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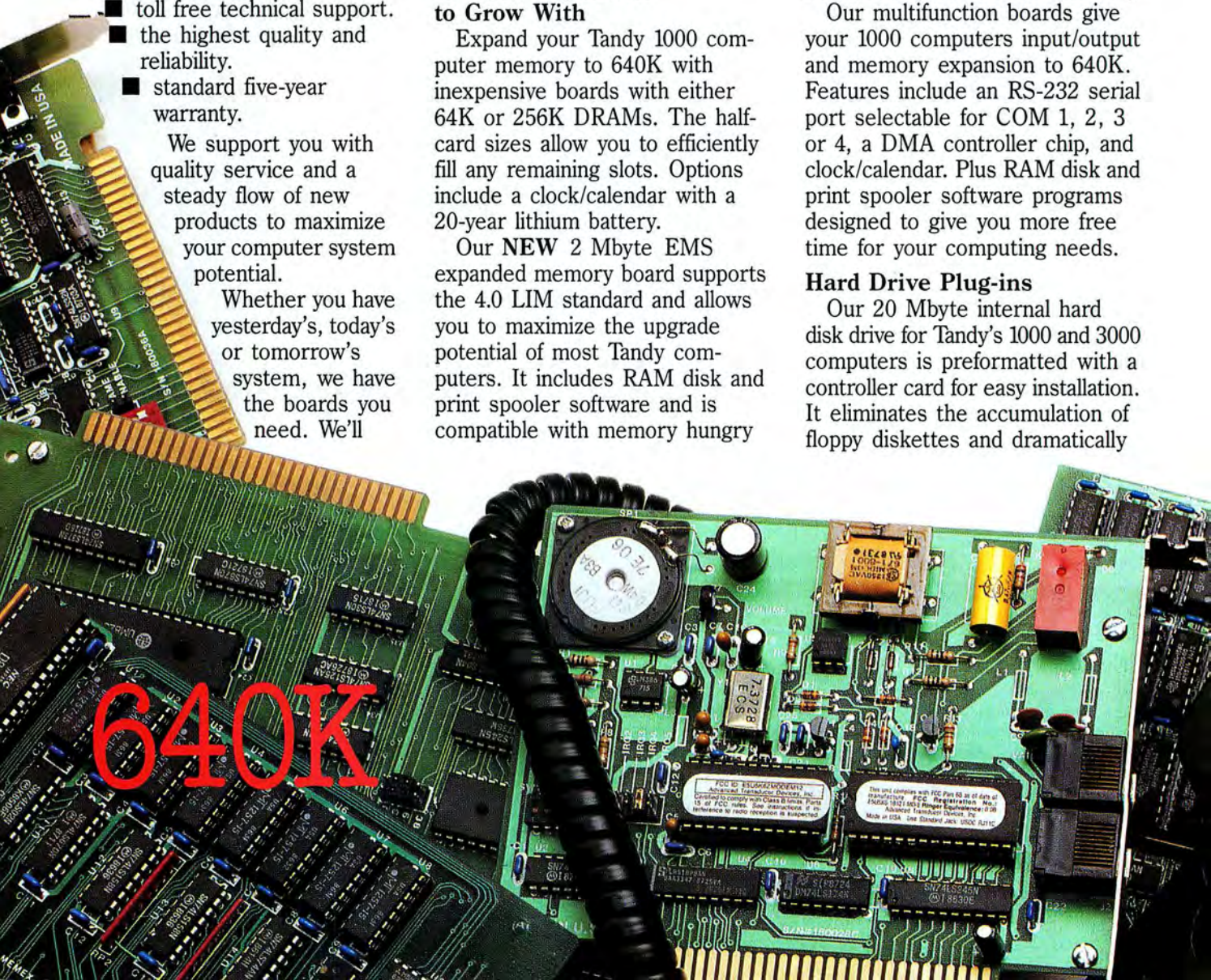

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On Our Cover

The new Tandy 1000 TX offers 80286 speed at an 8088 price. See David Williams' evaluation of this computer on page 30.
Photography by Larry Dunn

The program listings included with 80 Micro *run on all Tandy MS-DOS computers unless otherwise noted. The Model 2000 and Tandy 600 are not true MS-DOS compatibles, and we do not cover either computer.*

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Know Thy Reader

■ by Michael Nadeau ■

"Know thy reader" is one of an editor's Ten Commandments. "Don't trust surveys" is another. Having stated this, I'd like to tell you about the results of a recent *80 Micro* reader survey.

Last fall, we mailed 1,000 questionnaires to a random sampling of our subscribers. Nearly 500 responded. The survey was designed to reveal three things about our readership: what computers you use, your interests, and your level of computer expertise. Much of what we learned was expected, but you did surprise us in a few instances.

Before I get into specifics, keep in mind that this survey was mailed when *80 Micro* covered both TRSDOS and MS-DOS computers. Unless otherwise noted, the totals and percentages I cite here represent only the MS-DOS respondents. Of the 492 questionnaires returned, 278 came from Tandy MS-DOS users.

Tandys of Choice

As anticipated, Tandy 1000 users (255) greatly outnumbered users of other Tandy MS-DOS models (49). Tandy 3000 ownership was next highest with 25. The 1200, 2000, and 4000 accounted for 24 responses. (Multiple model ownership explains these figures adding up to more than 278.)

The most popular 1000 was the original model, with 118 responses. The SX was next with 98, then the EX with 36. The HX and TX claimed a total of three responses each. I expect the EX and the newer HX to remain less popular than both the SX and TX. While the lower-end 1000s appeal to entry-level buyers, they offer less expandability for small-business owners and computer-using professionals, who represent larger markets for Tandy.

I also expect to see more 3000 owners reading *80 Micro* in the near future. The price is dropping to within reach of many traditional 1000 buyers; some mail-order franchises have discounted the price of the 3000 HL to about the retail price of a 1000 TX. The 1400 LT should come on strong, too. It's a solid unit priced ($1,200 discount) to seize a good chunk of the MS-DOS portable market.

Your Likes and Dislikes

We asked three questions to determine your computing interests: One concerned feature articles, and the others concerned software and hardware reviews, respectively.

