure 1. Example of printout of left-justified data produced by Columns1.

```
$  1.00    $ 10.00    $  0.10    $  1.01
$  4.00    $ 40.00    $  0.40    $  4.04
$  7.00    $ 70.00    $  0.70    $  7.07
$ 10.00    $100.00    $  1.00    $ 10.10
$ 13.00    $130.00    $  1.30    $ 13.13
$ 16.00    $160.00    $  1.60    $ 16.16
$ 19.00    $190.00    $  1.90    $ 19.19
$ 22.00    $220.00    $  2.20    $ 22.22
$ 25.00    $250.00    $  2.50    $ 25.25
```

Figure 2. Example of printout for Columns2. Note the addition of decimal points and leading and trailing zeros.

```
LINE # =  1    1     $ 10.00   $  0.10   AAAAAAAAAA   $  1.01
LINE # =  4    4     $ 40.00   $  0.40   AAAAAAAAAA   $  4.04
LINE # =  7    7     $ 70.00   $  0.70   BBBBBBBB     $  7.07
LINE # =  10   10    $100.00   $  1.00   BBBBBBBB     $ 10.10
LINE # =  13   13    $130.00   $  1.30   CCCCCC       $ 13.13
LINE # =  16   16    $160.00   $  1.60   DDDD         $ 16.16
LINE # =  19   19    $190.00   $  1.90   DDDD         $ 19.19
LINE # =  22   22    $220.00   $  2.20   EE           $ 22.22
LINE # =  25   25    $250.00   $  2.50   EE           $ 25.25
```

Figure 3. Example of printout for Columns3. TAB(nn)" " lets you vary column widths.

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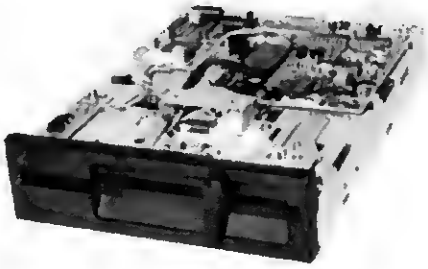

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Program Listing 1. Columns1. Figures are left-justified; decimal points aren't aligned.

```
10 FORN=1TO25STEP3
20 O=N*1B:P=N/10:Q=N+N/100
30 PRINT#-2,TAB(10)N;TAB(20)"$";
O;TAB(30)"$";P;TAB(40)"$";Q
40 NEXT
```

End

Program Listing 2. Columns2. Figures are properly aligned, but column widths are the same.

```
10 FORN=1TO25STEP3
20 O=N*10:P=N/10:Q=N+N/100
3B A$="      $###.##"
4B PRINT#-2,USINGA$;N;O;P;Q
5B NEXT
```

End

Program Listing 3. Columns3.

```
10 DIMN$(5)
20 N$(1)="AAAAAAAAAA"
30 N$(2)="BBBBBBBB"
40 N$(3)="CCCCCC"
50 N$(4)="DDDD"
60 N$(5)="EE"
70 FORN=1TO25STEP3
80 X=INT((N-1)/5)+1
90 O=N*10:P=N/10:Q=N+N/1B0
100 A$="$###.##"
110 PRINT#-2,"LINE # = ";N;TAB(1
5)N;TAB(25)"";
120 PRINT#-2,USINGA$;O;
130 PRINT#-2,TAB(35)"";:PRINT#-2
,USINGA$;P;
140 PRINT #-2,"    ";N$(X);TAB(60
)"";:PRINT#-2,USINGA$;Q
150 NEXT
```

End

in a Print# – 2 statement. This left-justifies the data immediately following the Tab, placing it at the location you specify.

While this provides an easy way to create columns, left-justifying numbers misaligns their decimal points. Also, this approach doesn't provide decimal points for integers, and numbers like 10.1 in Fig. 1's third column don't line up because they lack trailing zeros.

Columns2 (Program Listing 2) and its sample output (Fig. 2) show the result of combining Print# – 2 and UsingA$ commands. These statements let you align the columns' decimal points, add leading and trailing zeros, and accommodate numerical and string data in any of Extended Color Basic's documented formats—for example, #, $$, and ^^^^. Unfortunately, you must set all columns to equal widths.

One further refinement provides maximum flexibility for printing columnar data (see Program Listing 3 and Fig. 3). If you combine the Tab and Using commands with PRINT# – 2, you can create aligned columns of varying widths. The key lies in using TAB(nn)" "to index the location for PRINT# – 2,USING. However, you must insert semicolons to print data on the same line. Use colons or add a program line for the Using statement after inserting a Tab command. Lines 110–140 of Listing 3 illustrate the proper format.

Once you master the technique you'll be able to line up your numbers perfectly. Of course, you can use the same commands to create tables of alphabetic data.■

Milton T. Simpson welcomes your comments or questions. Write to him at 831 Hillcrest Drive, Martinsburg, WV 25401. Enclose a self-addressed, stamped envelope for a reply.

Animal House

by Chris Cantrell

Guessing games are as old as the hills. They've been played around camp fires, in drawing rooms, and on jet rides. While the name of the game varies, the pattern is the same. Someone thinks of an animal (or object) and the other players ask a series of yes/no questions to try to determine its identity.

On the computer, this game lends itself to the use of a data structure, called a binary tree, to sort questions and answers and reach a conclusion. Zoo (see the Program Listing) is a short guessing game program that demonstrates the logic of binary trees. The computer asks a series of questions about the animal you're thinking of. You respond until the computer makes a guess. Zoo relies on a disk file containing animal names and related questions: when the program guesses wrong, it adds the correct animal name and a question to the current file.

Running the Zoo

The first time you load and run Zoo, you must press the I (Initialize) key while the program is setting up. Otherwise you'll get an error message because Zoo expects to find a data file to load in. Later, when you have a zoo on disk, you can bypass this option so that Zoo automatically loads the disk file.

Now Zoo starts asking you questions. Think of an animal and answer all questions with a "yes" or "no." If the computer guesses your animal, a new game begins. When the computer guesses wrong, you can expand your zoo file by providing a question and answer to help it differentiate between animals.

Because you're starting without a data file, the program has little information on which to base its guesses. Questioning will be very limited until you build up a list of animals. The Table shows a sample question series, and demonstrates how to add animal names to your data file.

Pressing M brings up the menu. The first two options let you save or load a zoo

System Requirements

32K RAM
Disk Extended Color Basic

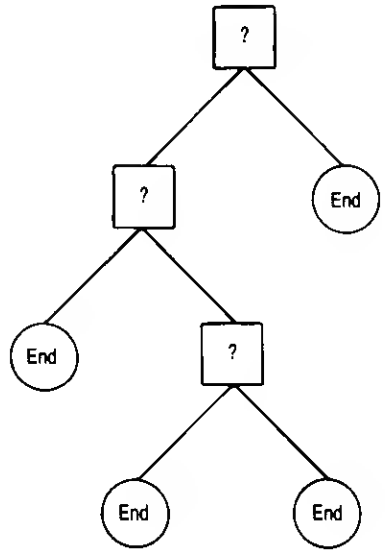

Figure 1. Binary tree structure.

(Animal)	Question	Response
Snake	Does it live on land?	Yes.
	Does it have fur?	No.
	Is it a reptile?	Yes.
	Is it a frog?	No.
	What is it?	Snake.
	Give me a yes/no question to separate it from my guess.	Does it have legs? (No.)

Table. Example of question-and-answer sequence.

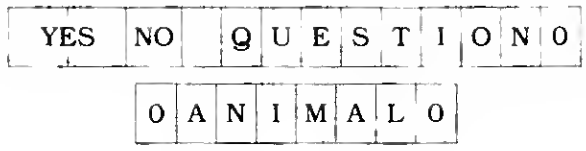

Figure 2. (a) Format of question node. (b) Format of end node.

to or from disk. Disk file names can contain up to eight letters plus a three-letter extension. Call the zoo you use most often Zoo/ONE; the program will load it automatically on startup. You must resave your file to disk each time you add new animals. The third menu option returns you to the game; the fourth prints out a list of the animals in memory.

It's Elementary

While the series of questions and answers may be quite complex, the underlying logic is straightforward. Zoo doesn't organize or remember questions and answers; instead, it maintains a branching data structure to define the animal. Figure 1 shows how the tree works.

A binary tree contains two types of nodes: a question node and an end node. When the program encounters a question node, it asks a question and waits for your response. Each question node connects to two branches, one for a positive response, the other for a negative response. By following the path of your answers, the program moves through the tree until it reaches an end node. In Zoo, the end node is the animal to which all previous questions and responses lead. Although it might not be the correct animal, it's the best guess the computer can make with the information you've given it.

In the sequence of questions shown in the Table, the computer makes a guess after your response to the third question because it has reached an end node. It has no more questions on file to help it further differentiate reptiles.

Tree Maintenance

I used a method known as branch pointing to maintain the tree in free memory at address &H400. Figure 2 illustrates the configuration of the two types of nodes in memory. In order in RAM, the question node contains a 2-byte pointer for a "yes" response followed by a 1-byte pointer for a "no." Zoo stores the questions in ASCII format after the pointers. The pointers indicate the address of the next node; the final zero serves as an end marker. The end node—the animal node in this case—contains an initial zero, the animal name in ASCII format, and a final zero as an end marker.

The nodes appear consecutively in memory. To enlarge the tree, you add nodes to the end of the tree and change the pointer so that it indicates the new node. This allows you to insert data without shuffling the entire tree. Zoo, for example, asks questions and jumps to the appropriate memory locations according the answers you supply.■

Write to Chris Cantrell, 3276 Old Chisolm Road, Apt. 1111E, Florence, AL 35630.

Program Listing. Zoo

```
1Ø CLEAR 5ØØ,&H4ØØØ
2Ø CLS:PRINT"PRESS 'I' DURING S
TART UP TO    INITIALIZE STRUCTU
RE."
3Ø FORZ=1 TO 37:READ A$:IF A$="Ø
" THEN A$=" "
4Ø IF MID$(A$,1,1)>="Ø" AND MID$
(A$,1,1)<="9" THEN A=VAL(A$) ELS
E A=ASC(A$)
5Ø POKE &H3FFF+Z,A:NEXT:DATA 64,
25,64,31,D,O,E,S,Ø,I,T,Ø,L,I,V,E
,Ø,O,N,Ø,L,A,N,D,Ø,Ø,F,1,S,H,Ø,Ø
,B,I,R,D,Ø
6Ø ZE=&H4Ø25
7Ø IF INKEY$="I" THEN 9Ø
8Ø LOADM"ZOO-ONE":ZE=PEEK(&H3FFE
)*256+PEEK(&H3FFF)
9Ø CLS:PRINT"******COCO ZOO*****
*******************BY CHRIS CANTR
ELL-1985******
1ØØ PRINT:PRINT"> YOU THINK OF A
N ANIMAL AND I    WILL TRY TO GU
ESS IT. ANSWER    MY QUESTIONS Y
ES OR NO(Y/N).    PRESS 'M' FOR
MENU."
11Ø ZS=&H4ØØØ:PRINT:PRINT:GOTO 1
8Ø
12Ø G$=""
13Ø G$=G$+CHR$(PEEK(X)):X=X+1:IF
 PEEK(X)<>Ø THEN 13Ø ELSE RETURN

14Ø K$=INKEY$:IF K$="Y" THEN Y=2
 ELSE IF K$="N" THEN Y=Ø ELSE IF
 K$="M" THEN Y=3 ELSE GOTO 14Ø
15Ø PRINTK$:RETURN
16Ø FOR H=1 TO LEN(FS):POKEX,ASC
(MID$(FS,H,1)):X=X+1:NEXT:POKE X
,Ø:X=X+1:RETURN
17Ø GG=INT(G/256):POKE X,GG:POKE
 X+1,G-GG*256:X=X+2:RETURN
18Ø IF PEEK(ZS)=Ø THEN 19Ø ELSE
ZG=ZS:X=ZS+4:GOSUB12Ø:PRINTG$+"?
";:GOSUB14Ø:IF Y=3 THEN GOTO 26Ø
 ELSE GZ=Y:ZS=ZS+Y:ZS=PEEK(ZS)*2
56+PEEK(ZS+1):GOTO 18Ø
```

Listing continued

Listing continued

```
19Ø X=ZS+1:GOSUB 12Ø:PRINT"IS IT
 A "+QS+"?";:GOSUB 14Ø:IF Y=3 TH
EN GOTO 26Ø ELSE IF Y=2 THEN GOT
O 9Ø
2ØØ PRINT"I GIVE UP! WHAT IS IT?
":INPUT AS:PRINT"GIVE ME A YES O
R NO QUESTION TO SEPARATE YOUR A
NIMAL FROM MY    GUESS.":INPUTQS
:PRINT"AND WHAT SHOULD THE ANSWE
R BE   FOR YOUR ANIMAL?"
21Ø INPUT RS:IF MIDS(RS,1,1)<>"Y
" AND MIDS(RS,1,1)<>"N" THEN 21Ø
 ELSE IF MIDS(RS,1,1)="Y" THEN Z
=2 ELSE Z=Ø
22Ø Z2=ZS:ZS=ZG:X=ZS+GZ:G=ZE:GOS
UB 17Ø
23Ø X=ZE+4:FS=QS:GOSUB 16Ø:POKE
X,Ø:X=X+1:FS=AS:GOSUB 16Ø:ZG=X:Y
A=ZE+LEN(QS)+5:NA=Z2
24Ø IF Z=Ø THEN J=NA:NA=YA:YA=J
25Ø X=ZE:G=NA:GOSUB 17Ø:G=YA:GOS
UB 17Ø:ZE=ZG:GOTO 9Ø
26Ø CLS:PRINT"*****MENU*********
"
27Ø PRINT" 1> DISK INPUT
28Ø PRINT" 2> DISK OUTPUT
29Ø PRINT" 3> GAME
3ØØ PRINT" 4> LIST ANIMALS I KNO
W"
31Ø PRINT:PRINT" PUSH A NUMBER"
32Ø KS=INKEYS:IF KS<"1" OR KS>"4
" THEN 32Ø ELSE ON VAL(KS) GOTO
33Ø,34Ø,9Ø,35Ø
33Ø PRINT" 1>INPUT":INPUT"NAME O
F FILE";AS:LOADM AS:ZE=PEEK(&H3F
FE)*256+PEEK(&H3FFF):GOTO 26Ø
34Ø CLS:PRINT" 2> OUTPUT":INPUT"
WHAT DO YOU WANT TO CALL THIS
FILE";AS:Z=INT(ZE/256):POKE &H3F
FE,Z:POKE&H3FFF,ZE-Z*256:SAVEM A
S,&H3FFE,ZE,Ø:GOTO 26Ø
35Ø CLS:X=&H4Ø25:PRINT"BIRD":PRI
NT"FISH"
36Ø IF X=ZE THEN 39Ø ELSE X=X+4
37Ø IF PEEK(X)<>Ø THEN X=X+1:GOT
O 37Ø
38Ø X=X+1:GOSUB 12Ø:PRINTGS:X=X+
1:GOTO 36Ø
39Ø PRINT:PRINT"**ANY KEY FOR ME
NUE**"
4ØØ KS=INKEYS:IF KS="" THEN 4ØØ
ELSE 26Ø
```

End

Check PPoint

Send your letters, club and BBS notices, and requests for assistance to HOT CoCo, *c/o* 80 Micro, *80 Pine St., Peterborough, NH 03458.*

Readers Respond

I agree completely with Michael Nadeau's comments on the slowdown in the home computer market (Digressions, *HOT CoCo*, September 1985, p. 4). While his points are valid, he failed to mention the indifference of computer companies after they make a sale. Manufacturers sell high-priced software that doesn't work as claimed and then shrug off most user inquiries. For instance, when I requested help with DynaCalc, the company told me to phone because the response was too complex for a written answer. If they can't explain it in writing, what chance do I have of remembering the explanation after hearing it over the phone?

Then there's the matter of RAM. When you buy a computer with 16K of RAM, you think you understand what "random," "access," and "memory" mean. Until you get home and find out that you don't have 16K of memory you can access randomly. Available memory is closer to 8K.

Adding this information to the points Nadeau makes in Digressions, you see why the home computer buyer feels he's been had and loses interest. Only dyed-in-the-wool electronic hobbyists will continue to use computers when they don't need to.

Jult M. Diver
Tacoma, WA

As far as I'm concerned, you can extend the editorial comment on boring Tandy TV ads (Digressions, December 1985, p. 5) to cover magazine ads. So often Tandy focuses on children and games. The ad showing a youngster with a CoCo sneering at a jealous playmate with another make of computer turned me off. I was ashamed to own a TRS-80 when I saw it.

Charles H. Hoyt
Camas, WA

Line Drawing

I developed a short program, Lines/BAS, to save memory and time when you write Line statements (see the Program Listing). To use it, you insert data pairs for the horizontal and vertical coordinates of the lines' starting and ending points. If the value of the first horizontal coordinate (A) is greater than zero and less than 256, Lines/BAS uses 128,96 as the default starting point of the line. When other horizontal coordinates fall within this range, Lines/BAS uses the end point of the previous line as the starting point for the next line.

Program Listing. Lines/BAS.

```
10 PMODE 4,1
20 PCLS
30 SCREEN 1,1
40 FOR X=1 TO 1000
50 READ A,B
60 IF A<0 THEN XXX 'LAST LINE NU
MBER
70 IF A>256 THEN LINE (A-256,B)-
(A-256,B),PSET:GOTO50
80 LINE -(A,B),PSET
90 NEXT X
XXX END
```

End

However, Lines/BAS accepts values for A that are greater than 256. You can use such values to establish a starting point other than the default origin of 128,96. For example, the sample data in the Listing begins with the data set 500,100. Since A is greater than 256, the program uses line 70 to determine the starting point—244,100. If you use 244,100 as the first data set, Lines/BAS draws a line from 128,96 to 244,100 because the equation in line 80 does not specify a starting point.

To move a line so that it doesn't begin at the end point of the previous line drawn, add 256 to the real value of A you want to use. For example, the following data sequence draws two parallel lines:

```
DATA 500,100,150,100,406,40,244,40,
     -1,-1
```

The first pair starts the line at 244,100; the line ends at 150,100. Using 406,40 as the third pair ensures that the next line begins at 150,40. The final data pair is a stop that transfers control to the end statement.

Ross Evans
Prince George, British Columbia

Mail Bag

J.D. German's article, "Mail It with Telewriter-64" (*HOT CoCo*, November 1985, p. 34) provided Telewriter with an easy-to-use mailing list generator. German designed the program to print one label at a time; he suggested resetting the margin, rolling back the label to the start, and doing a partial print to print two or three labels across. I found this method too cumbersome and developed another procedure.