Of the 16 topics listed on the questionnaire, 10 drew a 20 percent or higher response. (Readers were asked to choose three items.) Those topics, in order, were software reviews (45 percent), MS-DOS tutorials (44 percent), type-in utilities (36 percent), business-related programs (33 percent), batch file tutorials (30 percent), hardware reviews and telecommunications (24 percent each), graphics and Basic tutorials (23 percent each), and games (22 percent).

This is the first *80 Micro* survey I can recall where utilities did not rank first in interest. Also, the urge to program seems not to be as strong as it once was. My interpretation is that computer users, or more specifically, MS-DOS computer users, are more application-oriented now.

Productivity—which I take to mean getting the job done in the most efficient manner possible—is the primary pursuit of our readers. Technical knowledge and recreation are still important, but only secondarily.

The top software review items were utilities (27 percent), word processors and personal finance software (26 percent each), desktop publishing products (24 percent), data base managers (23 percent), communications and educational software (21 percent each), and games and programming languages (20 percent each).

Notable here are the items with the lowest response: networking products (9 percent), business graphics (10 percent), general ledger/accounting software (13 percent), and spreadsheets (18 percent). I can understand interest in networking being so low; few home users or small businesses need it. I did expect a more enthusiastic response to the business-related topics.

I suspect that readers tended to choose items that piqued their interest rather than those of immediate use to them. For instance, I doubt that 24 percent of our readers are actually using desktop publishing. The topic is "hot," however, and that promotes interest that otherwise might not exist among computer users.

You were clear on your choices of hardware items to review: Hard drives (42 percent), multifunction boards (35 percent), printers (31 percent), memory (24 percent), and modems (23 percent) outpaced the rest of the field. Surprisingly low were keyboards (4 percent), monitors (8 percent), and EGA/VGA adapters (15 percent).

Apparently, a lot of you are looking to buy hardware, especially hard drives, multifunction boards, and printers. Look for advice on these items in upcoming issues. I attribute the low ratings for keyboards, monitors, and video adapters to a lack of awareness of alternatives.

Tandy would have its customers believe that they must stick with its hardware, but several companies are developing better keyboards and video adapters specifically for the Tandy 1000. Many inexpensive, high-quality, third-party monitors are available for your Tandy. We plan to review these items despite their low ratings on the survey.

Level of Coverage

The survey wasn't successful in telling us if we were hitting our readers at the right level. I can only make guesses by reading between the lines.

First, the facts: You've owned your computer for an average of 3.66 years—a relatively long time. You use your computer mostly at home for personal tasks (89 percent) and at home for business (64 percent). Only 30 percent of you use them at work.

You rate yourselves as beginning to intermediate Basic programmers with little interest in other programming languages. You generally agree that the magazine is easy to read and disagree with the statements that the magazine is too technical and that the magazine isn't technical enough. The other computer magazines you read tend not to be very technical.

I have no solid conclusion on your average level of expertise. My guess is that the level of *80 Micro's* content is close to what you need. In the next survey, I hope to reword the questions so they'll provide more definitive answers.

The Trouble with Surveys

While surveys are an important tool for gauging reader interests, they have their faults. First, you never know if the person filling out a questionnaire interprets the questions the way you intended them to be understood. Second, there's no guarantee that the respondents represent the readership at large.

For example, I suspect that the number of TRSDOS users responding to the survey was out of proportion to the actual number of TRSDOS-using readers. Surveys based on reader service card responses contradict the numbers in this survey.

Finally, it's too easy to rationalize when the results aren't what was expected, dismissing them because you don't want to accept what they say. Consequently, we don't use surveys alone to determine the editorial direction of the magazine. They offer valuable information about your needs, but we also need interaction with individual readers, knowledge of the market, and good instincts to serve you well. ■

Photograph by Jane Billings

Circle 141 on Reader Service card.

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11:45a Luncheon at Riverdale Country Club
Text
Worksheet
Filer
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Calendar
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ADDRESS
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LHEAD
MEMO
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The power of a desktop computer. The Tandy 1400 LT's 8088-equivalent microprocessor has a clock speed of 7.16 MHz (vs. 4.77 MHz for most other PC-compatible portable computers). The 768K RAM puts a tremendous amount of computing power into your hands. With 640K addressed by MS-DOS, and 128K for a RAM-based disk drive, you'll have plenty of memory for large spreadsheet and database applications. And you can even connect the 1400 LT to a color monitor and an enhanced keyboard for the perfect office desktop system. The 1400 LT could be the solution to all your computing needs.

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The "extras" are included. The Tandy 1400 LT comes with many standard features the competition considers extra-cost: a parallel printer adapter, RGBI and composite monitor outputs, an RS-232C serial adapter, external keyboard adapter and a real-time clock. We even include the MS-DOS 3.2 operating system, as well as GW-BASIC software.

Come in today! Want the best in both worlds of computing for a terrific low price? The Tandy 1400 LT combines the best features of a desktop computer with the ultimate in portability. Don't leave the office without it—only $1599. (25-3500)

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Accessing DOS from Basic

CAN A NEW 1000 TOP THE OLD MODEL 4?

Q. I've owned four Tandy computers—a Color Computer, a Model III, a Model 4, and a 1000 SX. Though each has offered clear advantages over the previous one, each has also had its disadvantages.

One of the advantages of the Model 4 is being able to access DOS commands from Basic. For example, I can copy a file from one drive to another without losing the Basic program. How can I do this with the 1000?

Model 4 Basic has a search-and-replace function. It also allows the use of words to designate specific program lines so that in programming it isn't necessary to remember the line numbers you want to refer back to. Furthermore, it enables you to scroll up and down in the listing. I haven't been able to find such a program for the 1000.—*Arnold H. Eichert, Fort Lauderdale, FL*

A. The Shell command in Basic allows access to DOS commands. To copy from one drive to another in Basic, use the command:

```
SHELL "COPY A:filename B:filename"
```

Take a look at a compiled Basic such as Microsoft's Quick Basic or Borland's Turbo Basic. Both have a search-and-replace function, use labels instead of line numbers, and scroll up and down in the listing. They also add several other features, particularly a significant increase in speed. They are more than worth their $99 price.