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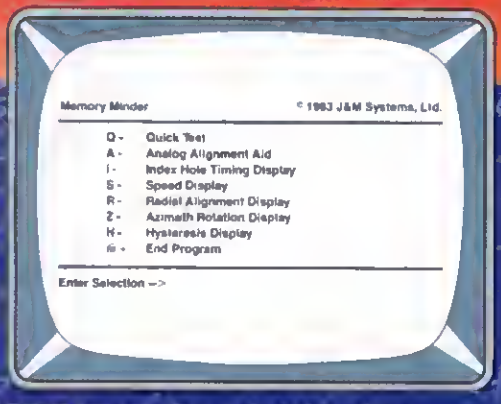

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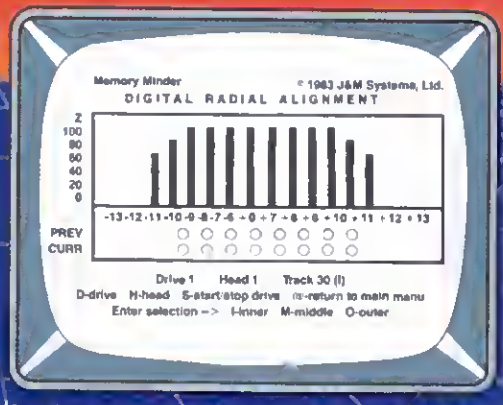

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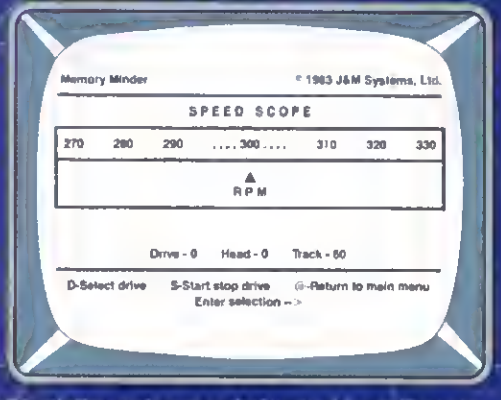

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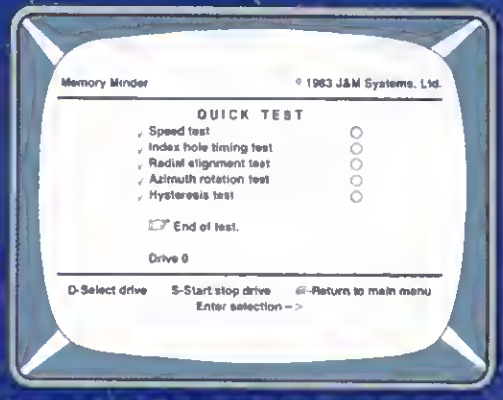

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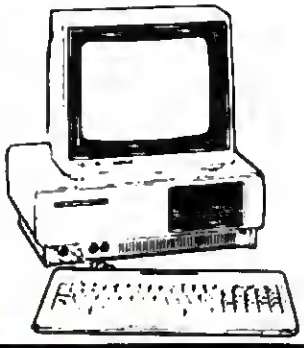

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Dave Machlitt
Ventura, CA

Binary Graphics

When I began using the CoCo's graphics characters, I was unwilling to memorize the pattern codes. Instead, I worked out a system that relies on binary numbers. The method treats each Print@ screen position as a two-pixel by two-pixel block. You can turn each pixel on or off, making it black or the color of the block.

You define the pattern with an 8-bit binary number and POKE the decimal equivalent of this value into the appropriate memory location for a particular screen location. Bit 7, the most-significant bit, determines whether a character is alphanumeric or graphic. To create a graphics character, you must set this bit to 1. Bits 4–6 control the color of the block (see the Table). The remaining 4 bits turn individual pixels in the block on and off (see the Figure). For example, a logical zero in bit 3 turns the upper left-hand pixel off, making it black.

Figure. Configuration of bits zero to 3 of a graphics block.

Code	Color
000	Green
001	Yellow
010	Blue
011	Red
100	Buff
101	Cyan
110	Magenta
111	Orange

Table. Color codes.

I'll illustrate the procedure by setting up a pattern for the graphics block in the upper left-hand corner of the screen, memory location 1024. If you want to make the left half of this block cyan and the right half black, you must first set bit 7 to 1. Bits 4–6 are 101 (cyan); the appropriate on/off sequence for the block is 1010. The 8-bit binary number for the pattern is 11011010 or decimal 218; therefore the appropriate command for creating and positioning the character is POKE1024,218. (You might find it simpler to divide the binary number in sections (10000000 + 101 + 1010) and compute the decimal equivalent from the sum of the sections (128 + 80 + 10).)

Increasing the memory location by one moves the character one block to the right. Add 32 to reposition the block on the line below.

Jon Howell
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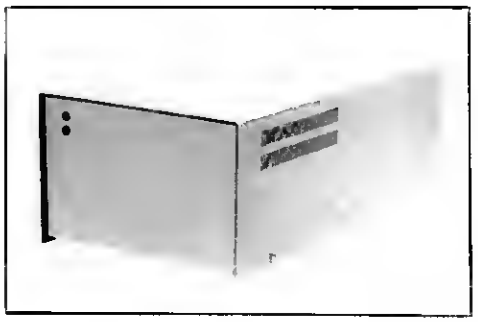

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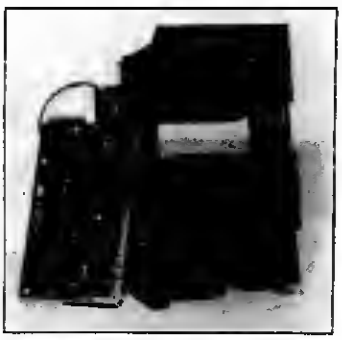

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Help Wanted

►Raymond L. Kornele (P.O. Box 69, San Jacinto, CA 92383) would like a memory map, software, and information on machine language for the MC-10. He also needs help using the WordsMC program in the book, *Color Computer Programs* (Radio Shack catalog number 62-2313).

►Jim Partridge (27 Cedar Road, Clinton, CT 06413) is in the market for an inexpensive disk drive. Contact him if you have one you'd like to sell or if you want to exchange tips and information on the CoCo.

► James Ellis (319 Croton Ave., New Castle, PA 16101) needs help adding an opening "book" of moves to his computer chess program.

To Err Is Human

The Listing for Star Merchant (*HOT CoCo*, January 1986, p. 36) contains an error. Line 460 should end with NEXT, not N as printed.

Doctor ASCII

by Richard E. Esposito and Ralph E. Ramhoff

Having technical difficulties? Consult the Doctor for an answer. Due to the volume of mail Doctor ASCII receives, we can't guarantee publication of your query. Please send a self-addressed, stamped envelope with all letters to Doctor ASCII, c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.

Q: How can I add extra features to Telewriter-64? *(Dave McNamara, Saldine, MI)*

A: *HOT CoCo* magazine has published a few suggestions for improving Telewriter (see "Improve Your Telewriter-64," April 1985, p. 40, and The Computer Room, December 1985, p. 18). Software manufacturers have also developed some enhancements.

J & R Electronics (P.O. Box 2572, Columbia, MD 21045, 301-788-0861) offers a 256K upgrade called The Banker ($29.95 to $99.95). It includes RAM disk software that you can incorporate directly into Telewriter's program.

Spectrum Projects (93-15 86th Drive, P.O. Box 21272, Woodhaven, NY 11421, 718-441-2807) markets Bob van der Poel's Telepatch ($19.95). It adds a true block move, overstrike, tspool, key beep, and key repeat.

Telegraphics ($24.95) from Derringer Software (P.O. Box 5300, Florence, SC 29502, 803-665-5676) lets you print bit-image graphics screens as letterheads; you can then print them from Telewriter's Disk I/O menu.

Q: Can I exchange files between the Tandy 1000 and the CoCo? A Radio Shack salesman told me transfer is impossible because the CoCo uses single-sided drives and the 1000 has double-sided drives. *(J.R. Lavallee, Carrollton, TX)*

A: Mark Data Products (24001 Alicia Parkway, No. 207, Mission Viejo, CA 92691, 714-768-1551) markets CoCo-Util for $29.95. It lets you read, write, and format single-sided CoCo disks on your Tandy 1000 or IBM PC.

D.P. Johnson (7655 S.W. Cedarcrest St., Portland, OR 97223, 503-244-8152) sells PC-XFER for $45. With PC-XFER and Johnson's SDisk disk driver ($29.95), you can read, write, and format single-sided MS-DOS disks on your CoCo under OS-9.

Both utilities permit transfer of ASCII text files between machines. If you want to exchange programs, you must transfer them to ASCII and then make appropriate changes in syntax.

Q: I own a CoCo with OS-9 and two dtsk drives—one Radio Shack and one double-sided TEAC. My TEAC includes patches to make each side operate as a separate drive; I'd like to use it as a single drive with a fast step rate. Would I hurt the drives by running them at the faster 6-millisecond step rate? Can I use Pascal-09 to generate high-resolution color graphics? *(Dan Doner, Walsh, CO)*

Program Listing. Patch to make Telewriter work with the older 1.1 and newer 1.2 ROMs.

```
59 CLOADM"",OF:GOSUB500:POKE39,PEEK
(214):POKE40,PEEK(215):GOSUB330
500 P1=PEEK(40960):P2=PEEK(40961)
501 POKEOF+7931,P1:POKEOF+7932,P2
502 POKEOF+8207,P1:POKEOF+8208,P2
503 POKEOF+9728,P1:POKEOF+9729,P2
510RETURN
```

End

A: To use double-sided disks as a single disk, you need to replace the CCDisk module with a module like the one described on page 39 of the *OS-9 Technical Information Manual*. The module supplied with the CoCo doesn't have the IT.SID routine implemented. D.P. Johnson (see address above) sells SDisk ($29.95) as a replacement for CCDisk; it implements all the features mentioned in the manual. Johnson also markets Bootfix ($6), which lets you boot up your system with a double-sided system disk. Bootfix puts the entire OS-9 boot routine on one side of the disk by manipulating sectors and the disk allocation table to avoid confusing the DOS command in the CoCo's ROM.

If your drives can handle operating at the higher step rate, they should run more quietly and last at least as long as they would running at a slower rate. With Pascal-09, you can access high resolution graphics by using pointer variables or Assembly-language routines.

Q: A Radio Shack salesman told me I couldn't connect an Atari 1050 disk drive to my CoCo. Is he correct? *(Joseph Smith, Flushing, NY)*

A: The salesman is right. Prior to introduction of their Motorola-based 68000 520ST, Atari used a nonstandard serial interface for their disk drives. The CoCo (like the IBM PC, IBM PC clones, and TRS-80 Models I, III, and 4) uses an industry-standard disk drive interface.

Q: Can I get my CoCo to run faster, possibly by exchanging its 6809E for a 68000 or 68020? Can I substitute an Atari ROM for my CoCo's

ROM? Can I buy parts to build my own CoCo at a reasonable cost? *(Ray Jungman, Buckholts, TX)*

A: Orbit Electronics markets their Supercomp 68008 board in various configurations from $99 for a bare PC board to $389 for an assembled and tested board with 256K RAM and MC68008. With the 68008 board, you'll get a faster processor but virtually no support. In my opinion, the Atari 520ST for $1,000 is a better buy; it includes an RGB monitor, an 80-track 3½-inch drive, mouse, 68000 microprocessor, 512K RAM, Basic, Logo, GEM windowing environment, and documentation.

The Atari ROM would do you no good because it contains machine-language code for a 6502 microprocessor and thus uses a different instruction set from the 6809E. You can obtain all parts for the CoCo from Radio Shack National Parts Division (900 E. Northside Drive, Fort Worth, TX 76102, 817-870-5662). However, if you're building a CoCo from scratch, you'd find it cheaper to buy a complete CoCo and then cannibalize it.

Q: While visiting the Boston area, a friend of mine bought a 57-key CoCo 2 keyboard (catalog number 277-1019) at a Radio Shack store. It has F1, F2, control, and alternate keys in addition to the usual ones. After checking with three stores in my area, I couldn't find one and was told they can't be ordered. *(Frank Nardis, Painesville, OH)*

A: These were keyboards for the Super CoCo that Tandy canceled because of a slump in the microcomputer industry.

Q: The voltages for the CoCo and CoCo 2 disk controllers differ. Will the Disk Extended Color Basic 1.0 ROM work in a CoCo 2 controller? *(Ray S. Preston, Rarotonga, Cook Islands)*

A: The ROMs are interchangeable. The only difference lies in the resident software; fortunately, the hardware is compatible.

Q: I had trouble using the tape version of Telewriter-64 with ROM verston 1.2. Applying information gleaned from the September Doctor ASCII (*HOT CoCo*, p. 13), I figured out a patch to make Telewriter-64 work on both my machines. You need to change line 59 and add lines 500–510 (see the Program Listing). *(Dale Leistico, Lompoc, CA)*

A: Thanks for the information.

Q: I bought a Comrex Cr-1 printer two years ago, and I'm having problems with the ribbon feed. Comrex Corp. referred me to Brother International Corp. of Piscataway, NJ, for repairs, but their phone has been disconnected. A technician at a local repair center won't touch the printer without a schematic. Can you suggest someone who'll work on the Cr-1? *(David O. Winfrey, Smithsburg, MD)*

A: Adahk Inc. (7260 Collamer Road, East Syracuse, NY 13057, 315-656-3988) repairs most printers for $59.95 plus parts. Call them and explain your situation. Due to the current industry shakeout, many companies are going under or abandoning the microcomputer market.

An interesting article, "Printer Preservation" by Vincent E. Meyer (*80 Micro*, November 1985, p. 44), tells how to perform do-it-yourself maintenance and repairs on a variety of printers. Printer prices have dropped dramatically in the last two years, though; you may find it cheaper to buy a new printer than to have your old one repaired.

Q: Your directions for the Versadump program ("Printer Answers," *HOT CoCo*, March 1985, p. 24) confused me. What is a memory map and how do I obtain it? *(Jerome Scanlon Jr., San Antonio, TX)*

A: "64K Modification Revisited" (*HOT CoCo*, June 1985, p. 40) contains a program called Enable; it switches memory maps and copies Basic ROMs into memory map 1, which is an all-RAM mode. Enable lets Basic continue running in RAM, but since Basic doesn't need all the space between addresses $A000 and $FDFF, you can put your own machine-language program in the unused areas ($C000–$FDFF for Extended Color Basic and $E000–$FDFF for Disk Extended Color Basic).

After you run Enable, you can offset load the 32K version of Versadump into the upper bank of memory. The 32K version of Versadump starts at address $7A00; to load it at $E000, type in CLOADM"PROGRAM NAME",26112. (I obtained 26112 by typing in PRINT &HE000-&H7A00.)

Q: I want to use a Centronics 701 printer with my CoCo; it has a 36-pin parallel interface. Can I buy or build an interface? *(Sudhir Kapoor, Covington, GA)*

A: You have two options. You can use a serial-to-parallel converter like the one made by Botek Instruments (4949 Hampshire, Utica, MI 48087, 313-739-2910); in that case, you won't need a software driver. The alternative, adding a parallel interface card to your CoCo's Multi-Pak Interface, lets your printer work at its maximum speed but requires a software driver. PBJ Electronics (911 Columbia Ave., Box 813, N. Bergen, NJ 07047, 201-330-1898) sells a parallel interface card that would work.

Q: Why doesn't POKE 65495,0 work after you use the 64K Enable program ? *(Milton T. Simpson, Martinsburg, WV)*

A: The POKE in question, frequently called the high-speed POKE, puts the computer in the dual-speed RAM/ROM mode; RAM runs at 1 MHz and ROM runs at 2 MHz. With 64K enabled, your computer never runs in ROM, so you don't benefit from the extra speed.

Q: How can I modify the SDUMPX2 screen print program (Doctor ASCII, *HOT CoCo*, December 1984, p. 89) to work with a Radio Shack LP VII printer? *(Andrew Paulina, Willowick, OH)*

A: We faced the same obstacle when we wrote the Versadump program. The Gemini, Epson, and IBM printers print eight dots per column in graphics mode; Radio Shack printers print only seven. Getting SDUMPX2 to work with a Radio Shack printer would require extensive rewriting. We recognized this immediately and used SDUMPX2 as a starting point in coding Versadump.

Q: I want to upgrade my E-board CoCo to 64K. The machine contains five jumpers; one of them doesn't have a 32K position marked. I understand the rest of "64K Modification Revisited" but need clarification on setting the jumpers. *(John Clanton, Phoenix, AZ)*

A: If the jumper in question has only 4K and 16K positions, set it to 16K. Unless you are upgrading from 4K, the jumper should already be set to 16K.

Q: I'm having a problem getting Possum Run (*HOT CoCo*, March 1984, p. 50) to run from disk. Would your Tapefix program (*HOT CoCo*, September 1983, p. 134) help?

I have a non-Tandy controller with JDOS. Many programs such as Telewriter-64 won't work with it. How can I tell if a program will work with JDOS? *(Frank J. Hoegler, APO, New York, NY)*

A: Since Possum Run isn't a pure machine-language program, Tapefix won't help. With a disk system, the code for a Basic program sits higher in memory (by 2K) and conflicts with the location of POKEd machine-language routines. The problem lies in line 0 and the POKE routine beginning in line 5025 of Possum Run. They POKE machine-language routines into memory starting at address 16000. If the code in your pro-

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CBASIC WAS DESIGNED FOR BOTH BEGINNING & ADVANCED USERS

CBASIC is a Powerful tool for the Beginner or Novice programmer as well as the Advanced Basic or Machine Language programmer. The Beginner or Novice programmer can write and compile programs without having to worry about Stack Pointers, DP registers, memory allocation, and so on, because CBASIC will handle it for you automatically. All they have to do is write their programs using the standard Basic statements and syntax. For the advanced Basic and Machine Language programmers, CBASIC will let you take command and control every aspect of your program, even generating machine code directly in a program for specialized routines or functions.

CBASIC adds many features not found in Color Basic, like Interrupt, Reset, and On Error handling. It also has advanced programming features that allow machine level control of the Stack and Direct Page registers, variable allocation, automatic 64K RAM control, program origin and even multiple origins. It can even have machine language code generated within a program that executes just like any other Basic program line.

FULL COMMAND SUPPORT & SPEED

CBASIC features well over 100 Basic Commands and Functions that fully support Disk, Tape, Printer and Screen I/O. It also supports ALL the High and Low Resolution Graphics, Sound, Play and String Operations available in Extended Color Basic, and all with 99.9% syntax compatibility.

CBASIC is FAST. Not only will CBASIC compiled programs execute 10 to 1000 times faster than Basic, but the time it takes to develop a CBASIC program versus writing a machine language program is much, much shorter. A machine language program that might take several months to write and debug could be created using CBASIC in a matter of days or hours, even for a well experienced machine language programmer. We had a report from a CBASIC user that claimed "a Basic program that used to take 3 hours to run, now runs in 7 to 8 minutes". Another user reported a program that took 1 to 1½ hours to run in Basic, now runs in 5 to 6 minutes!!!

MORE THAN JUST A COMPILER

CBASIC has its own completely integrated Basic Program Editor. The Editor contained in CBASIC is used to Create and/or Edit programs for the compiler. It is a full featured editor with functions designed specifically for writing and editing Basic programs. It has built-in block Move and Copy functions with automatic program renumbering. Complete, easy to use inserting, deleting, extending and overtyping of existing program lines. It is also used for Loading, Saving, Appending (merging), Killing disk files and displaying a Disk Directory. It also has automatic line number generation for use when creating programs or inserting sequencial lines between existing lines. You can set the printer baud rate and direct normal or compiled listings to the printer for hard copy. The built in editor makes program corrections and changes as easy as "falling off a log". If CBASIC finds an error when compiling, it points to the place in the program line where the error occurred. All you have to do is tell the editor what line you want to start editing and when it is displayed, move the cursor with the arrow keys to the place where the error is and correct it. Just like that, it's simple.

HI-RES & 80 COLUMN DISPLAYS

CBASIC is the only Color Basic Compiler that includes its own Hi-Resolution 51, 64 or 85 by 24 line display. It is also the only compiler that supports both the PBJ "Word Pak" and the Double Density 80 column cards. All of these display formats are part of the standard CBASIC compiler package. Not only can these display formats be used for normal program editing and compiling, but CBASIC will also include them in your compiled programs! If you want CBASIC to include the display driver in your program, all you have to do is use a single CBASIC command "HIRES". The run-time display driver that CBASIC includes in your program is not just a simple display, but a full-featured display package. With the Hi-Resolution display package you can mix text & graphics, change characters per line, underline, character highlight, erase to end of line or screen, home cursor, home & clear screen, protect screen lines, and much more. All commands are compatible with our HI RES II Screen Commander so you can easily develop screen layouts using HI RES and Color Basic before you compile your program. The same applies to using the 80 column card drivers. What other Basic compiler offers you this kind of flexibility?