WHAT'S IT FOR?

Q. I have a 1000 SX, and I want to be able to boot an application program disk without having to install my start-up disk. In the quick reference guide that came with the computer, it says that at the A> prompt, I should type COPYDOS P, but I keep getting "Bad command" or "Bad file name" messages. I've tried it in lower- and uppercase. I've tried it with my MS-DOS/GW-Basic 3.2 and the MS-DOS Supplemental Programs disk, but no luck. And that's another thing—what is the Supplemental Disk for? The manual doesn't mention it, and I've never used it.—*Harry Spoerl, New Castle, DE*

A. Copydos is an MS-DOS 2.11 command. It is not available in 3.2 (note the 2.11 on the disk picture next to the Copydos command in Tandy's *1000 SX Quick Reference Guide*). Use the SYS command to transfer the system files to your application program disk. You must then use the Copy command to copy the Command.COM file to your application disk. Assuming your DOS disk is in drive A and your application disk is in drive B, at the A> prompt, type in the following, pressing enter after each line:

```
SYS B:
COPY COMMAND.COM B:
```

Be aware that the system files plus the Command.COM file require 70,656 bytes of disk space. You must have at least that much space available on your application disk.

The Supplemental Disk contains several utilities, most of which are briefly explained in the quick reference guide. Backup.COM, FDisk.COM, HSECT.COM, MLFormat.COM, MLPart.COM, MLPart.SYS, Restore.COM, and Shiptrak.COM are all used for hard drives. EXE2BIN.EXE, LIB.EXE, and Link.EXE are used with assembly language files. Share.EXE is used in networking.

Append.COM sets a data file path. Debug.COM is used to create and assemble small assembly language files, follow the processing of a program to "debug" (find error and correct it), and look at areas of memory or disk. Edlin.COM is a limited word processor. KEYCNVRT.SYS changes some keyboard generated codes to make them compatible with some application programs. The keys affected are the backslash (\), vertical line (|), tilde (~), single left quote (`), minus (-) (delete number lock), and plus (+) (insert number lock). KEYCNVRT.SYS must be in the Config.SYS file as DEVICE = KEYCNVRT.SYS. LPSetup.COM is a printer filter that allows pagination. Patch.COM allows you to modify a disk file (using hexadecimal values). Recover.COM recovers files with bad sectors. And finally, Spooler.COM sends commands to and gets the status of the print spooler. Spooler.SYS must be installed in the Config.SYS file as DEVICE = SPOOLER.SYS. (A spooler is a buffer that contains data on its way to the printer. It feeds the printer while allowing the computer to continue its processing.)

Send your problems and solutions to Feedback Loop, 80 Micro, 80 Elm St., Peterborough, NH 03458. Where applicable, include the proper program name and version, the computer you're using (including any non-standard system configuration), the DOS version you're using, your phone number (not for publication unless you request it), and a self-addressed, stamped envelope.

BOOTING FROM HARD DISK

Q. I have a Tandy 1000 SX. I recently reorganized the files on my hard disk according to John Harrell's recommendations (see "Beating the Hard-Disk Hodgepodge," September 1987, p. 92). Now I have only one problem: I don't know how to get it to boot up from the hard disk again. What do I do?—*Debra Heiss Hall, Green Lane, PA*

A. I suspect that when you reformatted your hard drive, you didn't use the /s option to transfer the hidden system files (IO.SYS and MSDOS.SYS) from your master DOS disk to your hard drive. You can now transfer the files to your disk with the SYS command. Place your master DOS disk in drive A and type SYS C:. Then press the enter key. Also be sure to put the Command.COM file in your root directory.

UPDATING DOS

Q. I have an early Tandy 1000: BIOS (basic input/output system) 01.01.00, MS-DOS 2.11.24, with a 10-megabyte (MB) external hard disk. Can I change the DOS to 3.2? I have the 3.2 on a floppy, but copying it to my hard disk still leaves me in 2.11. If I try to run a command peculiar to 3.2, I get an "Incorrect DOS version" message.

Illustration by Maris Bishofs

Is there anything I can do?—*Robert Hogg, Anacortes, WA*

A. You also need to use the SYS command to transfer the 3.2 hidden system files to update your DOS. The Copy command does not transfer the hidden system files.

THIRD-PARTY PERIPHERALS

Q. Most of the early MS-DOS Tandys would not accept third-party peripheral cards—controller or EGA cards—in their slots. If I buy a 3000 HL or a 4000, will I be able to buy stock AT cards now readily available at reasonable prices and install them as I would in any other clone or compatible?—*Al Perkins, Palm Coast, FL*

A. Yes, you should be able to use any stock AT cards now available. I don't believe that there's any such thing as 100 percent compatibility among computers, even those manufactured by the same company.

It's always wise to establish before purchase either that the board has been proven compatible with your system or that you have the option of a refund if the board proves to be incompatible.

MOVE QUBIE TO A TX?

Q. I have an original Tandy 1000 and a 20MB hard disk supplied by Qubie. The controller card for this disk is specially designed for the Tandy 1000's unique interrupt structure. However, I now need a faster system. Will this disk drive work with a Tandy 1000 TX?

At what speed does the coprocessor run? Will I need an 80287-8 for the 1000 TX?

Can I use one of my two 5¼-inch floppy drives from my old 1000 in the 1000 TX?—*Anthony Q. Martin, Clemson, SC*

A. Yes, you should be able to transfer your hard drive and controller card and 5¼-inch floppy drive over to your new 1000 TX. And yes, you should get a 80287-8 coprocessor for the TX. The number after the hyphen indicates the speed to which the coprocessor is quality tested. This should be equal to or higher than the speed of the computer.

ADDING A SECOND HARD DRIVE

Q. Is there a 20- or 30MB hard drive I could use to replace the 10MB drive in my 1200? What would be involved in adding a second external hard drive? —*W.L. Garrott, Gainesville, FL*

A. Hard Drive Specialist, 16208 Hickory Knoll, Houston, TX 77059, 800-231-6671, and Bi-Tech (BT Enterprises), 10 Carlough Road, Bohemia, NY 11716-2996, 800-645-1165, both supply hard drives for the 1200. The drives come with controller boards, most of which allow you to attach a second hard drive such as an external drive. The external drive would have to have a casing, a power supply, and cables to connect to the controller board.

The installation is not difficult. After you remove the outer case, unscrew the floppy drive and slide it forward so you can access the screws of the hard drive. Remove the old hard drive and controller board and insert the new hard drive and controller board according to the instructions included with the unit. Replace the floppy drive and cover, and you are ready to go.

PRINT QUEUE

Q. I am using a 1000 SX with 640K, operating under MS-DOS 3.2. I have a question concerning the print queue program (Print.COM) that comes with MS-DOS. The quick reference guide says that the program accepts commands to change the number of files in the print queue, but every time I've tried to use the /Q: option, the program gives me an "Invalid param-

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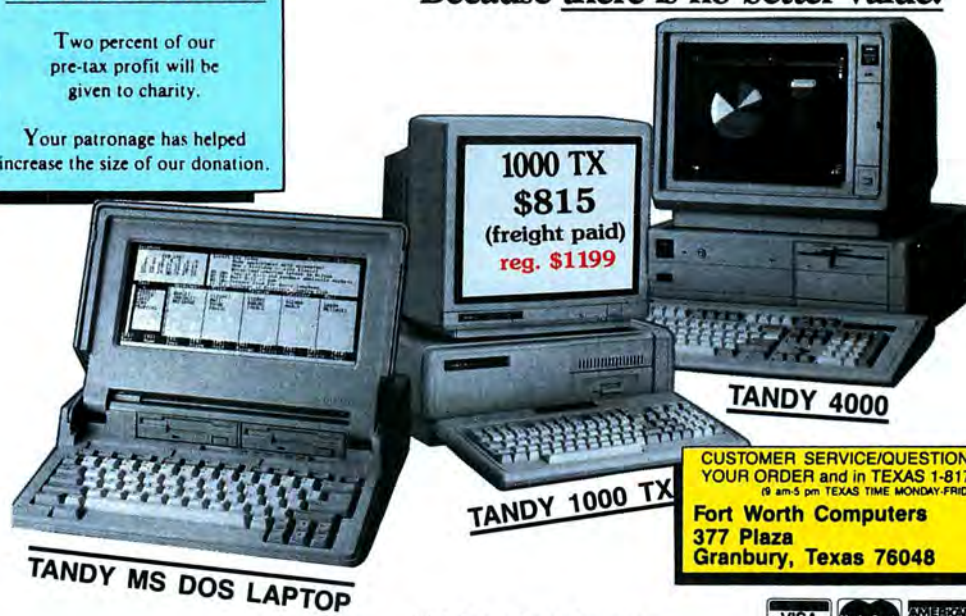

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eter" error message.

I called the local Radio Shack store and they gave me a number for Radio Shack's MS-DOS support group, but every time I try to call the number I get a busy signal. Any ideas on what I can try or what I am doing wrong?—*Scott A. Michels, Sanford, FL*

A. The /D: option to specify the print device, the /B: option to specify the buffer size, and the /Q: option to specify the number of files allowed in the print queue must be in the first Print statement used after you boot. If they are introduced after a Print statement has been used, they will result in an "Invalid" parameter error message.

The Tandy support number is 817-338-239n, where n is zero for spreadsheets and word processing; 1 for accounting; 2 for languages and operating systems; 4 for hardware; 5 for Color Computers, laptops, and games; and 6 for education. Please note that the call is on your nickel, and you may have a long wait on line.

KEY QUERY

Q. I purchased a 1000 EX several months ago. Because it was sold as "IBM compatible," I assumed this meant I could use any IBM-compatible software.

The 1000 EX keyboard, however, has 90 keys, and the IBM keyboard has 101. This was immediately apparent when I bought some IBM-compatible software that required a number of keystrokes for which there were no keys on my 1000 EX—for example, the scroll lock key.

The software manufacturer told me to ask Tandy. Tandy told me to ask the manufacturer. Can you help me? It seems that if the 1000 EX is compatible, there must be combinations of keys that will produce the required scan codes. Otherwise the computers wouldn't be "compatible." —*F.C. Le Rocker, San Jose, CA*

A. Use the alternate-break key combination to emulate the scroll lock key. Add KEYCONVRT.SYS (included with DOS) to the Config.SYS file by adding the line:

DEVICE = KEYCNVRT.SYS

Be sure to place KEYCONVRT.SYS in your root directory. This will eliminate most compatibility problems.

Some programs look for a key's position on the keyboard so you can use the "2," "4," "6," and "8" keys on the numeric pad as the arrows and the left arrow key as the backslash.

I strongly suggest the same for software as I did for hardware (see "Third-Party Peripherals," above). Be sure to establish that a program has been proven to run on your system; if you can't do that, make sure you have the option of returning the program if you can't use it.

GONE FISHING

Q. James McLean's letter (see "Fishing For Chips," November 1987, p. 10) gave me the idea that I too could upgrade my 1000A. I have the same upgrade board mentioned in the article, with 128K and room for another 128K. I ordered and installed two sets of 64K chips but cannot access the memory addresses. Does this upgrade require more than just putting in the memory chips? Do I need another chip or a special jumper?—*Alan M. Pess, Bellmore, NY*

A. A jumper should have been enclosed with your board, if not already installed on it. The absence of the jumper on pins E1 and E2 tells the computer that the board has 128K installed. When the second 128K is installed, the jumper must be installed on pins E1 and E2 to inform the computer there is 256K. If you've lost the jumper, you can buy one at an electronic parts or Radio Shack store. ■

by Ron White

Spawning a Computer "Virus"

The hunter moves quickly and silently through the battlefield, searching for an enemy that lurks unseen. The hunter must be wary because it, too, is hunted. The enemy could attack at any moment, hacking the hunter in two and wiping it out of existence. Almost too small to be noticed but deadly just the same, the enemy springs. The hunter never knows what's happening. One moment it is on the attack, but the next moment it is obliterated. The only witnesses to its death are a group of people gathered around a computer screen.

The computer is the only window to this particular war, which is being fought entirely within the memory of a personal computer at the Computer Museum in Boston. The people are members of the International Core Wars Society. They may be strange poets in their own fashion because they write programs that are violent imitations of life and death.