64K RAM SUPPORT

CBASIC makes full use of the power and flexibility of the 6883 SAM (Synchronous Address Multiplexer) in the Color Computer. It will fully utilize the 96K of address space available in the Color Computer (64K installed) during program Creation, Editing and Compilation. CBASIC has a special command for automatic 64K RAM control. When used in a program, it allows the user to use the upper 32K of RAM space automatically for variables or even program storage at run-time. It will automatically switch the ROMs in and out when needed. There are also two other commands that allow you to control the upper 32K of RAM manually, under program control. No other Color Basic compiler directly supports the use of 64K RAM like CBASIC.

ALL MACHINE LANGUAGE

CBASIC is completely written in fast efficient Machine Language, not Basic, like some other Color Basic compilers. Because of this, CBASIC can edit and compile very large programs. Even using the Hi-Resolution 51 by 24 line display, it can work with about a 34K program, and the 80 column card versions can handle almost 40K of program. Some of the other Basic compilers can only work with 16K or about 200 lines. Even working with large programs, CBASIC compiles programs with lightning fast speed. It will compile a 24K program to disk in less than 2 minutes! That's without a listing being generated. We've heard stories about some other compilers that take almost 10 minutes to compile a simple 2-3K program. You might inquire about this when you look at some of the other compilers available.

Circle 273 on Reader Service card.

THE FINISHED PRODUCT

Since CBASIC contains statements to support ALL of the I/O devices (Disk, Tape, Screen & Printer), Hi-Res Graphics, Sound, and Enhanced Screen displays, it is well suited for a wide range of programming applications. It generates a complete, Ready to Run machine language program. The finished product or program does not have to be interfaced to a Basic program to perform some of its functions or commands. This may seem obvious to you, but some of the other Color Basic compilers don't necessarily work this way. Some of their compiler commands need a separate Basic program in order for them to work. In some cases, require that a separate Basic program be interfaced to the compiled program to perform I/O functions, like INPUT, PRINT and so on. CBASIC doesn't do this. ALL of its commands are compiled into a single machine language program that does not require any kind of Basic program to make it work.

COMPATIBILITY

You may be wondering about those statements we made earlier concerning 99% or 99.9% syntax compatibility. What does that other 1% consist of? The biggest part of that 1% has to do with string arrays and variables. CBASIC does not use a "String Pool" like Color Basic. It uses absolute memory addresses to locate string variables and arrays. This is why CBASIC's string processing is so fast, it also eliminates the time consuming "Garbage Collection" problem. When CBASIC allocates space for strings, it must know how much space to use for each string. When you Dimension a string variable in CBASIC, you must tell it how much space you want to save for each element. To Dimension an array of 40 strings, 64 characters each, you would DIM DA$(40,64). If a string is not dimensioned, CBASIC will automatically allocate 32 bytes for it. If you want a single string to have enough room for 200 characters you would DIM AX$(200). For string arrays, you would still access the element you want, the same as Color Basic, to get string #30 from the array DA$, you would still use DA$(30), the only real change is in the DIM statement. For undeclared string arrays of 10 elements or less, CBASIC will automatically reserve space for 10 (0-9) strings of 32 characters. In some other Color Basic compilers, you have to declare EVERY string variable used in the progrm in a DIM statement. And, to create an array of 40 strings with 64 characters each, you would have to DIM AD$(2560), and then to access string #30, you would have to multiply 30 × 64 and use a special variable name format or access it one character at a time. Not very compatible or convenient to use, and difficult at best.

CBASIC REQUIREMENTS

CBASIC requires a minimum of 32K RAM and at least one Disk drive. We strongly recommend that you have 64K. CBASIC is compatible with all versions of Color & Extended Basic and both Disk Basic V1.0 and V1.1. Programs compiled on either system will run on systems with different ROMs. CBASIC is NOT compatible with JDOS.

DOCUMENTATION

The Documentation provided with any program is very important to the user. This is especially true when you talk about a program as complete and complex as CBASIC. Even though CBASIC was designed to be the most User Friendly compiler on the market, we went to great lengths to provide a manual that is not only easy to use and understand, but comprehensive and complete enough for even the most sophisticated user. The manual included with CBASIC consists of approximately 120 pages of real information, not like some manuals that put just one or two short paragraphs on a page. If we did it that way, we could have easily created a three or four hundred page manual. The manual index breaks down each section of the manual and gives a 3 or 4 word description of each section and its items along with page numbers. The manual has three sections, the Editor, Compiler and Appendix. Each of these is divided into subsections, with Section and Subsection titles printed at the top of each page. If you want to, you could find the information you are looking for by simply flipping through the pages and scanning the Section titles on the top of the pages. The Manual itself is an 8½ by 11 Spiral Bound book with durable leather textured covers. Some of the reports we have had from CBASIC users describe the manual as being the Best program manual they have ever used.

COMPARE THE DIFFERENCE

CBASIC is not just another Color Basic Compiler. It is the only complete Basic Compiler System for the Color Computer. Compare CBASIC's features to what other compilers offer and you'll see the difference. When comparing CBASIC to other compilers, you might want to keep some of these questions in mind. Does it support I/O functions? You can't write much of a program without PRINT, INPUT and so on. What about complex string statements, or string statements at all? How large of a program can you write? Can you compile a complex string like: MID$(RIGHT$(DA$(VAL(IN$),LEN(LE$)),3,3)? Can you use two character variable names for string & numeric variables, like Basic. Does it support all the Hi-Res graphics statements including PLAY, DRAW, GET and PUT, using the same syntax as Basic? Do you ever have to use a separate Basic program? Can you take complete Basic programs and compile them without extensive changes? Will they work? How do you edit a program when it has errors compiling?

PRICE VERSUS PERFORMANCE

The price of CBASIC is $149.00. It is the most expensive Color Basic Compiler on the market, and well worth the investment. We spent over 2 years writing and refining CBASIC, to make it the Best, most Compatible Color Basic compiler available. Most of our CBASIC users already bought one or more of the other compilers on the market and have since discarded them. We even traded in a few of them. If you want a cheap compiler, we'll sell you one of those traded in, at a good price. Before you buy a compiler, compare the performance of CBASIC against any Color Basic compiler. Dollar for Dollar, CBASIC gives you more than any other Color Basic compiler available.

ORDERING INFORMATION

To order CBASIC by mail, send check or money order in the amount of $149.00 plus $3.00 for shipping and handling to the address listed below.

To order by VISA, MASTERCARD or COD, call us at: (702) 452-0632 (Monday thru Saturday, 8am to 5pm PST).

CER-COMP
5566 Ricochet Ave.
Las Vegas, NV 89110
(702) 452-0632

gram is position independent, change the addresses in the 16000's by adding 16000 (e.g., 16500 becomes 32500). If that doesn't work, you'll need to disassemble the machine-language routines.

With JDOS, you should be able to execute programs if they don't use DOS routines other than DSKON and don't attempt to modify DOS routines by shifting into 64K mode. If you want the additional features of JDOS without its associated compatibility problems, I suggest you invest in ADOS.

Q: I recently purchased an RCA monitor/receiver, intending to use it as a TV and as an alternative to the green monitor I use for my CoCo. After three days, the color input to the monitor stopped working. I swapped the cables between my monochrome monitor and the RCA monitor: the monochrome output appeared black and white on the RCA monitor; the monochrome monitor displayed shades of green.

When I returned the RCA monitor to the store, they played two VCRs using the monitor and said that my computer produces RGB output while my monitor expected composite video. Is the salesman confused? Why did the monitor work for three days if the video outputs are different? (*Lynn Sundberg, San Diego, CA*)

A: Most home computers, including the CoCo, modulate their video signal on TV channel 3 or 4. This modulated signal includes audio and composite video combined as if they were being sent by a TV transmitter. All home VCRs provide the same modulated signal; many also provide separate audio and composite video connections.

By connecting the shielded cable with an RCA phono plug to your CoCo before the RF modulator, you can get direct composite video. You'll also need a simple circuit to complete the hookup. Several companies market these video drivers: Computer Plus (800-343-8124) sells Mark Data's Universal Video Driver for $29.95. (See "The Truth About Monitors," *HOT CoCo*, September 1985, p. 37 for further information on video drivers.)

The other major video interface is called RGB—red, green, blue. It separates the three colors used in a color picture. While this feature provides a high quality signal, it increases the price of the monitor, VCR, and computer. Your interface circuit may need replacement or adjustment if your CoCo usually works fine with a color TV. ■

Color Monitor

by Scott Norman

For this first edition of Color Monitor, I would like to depart from my usual beat, applications software, and discuss an innovative hardware/software combination. The product is Speech Systems' EARS (Electronic Audio Recognition System), and it lets CoCos act on voice commands. EARS is great for high-tech experimenters and should lend itself to some nifty games, but above all it provides opportunities for disabled people to communicate and control their environment.

What You Need And What You Get

To "recognize" speech, a computer takes electronic samples of voice signals and compares them with prerecorded patterns. If they match, the CoCo performs some predefined task.

In technical terms, EARS is a speaker-dependent, discrete-utterance system. Before using it, you must make your own recordings, or templates, against which EARS compares bona fide speech. A template file can contain as many as 64 utterances; each utterance can last up to two seconds (obviously, an utterance can consist of more than a single word).

You must pause briefly between utterances when you program the template to let the computer recognize the beginning and end of each utterance. EARS' documentation claims that a pause as short as 0.2 seconds is long enough, but I often found that simple Basic demonstration programs needed a full second or more to ensure word recognition.

Speech Systems sells tape and disk versions of EARS; both require a 32K CoCo. You'll find a disk drive advanta-

geous, and a 64K computer lets you add a voice synthesizer for total verbal interchange. Although EARS can generate speech, it uses a preprogrammed vocabulary; at present, it comes with only a single file containing the numbers from zero to 9. Speech Systems' own Super Voice is an excellent example of a more flexible synthesizer.

EARS' hardware consists of a plug-in cartridge for the CoCo's external port and a small microphone mounted in a lightweight headset. The cartridge's circuit board uses a General Instruments SP-1000 speech recognition integrated circuit. Speech Systems designed EARS' memory map to mesh with the CoCo disk controller and Radio Shack DOS; unfortunately, EARS doesn't work with JDOS.