Their creations are not video games—at least not the familiar kind in which images of soldiers, space ships, and monsters are manipulated with joysticks and buttons. "Core wars" are battles between rival programs for control of a theoretical computer's operating system. The only video images created by the battles are seemingly random clumps of differently colored pixels on the computer screen.

Each pixel represents a location in the computer's core memory that is occupied by part of one of the opposing programs. The display changes as the programs move through the memory, sometimes spawning clones of themselves that take up the hunt. When one program spots a portion of the enemy's code, it wipes it out. The winner is declared when not enough of the enemy code is sufficiently intact to function.

"It's kind of an aesthetic thing. It really is," said William R. Buckley, editor of *Core Wars Newsletter* and the new director of the society. Twenty-four of these hackers submitted 30 programs for the society's second annual tournament last fall at the museum. The winner was Robert Reed, a 39-year-old programmer from Windsor Locks, CT. His program, Ferret, had only 12 instructions. As its name implies, Ferret's strategy was to make itself as inconspicuous as possible. While opposing programs roamed the 8K area of the computer's memory that served as the battlefield looking for Ferret, Reed's program stayed in one spot as it sent small probes that made delicate but deadly incisions in the enemy code.

Robert Reed (left), the 1987 Core Wars champion, is congratulated by Chip Wendell (right), the 1986 winner.

In contrast to Ferret's guerilla tactics, the second-place program, Plague, written by Rod Paludan of Tucson, AZ, used the equivalent of mass bombing raids. Plague actually consisted of two programs. One tried to cause uncontrolled growth in the opponent, and the second one moved in to wipe out the opponent while the bloated code was immobilized under its own weight.

Versions of Core Wars work on MS-DOS, Apple, Amiga, and Atari personal computers, and some have even been designed for mainframes. The game actually consists of two parts. One is MARS (Memory Array Red Code Simulator), which creates a hypothetical computer within the real computer that MARS is running on. This MARS "computer" is the arena for the programs written with the second part of Core Wars, Red Code, an assembly language with its own compiler that the programmers use to create their code warriors. The language has only 10 instructions, and a program that uses more than 24 instructions is considered large among the society's buffs. But according to Buckley, with the various parameters that the instructions can use, it's possible to create different programs equal to 1 billion raised to the 8,000th power.

While the opposing programs fight it out, their creators can't do much except watch pixels change colors on the screen until MARS declares the winner. With practice, Buckley said, you can learn to recognize signature patterns created by different programs—but Galaxian, it's not.

Without the shoot'em-up appeal of many computer games, Core Wars is obviously entertainment for an elite group of sophisticated aficionados whose numbers are growing quickly. The society had only about 30 members when it began a couple of years ago, but that quickly shot up to 200, with branches in West Germany, Japan, and Australia.

The game "is designed for programmers to test their abilities against one another," Buckley said. "It's like chess, but the pieces do all their own moving.

"It's the ultimate hacker game because it satisfies the primal urge of the programmer to get around other systems," added Buckley, who in his youth cracked a defense contractor's mainframe half a continent away. "You can be a hacker and be it legally. No one is going to put you in jail. You're just writing something to use against someone who's also a hacker and who's writing something to breach your security."

Buckley sees in the hacker aspect of Core Wars some possible practical applications—if your idea of applications software is industrial and international sabotage. The principles behind Core War programs are similar to those in computer "viruses," which are insidious programs used by unethical hackers to destroy data stored on others' disks.

"A virus program could enter another piece of code and act like an AIDS virus, attaching itself to and riding the code to other disks," Buckley said. "The program could figure out how to turn on a computer's modem and download itself. It could spread from computer to computer without anyone knowing until it was too late.

"The most obvious application would be to infiltrate the IBM plant where their hard disks come from. Or you could infect the computers that control Soviet missiles, and

Photograph courtesy of The Computer Museum

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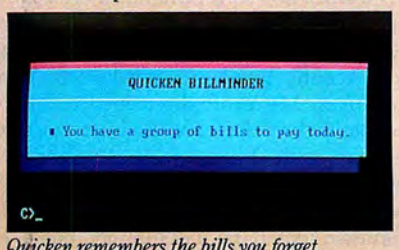

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when they're fired off, they would malfunction."

Is this science fiction, or does Buckley think that some super-secret government agency might be working on just that kind of computer espionage? "I don't know," he said. "But if anyone's interested, they can contact me. I'll be glad to do it for a million bucks."

The Core Wars concepts may also have application in the less antagonistic area of artificial life, he added. Last year, as a guest at Los Alamos National Laboratories in New Mexico, he discussed with scientists the similarities between living creatures and a Core Wars program's ability to carry out functions—including reproducing itself—without any outside control.

"Core wars may be a pre-cut of what life was all about before there was life," Buckley said.

If you feel the call to battle, there are several ways you can get started creating your own lean, mean Core Wars fighting machine. One is with a pair of programs written and sold by Buckley. The Core War Colosseum includes a MARS simulator and a Red Code assembler for MS-DOS computers. It costs $24.95 and is available through AMRAN Software, 5712 Kern Drive, Huntington Beach, CA 92659-4535. Membership in the International Core Wars Society costs $25 a year and includes the quarterly newsletter, which, by itself, is $20 annually. For membership or subscription information, write Michael de la Maza, ICWS Secretary, 10 Tumbleweed Drive, Irvine, CA 92715.

TANDYLAND

The salesman was desperate. "Do you have a Color Computer?" he asked. The answer was no. "Here. It doesn't matter. Take this. It's free. If you run into anyone with a Color Computer, give it to them." He thrust an educational game for a Tandy Color Computer III into our hands and turned back to brave the ocean of customers packed into a little retail outlet that had once been a Tandy training center in San Antonio, TX.

For the next hour, nobody left the store empty-handed. If they didn't buy anything, someone gave them a copy of the educational game from a pile near the door.

For three days, Tandy owners packed the store to grab bargain hardware and software that was gathering dust on shelves in Radio Shack stores throughout south Texas. Like a computer nerd's dream of a garage sale, the event occurs in cities throughout the country whenever unsold stock has accumulated too long.