You can connect a disk controller and the EARS cartridge to the CoCo by simply hooking them up to a ribbon Y-cable. Speech Systems' voice synthesizers also observe RSDOS and disk controller compatibility; they sell a special three-port cable for running disk drives, a speech recognizer, and a synthesizer simultaneously. The extra power requirements appear to be modest; I didn't detect any additional heat buildup when I ran the complete system.

The microphone, which the manufacturer claims incorporates a special noise-canceling design, plugs into a small jack on the rear of the EARS cartridge. You can plug an external audio amplifier into a second rear jack for higher-quality sound (normally, speech generated by EARS or one of its companion synthesizers comes through the speaker of your TV set or video monitor). A headband on the mike helps maintain a constant mouth-to-mike separation.

EARS' software includes the main machine-language program (also called EARS); a Basic program named EARSEDIT with which you build word-template files; and a few demonstration routines, such as number-recognition games, demonstrations of synthesized speech, and so on. The EARS program sits in high RAM, intercepts commands from the keyboard or your program, and acts on those requiring its intervention. At run time, EARS adds 15 new key words to Basic.

Unfortunately, fewer than 9,800 bytes remain free for your program at that point. You can increase available memory by the usual technique of releasing graphics pages. No matter what your memory setup, you pay a price for speech recognition capability. However, Speech Systems managed to minimize the impact of the speech synthesizer programs: A special command, Flip, puts them into unused high RAM in a 64K computer.

Speaking Out

In my opinion, developing and testing templates with EARSEDIT is the best way to learn the system—once you've run the demos to build your enthusiasm, that is. You could use some of EARS' new Basic commands to create template files within your own programs, but the convenience of the EARSEDIT menu-driven utility makes your first attempts more successful. Once you develop a feeling for the possibilities and limitations of speech recognition, you can strike out on your own.

The process of building a template consists of typing in a word and then speaking it (in an applications program, EARS returns the string you type in as the recognized word). EARS lets you repeat each word a second time, thus providing the computer with a better statistical sample of your speech patterns with which to form matches.

While each utterance can last up to two seconds, the typed-in version must not exceed 15 characters. You don't need to use the conventional spelling of a word; you could, for example, speak in a foreign language but enter English words from the keyboard. In a more practical vein, you could establish the phrase "number 4" for the character "4"—a useful trick for verbal programming. It pays to use lengthened utterances of this kind for short words; the computer then receives a larger speech sample to chew on.

Software authors who work with the vocally disabled might take advantage of this tolerance for unconventional speech. As long as an individual can consistently make a given utterance for a

Products

All products from:
Speech Systems
38W255 Deerpath Road
Batavia, IL 60510
312-879-6880

EARS
32K required (64K if used with a speech synthesizer) $99.95, disk or tape

Y-cable
$28.95

Triple Y-cable
$34.95

Super Voice
32K required for stand-alone use, 64K with EARS $79.95, disk or tape, if purchased alone; $59.95 with EARS

The user and computer must undergo training for EARS to work.

given purpose, you can construct programs that respond properly. Whether a casual listener can recognize the utterance is immaterial. Interfaces exist that let the CoCo use EARS to control external circuits; Speech Systems sells such a control unit and appropriate software.

The user and the computer must undergo a little training for CoCo speech recognition to work. EARS failed to recognize some of my utterances unless I was especially careful: The word "six," for example, presented a problem. EARSEDIT's facility for selectively deleting and reentering templates in a file, along with its menu selection for setting the accuracy required of a match, helped me get things right. Nevertheless, I had to pay attention to inflection when using the system.

Talking speed seemed less critical. Perhaps I didn't push things hard enough, but I felt the "dynamic time warping" compensation technique the SP-1000 chip uses handled reasonable variations in vocal speed.

Using EARS for Real

After you become comfortable with the system and template files, you should start exploring the uses of speech recognition. If you've been using EARSEDIT in a working session, clear it from memory with a New command. This doesn't affect the EARS machine-language program or the last template file in RAM. New key words—TCLEAR, TLOAD, and others—let you load other files without benefit of EARSEDIT.

One application described in the EARS manual is spoken Basic programming. While the process is slower than typing, you'll find it an intriguing way to use speech recognition. You might use it to copy program listings from magazines and books.

First, assemble a file of templates for numbers, Basic key words, and letters. After you type in the new key word DRECT, EARS treats any spoken word as if you'd entered it from the keyboard. You can even indicate that EARS should interpret an utterance as a nonprinting key word: "enter," "backspace," and so on. The 64-template limit restricts you, however. You must choose the subset of key words and letters you want EARS to recognize. You'll have to type in the rest; don't expect EARS to recognize all Basic key words.

EARS' documentation details methods for writing your own Basic program using speech recognition. Instructions rely heavily on EARS key words LISN and Match. LISN produces a template of an utterance, storing it as a Basic string under a preassigned name or holding it in RAM until you invoke Match to compare the utterance against a named template already in memory. EARS asks you to supply a numerical "rejection coefficient"; with it you control the degree of accuracy the computer requires for successful recognition.

Summing Up

Despite its limitations, EARS is a fascinating product. Most restrictions stem from the CoCo's memory size and processor speed, which influence the size of the template and time required for matching speech and template.

The biggest drawback lies in the narrow limits on acceptable pronunciation and inflection. The documentation claims that experienced users might expect to achieve recognition accuracies of 95 to 98 percent; I estimate that I obtained about 90 percent accuracy in my first few days. The manual supplies hints for increasing the system's accuracy, such as recording several templates of a given word in a different tone of voice. These might boost your performance.

Coming Attractions

New trends are taking shape in the CoCo software world. Integrated software packages, "desk accessory" utilities for the office, and programs that use Macintosh-like icons appear with increasing regularity. These products and tenacious rumors for a new big-memory CoCo promise to give me plenty to explore in coming months.■

Scott Norman is the manager of solid-state science at GTE Laboratories in Waltham, MA. Write to him at 8 Doris Road, Framingham, MA 01701.

Master Control

The Command Center ($179.95) from Curtis Manufacturing incorporates full power-line surge protection, EMI-RFI filtering, and individual power-switching capabilities for up to five computer components.

The Center sports five receptacles on its back and five push-button switches on its front that let you power a microcomputer and four peripherals. A receptacle circuit breaker and an 8½-foot power cord protect the unit. You operate the main power switch with a key, which also serves as a grounding device.

Other features include a bank of display lights and a digital clock/calendar. For more information, contact Curtis Manufacturing Co. Inc., 305 Union St., Peterborough, NH 03458, 603-924-7803.

Circle 552 on Reader Service card.

Power Struggle

The Power-200 rechargeable battery ($49.95) runs your Model 100 or 200 for up to 15 hours without recharging. When it needs a charge, you plug it up to your computer's ac adapter. And you can charge the Power-200 while you use the computer.

The battery is 10 inches long with a ¾ inch diameter and weighs 6 ounces. It comes with a velcro strip so you can attach it to the computer. The Power-200 can also power the Chipmunk disk drive, TRP-100 printer, and CCR-82 computer cassette recorder. For more information, contact A.R.M.S., 12131 Old Buckingham Road, Midlothian, VA 23113, 804-794-6675.

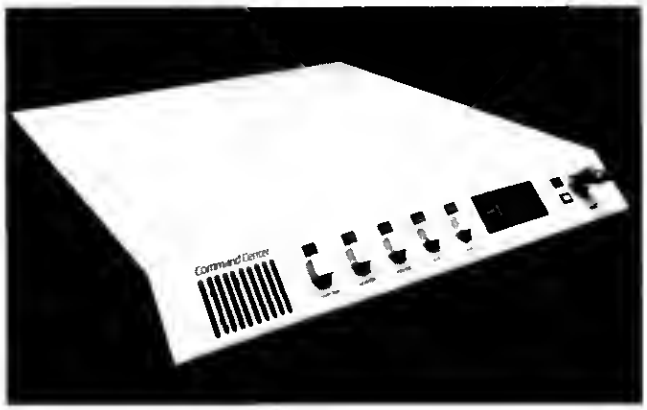
Circle 557 on Reader Service card.

A Super Book

PowerSoft Products offers a new version of *Using Super Utility 3.X, Super Utility 4/4P, and PowerTOOL* ($19.95). The user's guide tells you about the intricacies of best usage of Super Utility or PowerTOOL on the Models I, III, and 4/4P/4D. The author, Paul Wiener, describes functions that may not be immediately clear to you, including a step-by-step way to rescue and configure disks. A special section handles various kinds of NEWDOS/80 problems.

For more information, contact PowerSoft Products, 17060 Dallas Parkway, Suite 114, Dallas, TX 75248, 214-733-4475.

Circle 562 on Reader Service card.



Master control for your computer and peripherals.

Picture This

PIX lets you transfer pictures from one computer to another computer for editing or printing. PIX conversion programs exist for the TRS-80, IBM PC, Macintosh, Commodore-64, Atari XL, Kay-Pro, and Televideo TPC-1 computers, and the Epson, Tally, and Okidata printers.

Members of TUG (telecommunications user's group) developed the PIX standard through discussions on bulletin boards. You run your graphics file through a PIX conversion program to make a PIX file and then send the file to another computer or bulletin board for storage or retrieval. PIX conversion programs are in the public domain. For information on how to get these programs, send a legal-size, self-addressed, stamped envelope to TUG, Box 45254, Seattle, WA 98145.

Circle 565 on Reader Service card.

Family Ties

Quinsept's Family Roots, a genealogical data base program, is available for the Model 4 under TRSDOS. It stores all information (names and generations) on your ancestry, searches through that information, and prints out several types of genealogical charts and forms.

In addition to the the Model 4, Family Roots also runs on the Models 1000 and 2000 and selected CP/M machines. The program is $185. If you would like more information, you can order the manual ($15, which is deductable if you buy the program) or contact Quinsept Inc., P.O. Box 216, Lexington, MA 02173, 617-641-2930.

Circle 567 on Reader Service card.

Food Analysis

Diet Analysis from Health Software for the 64K Color Computer tells you how much protein, calories, vitamins, and minerals you get from your daily food intake. You enter food selections from a printed list of 181 foods.

The program compares the computed totals to your individual minimum daily requirement (MDR) if you're over 18, or recommended daily allowance (RDA) if you're under 19. There are 14 different age/sex categories for the MDR and RDA standards.

Included with Diet Analysis are three programs on nutritional therapy, hypoglycemia, and an individual biorythm grapher. The package is $10 for a tape and $12.50 for a disk. For further information, contact Health Software, 1521 Lancelot, Borger, TX 79007, 806-274-3083.

Circle 569 on Reader Service card.

Numbers and Math

Computer Science Press offers *Introduction To Computer Mathematics* ($27.95) by Russell Merris. The book describes how to use the computer to study probability, statistics, algebra, and geometry. You also learn about interactive computation, computer programming, number bases, number theory, and polynomials and functions.

A special teacher's edition of the book is available ($32.95) that offers supplemental material, answers to the exercises, and more. For more details, contact Computer Science Press Inc., 1803 Research Blvd., Rockville, MD 20850, 301-251-9050.

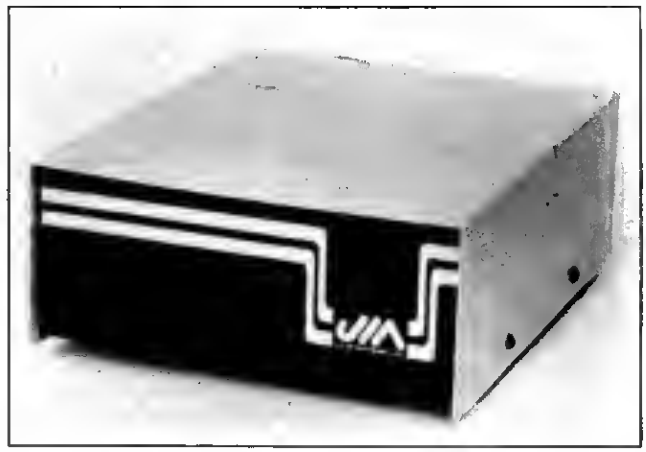
Circle 561 on Reader Service card.

Payroll System

A SUPER-P/R Payroll Job Costing ($77) from Microcomputer Applications is available for the Models I, III, 4/4P, and IBM PC and compatibles. It works together with the SUPER-P/R payroll system ($213) so you can figure gross payroll by job or function.

During a payroll period, you can enter multiple payroll transactions for an employee using an eight-position job number and then

NEW PRODUCTS



Hord drive system for your Color Computer.

produce transactions of gross wages by employee or number. You can transfer the transactions to the SUPER-P/R payroll file. SUPER-P/R updates employees' current earnings record, calculates all withholdings, and posts miscellaneous deductions.

For more information, contact Microcomputer Applications, 3485 Mock Orange Court S., Salem, OR 97302, 503-364-1090.

Circle 553 on Reader Service card.

CoCo Drive

A new hard drive from J&M Systems for the Color Computer comes in 5-, 10-, and 20-megabyte capacities.

The drive comes complete with case, power supply, cables, OS-9 drivers, and instructions. It runs under the OS-9 operating system and requires J&M Systems' JFD-CP disk controller. You can boot OS-9 directly from JDOS without using a boot floppy.

You can partition the drive into seven logical units or leave it as one large logical unit. The 5-megabyte system ($495) and the 10-megabyte system ($650) use 5¼-inch drives. The 20-megabyte system ($795) uses 3½-inch drives. For more information, contact J&M Systems Ltd., 15100-A Central S.E., Albuquerque, NM 87123, 505-292-4182.

Circle 581 on Reader Service card.

Orderly Letters

Aquarius offers Alphabetizing, a program for early learning and beginning reading students. The program works on the Models III, 4, and the Color Computer. It uses graphics to illustrate areas such as missing letters, letters that come before/after others, alphabetizing words with pictures, alphabetizing by first letter, and more.

Alphabetizing comes complete with teacher's guide and two disks for $55. Back-up sets are $16. For more information, contact Aquarius People Materials Inc., P.O. Box 128, Indian Rocks Beach, FL 33535, 813-595-7890.

Circle 558 on Reader Service card.

C Functions

Kim Brand's *Common C Functions* ($17.95) from Que Corp. includes generalized functions and programs you can add to your C libraries. When you write programs, you can pull these functions from the libraries and combine and adapt them as you want. A child's one-page editor and a say-get function similar to that in dBASE II are examples of functions and programs included.

The author also provides many examples of working source code and explains why they work. In addition, the book offers dozens of C functions that teach C coding techniques. All the C code is available on a companion disk ($49.95), which is sold separately. For more information, contact Que Corp., 7999 Knue Road, Suite 202, Indianapolis, IN 46250, 317-842-7162.

Circle 555 on Reader Service card.

NEW PRODUCTS

ACCO Anti-Glare CRT filter.

Clear View

ACCO Anti-Glare CRT filters are available in several sizes to fit your computer screen. They mount with self-adhesive clips.

The Anti-Glare CRT filters start at $29.95. For more information, contact ACCO International Inc., 770 S. ACCO Plaza, Wheeling, IL 60090, 312-541-9500.

Circle 566 on Reader Service card.

Tax Solutions

TaxCalc Software's new version of the TaxCalc spreadsheet tax planning template incorporates tax changes made for 1985 and covers more states. Each template works with most spreadsheet programs for what-if analysis of tax liabilities. The templates and the main program, TaxCalc Tax Planner, work on all Tandy (TRSDOS and MS-DOS) computers except the Model I. You need one disk drive. The TaxCalc Tax Planner is available for $150.

Tax-planning templates are available for Arizona, Illinois, Ohio, Oregon, and Minnesota for $50 each; and California, New York City, and New York State for $100 each.

The Planner lets you analyze a specific tax situation and examine alternatives. You can also use it as a tool in checking tax returns. You fill in the data that follows the appropriate tax form and use the spreadsheet's Recalculate command to post all results. The program calculates data by line number for Form 1040, Schedules D and G, Form 4972, and the alternative minimum tax under the Tax Reform Act of 1984. State and local templates follow appropriate state or city forms.

For more information, contact TaxCalc Software Inc., 4210 W. Vickery Blvd., Fort Worth, TX 76107, 817-738-3122.

Circle 560 on Reader Service card.

Star Trek

RAM TREK IV is a Model 4 (TRSDOS 6.X) disassembler from En Fleur Corp. that maps inner memory of RAM or a disk. You can disassemble pertinent areas of memory into symbolic, hexadecimal, or ASCII code. The program lets you stack up to 20 windows with independent address locations and modes.

RAM TREK IV lets you select banks zero to 2 for disassembly; debug, trace, and analyze software; mix or match disassembling modes among windows; edit the contents of disk or memory areas; and send disassembled information to the printer. The program costs $39.95 plus $2.25 for postage and handling. For more details, contact En Fleur Corp., 2494 Sun Valley Circle, Silver Spring, MD 20906, 301-598-4532.

Circle 556 on Reader Service card.

Note Maker

TCE's Memo Writer ($64.95) is a word processor for the whole family. It lets you set character size, set tabs, substitute words, and search and replace specific words. It includes three notepads where you can store text and then copy it to other documents.

The program has click-down menus you can use

NEW PRODUCTS

with a mouse or a joystick, on-screen underlining, and more. The program works on a 64K Color Computer or a 128K Model 1000. Network versions are available for the Color Computer (Network II, $129.95) and a 256K Model 1000 (Network IV, 149.95).

The Memo Writer is available via Express Order Software from Radio Shack. For more information, contact TCE Programs Inc., P.O. Box 2477, Gaithersburg, MD 20879, 800-4TC-4TCE.

Circle 568 on Reader Service card

On Line Help

IM-PRESS' *1-Hour Telecomputing* by Alford, Retelle, and Wnorowski helps you get the most out of telecomputing. The book includes information on the RS-232 serial communications interface, UARTs, modems, communications software, bulletin board systems (BBSes), and how all these parts work together. The book also contains a glossary of telecomputing terms, ASCII control codes, and resource addresses.

1-Hour Telecomputing costs $19.95 plus $2.50 for handling. For further information, contact IM-PRESS, 1412 Rosewood, Ann Arbor, MI 48104, 313-761-2231.

Circle 551 on Reader Service card.

Portable Ware

Queue Software Systems offers C-NUM, a renumbering utility, and C-SORT, a sort utility, for the Model 100. C-BUG, a debug utility, also is available for the Models 100 and 200.

C-NUM ($19.95) guards against line numbers less than zero or greater than 65,529, increments less than 1, unlisted line numbers, insufficient memory, and ASCII line length greater than 256 bytes. The program is fully relocatable and has complete error-checking.

C-SORT ($24.95) sorts columnar data. Records may be be up to 255 bytes long. You start and end columns within the range 1 to 255. C-SORT prints to the screen, printer, or a cassette or RAM file.

C-BUG ($19.95) displays Basic variables and their current values on-screen or on paper. The program is fully relocatable. You can call C-BUG several times from any Basic program to observe changes in variables' values. You'll see the line number followed by a list of variables. Control then goes back to the running Basic program.

For more information, contact Queue Software Systems, 4528 Belleview, Suite 210, Kansas City, MO 64111, 816-322-0936.

Circle 559 on Reader Service card.

Rain Forest Adventure

Treasure of the Aztecs is a high-resolution graphics adventure game for the 64K Color Computer from Computerware. You have to survive the perils of the rain forest and find the missing trail to the great treasure.

The game features special sound effects and four-voice music, over 50 high-resolution graphics screens, an advanced interpreter for full length sentence input, and load and save commands for games in progress. You can use the Radio Shack SSC Speech Cartridge with the game.

Treasure of the Aztecs costs $24.95 for cassette and $27.95 for disk (plus $2 shipping). For more details, contact Computerware, Box 668, Encinitas, CA 92024, 619-436-3512.

Circle 582 on Reader Service card.