At the San Antonio sale, copies of Dbase III, Lotus's 1-2-3, and Symphony were selling for under $50. A copy of PFS:Write cost a mere $19. Games sold for pocket change. Odd assortments of hardware—old 8-inch floppy drives, joysticks, and several Tandy 1000 and 2000 computers—could be bought at bargain prices. It was hard to determine exactly what some of the hardware was (or had been at one time), but it was snatched up by people who either knew or thought that at those prices, it was worth a chance to figure out how to use it.

In addition to the sales that pop up on an irregular basis, a Tandy warehouse on Terminal Road in Fort Worth, TX, hosts a permanent bargain basement. The store is ostensibly a regular Radio Shack store, and most of the items for sale are priced the same as at any other Tandy store. But off to one side on rows of metal shelves is a hodgepodge of surplus stock. What's on the shelves changes continually. Sometimes it's computers that were used by reviewers or Tandy's staff. Other times it's equipment that got separated from its boxes, test samples, or merchandise that didn't sell. The store has found there's even a market for mock-ups of real equipment, such as cardboard and photo imitations of stereo equipment.

Basically, the bargain shelves are potluck, which makes it all the more exciting when you discover an odd-looking piece of equipment at the back of a shelf without an identifying label, and others have passed it up because they didn't know what it was.

A trip to the Fort Worth store is only convenient for those who live in the area, but considering the time one normally spends between planes at the Dallas-Fort Worth airport, it might be a good way to kill a few hours the next time you pass through Texas.

The 1400 LT has been so successful, you'd think Tandy would be falling all over itself to get at least an 80286, hard-disk version of the 1400 on the market—better yet an 80386, which no one has done as of this writing.

Tandy's marketeers didn't anticipate the heavy demand for the 1400, and if they run true to form, they probably don't think there's that much desire for a small computer that runs so fast it wants to leap out of your lap. They might be surprised here, too.

MICRO TRENDS

Yo, ho, ho, and a bottle of RAM. Pirates, beware. American software manufacturers are on the attack, raiding the most notorious overseas black markets specializing in counterfeit programs.

Areas like the Golden Computer Arcade in Hong Kong are infamous for harboring shops that sell bootleg software complete with manuals. A new organization, the Business Software Association (BSA), conducted its first sting at the Golden Arcade and rounded up $260,000 worth of illegal software. The raid cost about $25,000 and six months of investigation for BSA, and the sting operation only scratched the surface, *PC Week* quoted Thomas Chan, an attorney for Ashton-Tate, which organized the association.

But BSA intends to conduct more raids, which have a dramatic appeal lacking in anti-piracy campaigns supported by the Association of Data Processing Service Organizations (ADAPSO) or by the Software Publisher Association (SPA). Their efforts have consisted mostly of magazines ads reminding computer users that unauthorized copying is a crime. Ads are OK, but BSA's Hong Kong raid has the satisfying ring of a Miami Vice episode.

ADAPSO is mainly an organization of companies associated with mainframes, and SPA is largely oriented toward games. BSA's members—still being organized at this writing—are likely to include microcomputer business software vendors such as Word Perfect Corp., Lotus Development, Microsoft, and Apple.

BSA has its work cut out for it. In the Golden Arcade alone there are more than 30 software bootleggers, Chan said. The most BSA can do is try to shake them up occasionally. Other sting operations will probably be conducted in Taiwan, Italy, Spain, Mexico, and Singapore.

The emphasis on foreign countries is because software companies feel that the readily available bootleg software overseas prevents them from expanding into those markets. After all, sooner or later, everybody and his dog will have a personal computer and all the software he can shove onto a hard disk. The market is greener on the other side of the sea.

There's a new bully on the block. ADAPSO attacks on IBM are reminiscent of a decade ago when IBM was the industry's heavy and constantly under attack on antitrust charges. But the way Microsoft Corp. has been acting lately, it may replace IBM as the industry's Mr. Mean.

Relations have never been smooth between Microsoft and Borland International, the manufacturer of several high-quality, low-cost software programs. But when Borland recently hired one of Microsoft's top executives, Microsoft threatened to sue on the basis that the exec had an exclusive contract with Microsoft and might give away trade secrets to Borland. Then Microsoft threatened to sue a small, virtually unknown company because its name includes the words "Micro Software Development." (Micro Software . . . Microsoft Ware, get it?) The company's owner agreed to change his name because he couldn't afford to fight Big M. ■

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Lap-Link Plus and Desk-Link

The software and six-foot serial cable that come with Lap-Link Plus ($139.95) let you connect an MS-DOS laptop to any other MS-DOS machine so they can share disk drives and printers. Desk-Link ($169.95) lets you transfer data between any two MS-DOS machines, including laptops, PS/2s, and networked computers. Both setups can transfer over 115,000 bits per second.

Traveling Software Inc., North Creek Corporate Center, 19310 North Creek Parkway, Bothell, WA 98011, 206-483-8088, $139.95.
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Better PC Tools

PC Tools Deluxe, an update to PC Tools, is a DOS utility package that includes a DOS shell; fast hard-disk backup and restore; undelete and unformat; and disk optimization, caching, verification, and safe formatting.

Central Point Software, 9700 S.W. Capitol Highway, Portland, OR 97219, 503-244-5782, $79.
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Text Collector

The Text Collector can search any file (word processing, source code, e-mail, data base) on hard or floppy disks for anything (words, parts of words, phrases, punctuation, non-ASCII characters).

O'Neill Software, P.O. Box 26111, San Francisco, CA 94126, 415-398-2255, $69.
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Disk Full

The memory-resident Disk Watcher automatically tells you when the disk you're working on is full so you won't lose your current work. The software also prevents you or a runaway program from formatting your hard disk.

RG Software Systems Inc., 2300 Computer Ave., Suite I-51, Willow Grove, PA 19090, 215-659-5300, $79.95.
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Graph-in-the-Box

The instant graph generator, Graph-in-the-Box 2.0, includes VGA and MCGA compatibility, faster performance, Ventura Publisher and Pagemaker compatibility, and batch printing.

New England Software, Greenwich Office Park 3, Greenwich, CT 06831, 203-625-0062 or 800-633-2252, $99.95.
Circle 580 on Reader Service card.