Book Worms

The Library Processes System (LPS) Catalog Card program ($225) from EDUCOMP works on the Models III, 4/4P, and IBM PC-compatibles (including the Model 1000). You need 48K, two disk drives, and a tractor-feed printer with a slit in the bottom, like that on the DMP-400 (so cards can feed from below).

The program handles up to 660 items per disk. It lets you process full sets of catalog cards and book lists. You can add or delete entries, sort alphabetically by author or numerically by call number, and search by key word or groups of call numbers. The program

also allows Dewey Decimal and local cataloging (up to 10-place cutter number).

A companion to the Catalog Card program, the Spine/Pocket/Card Labels program ($125), uses data already entered with the catalog program. It produces two spine labels and two author/title labels. Contact EDUCOMP, 919 W. Canadian St., Vinitia, OK 74301, 918-256-7183.

Circle 564 on Reader Service card.

DIFFERENT TRACK

Wrist Band Mania

The Charleswater STATFREE CP407 elastic style wrist band conducts static charges away from your body via interwoven stainless steel fibers in a lightweight polyester fabric. The bands are washable and come in small, medium, and large sizes.

The ground cords come in 5-foot straight lengths or 6- and 10-foot coiled wires complete with a combination alligator clip and banana jack plug. Prices start at $15. For more information, contact Charleswater Products Inc., 93 Border St., W. Newton, MA 02165, 617-964-8370.

Circle 563 on Reader Service card.

New Products Index

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

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CP/M-68K

TANDY-6000 MacIntosh

You purchased a computer with an MC68000 16/32-bit processor, one of the most powerful available. **Now you need the software to make it run!**

You need a powerful operating system like **CP/M-68K.** You need full-featured compilers for **FORTRAN-77, PASCAL, C,** and BASIC. And you need the compatibility to run the many CP/M-2.2 programs you are familiar with.

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Winning Ways

80 Micro's panel of judges (*80 Micro* technical editors) picked three winning two-line word processors from the many imaginative entries to the premier November 1985 Fine Lines contest (see Program Listings 1–3). We looked for smoothly working programs marked by effective and elegant programming techniques.

Our winners demonstrate several space-saving tricks and a variety of word processing features considering the contest limitations. However, since the winning lines are long, you'll need to use the edit mode to type in the listings.

Ronald Day (West Caldwell, NJ) used While. . .Wend loops exclusively in his wordwrapping Model 4 entry (Program Listing 1). Note the endless loop (While 1. . . Wend. 1 is always true) he uses to read the keyboard and process input. It's a neat way to jump back into the middle of a line of code.

Major features of Day's entry include wordwrap with text entry, and insert (shift/right-arrow) and delete (shift/left-arrow). Wordwrap doesn't work while you insert or delete text. The arrow keys give full-screen editing (with scroll protection), and control/colon dumps the screen to your printer.

Mike Strong (Annville, PA) wrote one of the best Model I full-screen editors (Program Listing 2). His entry also works on the III. To free up space for a Model I printing routine, Strong cleverly used an array (filled from a data statement) to assign functions to the editing keys.

You control the cursor with the four arrow keys, shift/down-arrow/B to home, shift/down-arrow/F to the left margin, and shift/left-arrow to backspace. Pressing the clear key clears the screen, and shift/down-arrow/E erases to the end of a line. Other commands preceded with shift/down-arrow are C and D to turn the cursor on and off, and P to print. But be careful: there's no scroll protection.

Steve Hill (Norwich, CT) used logical comparison instead of an If. . .Then. . . Else structure to make space for routines that save (control-S) and load (control-L) a file in his Model 4 program (Program Listing 3). You are prompted at the start for the file name. Hill also had room for insert- and delete-character functions (control-E and control-D). The four arrow keys allow full-screen editing. Control-/ homes the cursor; the shift/enter keys move it to the left margin. The clear key clears to the end of the screen.

Honorable mention goes to Adam Rubin (Wappinger Falls, NY) for writing a powerful one-line word processor (Program Listing 4). It performs file input/output.

This Month's Model

80 Micro presents its fourth back-page programming problem this month: a two-line Basic address and telephone directory. Your entry will have to use file input/output, of course. For the sake of *80 Micro*'s techies, please document your entry. What computer(s) does it run on and how do you make it work? Point out or explain any noteworthy techniques (especially those POKEs and PEEKs). Packed lines of code resist understanding, so help us out. You can also win prizes for submitting problems that we use in future contests.

Please note that we've had to change the deadline from the 21st to the 15th of each month to meet our production schedule. Otherwise the rules remain the same:

1. Owners of all TRS-80 and Tandy systems with the exception of the Pocket Computers are eligible. We'll consider degree of difficulty when comparing solutions created on different machines.
2. The deadline will always be the 15th of the issue month. Thus, this month's deadline is March 15, 1986. We realize that this doesn't give everyone the same amount of time to come up with their entries (we apologize to our overseas readers especially), but postponing the deadline any longer would add another month to our publishing the answers.
3. Speaking of the answers, they'll appear three issues from the issue in which the problem appears. Thus, this month's winners will make their appearance in the June 1986 issue.
4. Employees of CW Communications are not eligible.
5. We will not, unfortunately, be able to return entries.
6. Specify your T-shirt size. Bumper size not required.■

Program Listing 1. Ronald Day's Model 4 word processor.

```
30 DIM Z$(22):CLS:FOR I=0 TO 22:Z$(I)=STRING$(80," "):NEXT:WHILE 1:WHILE X$="":X
$=INKEY$:WEND:C=ASC(X$):WHILE C<12:PRINT CHR$(C+16);:C=18:WEND:A=ROW(Y):B=POS(X)
:WHILE C=13 OR C=32 AND B>70:A=A+1:B=1:C=0:WEND:WHILE A>22:A=22:WEND:L$=Z$(A)
50 M$=MID$(L$,1,B-1):WHILE C=24:L$=M$+MID$(L$,B+1)+" ":PRINT@(A,0),L$;:C=0:WEND:
WHILE C=25:L$=M$+" "+MID$(L$,B,80-B):PRINT@(A,0),L$;:C=0:WEND:PRINT@(A,B-1),;:WH
ILE C>31:PRINT X$;:MID$(L$,B,1)=X$:C=0:WEND:X$="":Z$(A)=L$:WEND
```

End

Program Listing 2. Mike Strong's Model I/III word processor.

```
1 IFF% K$=INKEY$:IFK$=""THEN1 ELSEIFK$<CHR$(11) K$=CHR$(C(ASC(K$))) ELSEIFK$=CHR$(
91) K$=CHR$(27) ELSEIFK$=CHR$(24) K$=CHR$(8) ELSEIFK$=CHR$(31) CLS
2 DATA8,28,15,14,30,29,8,24,25,26:IFF%=0 FORI%=1TO10:READC(I%):NEXTI%:CLS:PRINTCHR
$(28);:F%=-1:GOTO1:ELSEIFK$=CHR$(16) FORI%=15360TO16320STEP64:FORJ%=I%TOI%+63:LPRI
NTCHR$(PEEK(J%));:NEXTJ%:LPRINT:NEXTI%:GOTO1:ELSEPRINTK$;:GOTO1
```

End

Program Listing 3. Steve Hill's Model 4 word processor.

```
100 CLS:IF A=19 THEN OPEN"O",1,F$:FOR I=0 TO B:PRINT#1,L$(I):NEXT:RUN ELSE IF A=
12 THEN OPEN"I",1,F$:FOR I=0 TO 22:LINE INPUT#1,L$(I):PRINT L$(I);:NEXT:PRINT@0,
;:CLOSE ELSE B=23:DIM L$(B):FOR I=0 TO B:L$(I)=SPACE$(80):NEXT:INPUT"FILENAME";F
$:CLS
200 I$=INPUT$(1):A=ASC(I$):IF A=12 OR A=19 THEN 100 ELSE R=ROW(0):C=POS(0):I$=CH
R$(A-16*(A<14)):E$=SPACE$(-(A=5))+MID$(L$(R),C+(A=5)+1,(C-80)*(A<6)):MID$(L$(R),
C)=E$:PRINT E$;:PRINT@(R-(A=13)+(R=B),C-1),I$;:IF A>31 THEN MID$(L$(R),C)=I$:GOT
O 200ELSE 200
```

End

Program Listing 4. Adam Rubin's one-line Model 4 word processor.

```
1 INPUT"File";F$:OPEN"R",1,F$,1:FIELD 1,1AS G$:CLS:WHILE NOT EOF(1):GET 1:PRINT
G$;:WEND:A$=INPUT$(1):WHILE ASC(A$):B=ASC(A$)-8:WHILE(3 AND B)=B:B=B+16:WEND:WHI
LE POS(0)>64 AND B=24:B=2:WEND:A$=CHR$(B+8):PRINT A$;:LSET G$=A$:PUT 1:A$=INPUT$
(1):WEND:CLOSE
```

End

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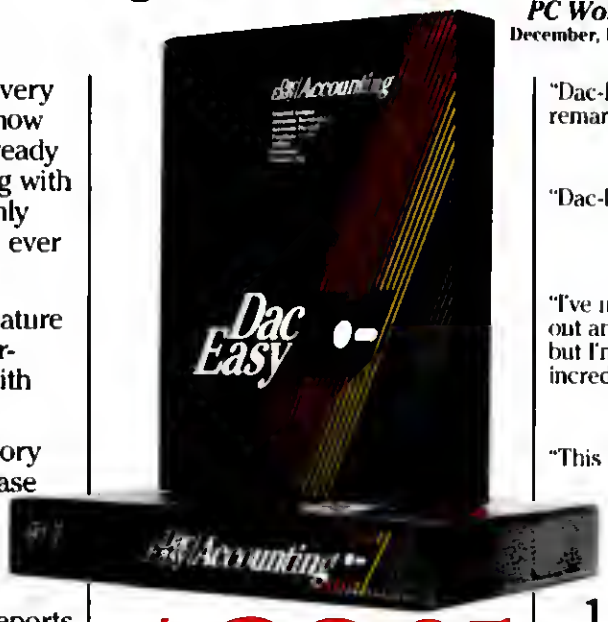

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