For the 386

386-to-the-Max is a memory manager for 80386-based systems. It clears implicit processing delays, freeing applications to run faster, lets your DOS applications access more and faster base RAM, remaps slow ROM to fast RAM, lets some memory-resident programs live outside the usual 640K base area, and supports the advanced page-mapping features of new LIM/EMS 4.0.

Qualitas Inc., 8314 Thoreau Drive, Bethesda, MD 20817, 301-469-8848, $74.95.
Circle 581 on Reader Service card.

FOR THE PROFESSIONAL

Business Decision-Maker

Stop/Go helps you weigh 70 factors under 13 categories to make an objective forecast on the chances for success or failure of a product, project, or other undertaking. The program can identify strong and weak areas within a project.

Suntex National Corp., P.O. Box 772868, Houston, TX 77215, 713-783-9059, $195.
Circle 568 on Reader Service card.

Conversion Tables

Memory-resident Quickinfo contains hundreds of conversion equivalencies that let you translate measurements such as kilowatts to horsepower or gallons to cubic feet.

Plies Development Corp., 2110 Crystal Hills, Houston, TX 77077, 713-493-3679, $49.
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Landlord's Helper

Rental Record Keeper manages information such as rental revenues and deposits, operating expenses and depreciation, mortgage interest and payments, year-end reports, and profit reports for any number of apartments in up to 24 rental properties.

Microease, 7110 44th Ave. S.W., Seattle, WA 98136, 206-447-2925 or 800-426-3401, $295.
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Asksam with Hypertext

Asksam 4.0, a free-form data base, is one of the first MS-DOS products to include hypertext capability. You can move a light bar to select a key word or phrase from a screen and retrieve all information (even across file boundaries) associated with it.

Seaside Software, P.O. Box 1428, Perry, FL 32347, 904-584-6590 or 800-372-5726, $295.
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Radio Shack Carries Excel

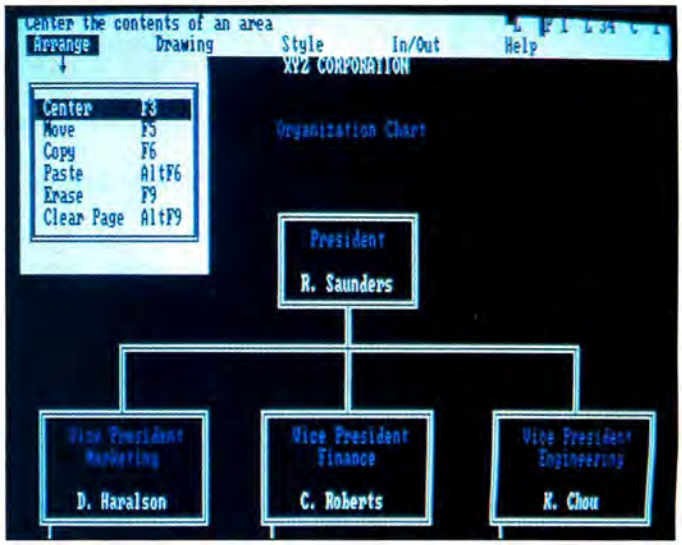
Microsoft's Excel is now available from Radio Shack. The powerful spreadsheet runs under Microsoft Windows on the Tandy 1000 TX/3000/4000 and offers two-way compatibility with Lotus's 1-2-3 files, so you can load and save Lotus spreadsheets directly. Excel's Macro Translation Assistant translates 1-2-3 macros into Excel macros.

Microsoft Corp., 16011 N.E. 36th Way, Box 97017, Redmond, WA 98073-9717, 800-426-9400 (in WA or AK, 206-882-8088), $495 (or from your Radio Shack dealer—catalog no. 25-1185).
Circle 563 on Reader Service card.

Cheaper Word Processing, Better Data Management

Data Access Corp. has reduced the price of their Dataflex Word Processing Option from $195 to $69.95 and announced revision 2.3 of their relational data-base development system, Dataflex ($695), which is faster, has graphics capabilities, and supports floating-point arithmetic as well as binary coded decimal (BCD).

Data Access Corp., 14000 S.W. 119th Ave., Miami, FL 33186, 305-238-0012.
Circle 566 on Reader Service card.



Instant Pages lets you combine text and graphics but doesn't require a graphics card.

Point of Sale

Salespoint is a point-of-sale system that prints invoices and purchase orders, manages inventory, and generates quotes, layaways, back orders, and work orders.

SSR Corp., 1600 Lyell Ave., Rochester, NY 14606, 800-521-0142 or 716-254-3200, $19.95.
Circle 565 on Reader Service card.

Gimme a Light

Dac-Easy Light provides multi-level, double-entry accounting for the non-accountant at home or at the office. The package can write checks, prepare invoices and statements, print financial statements, provide budgets, and track expenses.

Dac Software Inc., 4801 Spring Valley Road, Building 110B, Dallas, TX 75244, 214-458-0038 or 800-992-7779, $69.95.
Circle 564 on Reader Service card.

Project Manager

The Actiontracker project management system handles deadlines, priorities, budget, and time considerations for people who handle many projects simultaneously. It can produce over 1,000 combinations of reports on projects, actions, budgets, and resources.

Information Research Corp., 2421 Ivy Road, P.O. Box 6668, Charlottesville, VA 22906, 800-952-8660 (in VA, 804-977-2680), $198; with project query language, $298; network with PQL, $1,495.
Circle 567 on Reader Service card.

WORD PROCESSING

Desktop Publisher

Instant Pages lets you combine text and graphics to create forms, newsletters, charts, and correspondence. The menu-based program works with a color or monochrome monitor and doesn't require a graphics card.

Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404, 415-571-7171, $49.95.
Circle 573 on Reader Service card.

Webster's New World Combo combines the New World Spelling Checker and New World Thesaurus.

New World Help

Webster's New World Outliner + ($69.95) can help you outline your ideas, transfer ideas from word processor to spreadsheet, and organize personal tasks.

Webster's New World Combo ($89.95) combines the 114,000-word New World Spelling Checker and the 20,000-entry New World Thesaurus.

Compatible with over 40 popular word processors, the Speller proofreads documents as you work. The Thesaurus contains 330,000 synonym references and offers access to over one million replacement words.

Simon and Schuster Software, 1 Gulf + Western Plaza, New York, NY 10023, 800-624-0023 (in NJ, 800-624-0024).
Circle 574 on Reader Service card.

INFO LINE

First Word

The GEM First Word Plus includes GEM Paint 2.0 and the latest release of the GEM system software, GEM/3. The word processor includes such features as pull-down menus with keyboard shortcuts, the ability to open four windows simultaneously and integrate text and graphics, a 40,000-word spelling checker, footnote management, and leading control.

Digital Research Inc., Box DRI, Monterey, CA 93942, 800-443-4200, $295.
Circle 572 on Reader Service card.

Varsity Scripsit

Varsity Scripsit, Tandy's new addition to the Scripsit family, includes such features as pop-up menus, an append-file function, on-line help, split screens, spell checking, foot- and endnoting, and keywords file generation.

Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102, $99.95 (catalog no. 25-1174).
Circle 571 on Reader Service card.

Circle 133 on Reader Service card.

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Mega Card 30 (65ms access time)	549

Hard Drive Kits

Tandy 1000 Hard Drive Kits feature a Seagate Hard Drive with a Western Digital Controller. Easy to install, comes preformatted. 1 Year Warranty! (Requires the removal of drive B-1000, 1000SX, 1000TX)

Hard Drive Kit 20	$369
Hard Drive Kit 40	649

Tandy 3000, 3000HL and 4000 Kits feature a Western Digital Floppy/Hard Controller and Segate High Speed Drives.

30-Megabyte Full Height Kit (40ms)	$ 799
40-Megabyte Half Height Kit (40ms)	749
40-Megabyte Full Height Kit (28ms)	899
80-Megabyte Full Height Kit (40ms)	1299

Expansion Boards

for 1000/1000SX/1000TX	
Serial Board	$ 59
Serial with Clock	79
Dual Serial Board	99
Dual Serial with Clock	109
for 1000EX/1000HX/or Plus Boards	
Serial Board	$ 55
Serial with Clock	$ 75
Dual Serial Board	$ 95
Dual Serial with Clock	$ 105

Modems

Internal Modems by Everex—complete with a 1-year warranty and Bitcom communications software.

1200 Baud Evercom	$129
2400 Baud Evercom	239

Memory Upgrades

for 1000

Zucker Memory Expansion—512K of memory with DMA. An optional clock calendar can be added. $119

Zucker Multifunction Card—512K of memory with DMA, clock/calender with battery backup, serial RS-232 port and Ramdisk software. $199

for 1000 SX

SX Chip Set—upgrade your 1000SX from 384 to 640K. Easy to install with instructions. $39

for 1000TX/3000HL

128K RAM Kit—Upgrade your 1000TX from 640 to 768K or your 3000HL from 512K to 640K. $35

for 1000EX/1000HX

384K Upgrade by Micromainframe—Complete with two memory plus expansion connectors for adding Tandy Plus expansions, upgrades your EX/TX to 640K. $139

for 4000

1-Megabyte SIMM Kit—Upgrade your 4000 from 1 Megabyte to 2! Includes four 256 SIMMS. $239

4-Megabyte SIMM Kit—Upgrade your 4000 with a 4-Megabyte upgrade! Includes four 1-Megabyte SIMMS. $1049

for 1000/1000SX/1000TX

EMS Memory Board—includes EMS software, RAM disk, Print Spooler. Meets EMS standards set by Lotus and Intel.

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HARDWARE

Compatible Keyboard

The Tandy 1000 Turbo-101 keyboard plugs directly into the 1000. Its Selectric-style key layout includes 12 function keys; extra wide shift, return, and control keys; a separate cursor pad; a numeric keypad; and a page-contol cluster. Turbo-101 is bundled with a variety of software packages, including Borland's Turbo Lightning and Superkey, Living Videotext's Think Tank, or some of Turner Hall's Lotus add-ons.

Datadesk International, 7650 Haskell Ave., Van Nuys, CA 91406, 818-780-1673 or 800-826-5398 (in CA, 800-595-9602), $169.95.
Circle 550 on Reader Service card.

Data Translator

The Data Receiver half card and software lets you send data via a parallel-printer cable from a TRS-80, Apple, Kaypro, most CP/M systems, and others into your MS-DOS machine.

Image Technology Inc., 8150 S. Akron St., Suite 405, Englewood, CO 80112, 303-799-6433, $119.
Circle 551 on Reader Service Card.

Super Graphics

The Vega VGA switches between compatibility modes automatically. With a variable frequency digital monitor, it produces resolution of 640 by 480 or 800 by 600 pixels, each with 16 on-screen colors selected from a palette of 64.

With an analog monitor, the board can put 256 colors on screen from a palette of 262,144 at 320 by 200 pixels or 16 simultaneous colors at 640 by 480 pixels.

Video Seven, 46335 Landing Parkway, Fremont, CA 94538, 415-656-7800, $499.
Circle 552 on Reader Service card.

More Super Graphics

The VIP VGA graphics adapter offers a resolution of 800 by 560 pixels on multisync monitors and can display 256 colors from a palette of 256,000 in analog mode. The VIP includes 9- and 15-pin cables to use with digital or analog monitors. The card automatically senses and switches to the appropriate mode.

ATI Technologies Inc., 3761 Victoria Park Ave., Scarborough, Ontario, M1W 3S2, 416-756-0711, $449.
Circle 553 on Reader Service card.

Printer Interface Expansion

The Printer Performance Card makes it possible for up to three computers to share as many as seven printer devices. The card has an internal 256K (expandable) print buffer and a microprocessor, is configured with six print devices, and is equipped with six parallel and two serial ports and a high-speed synchronous port.

Dresselhaus Computer Products, 8560 Vineyard Ave., Suite 405, Rancho Cucamonga, CA 91730, 800-368-7737, $399.
Circle 557 on Reader Service card.

Low-Priced Laser Printer

The F-1000A Compact Laser Printer can produce 10 pages per minute, sharp text, graphics, and 39 bar code styles at 300 dpi (dots per inch) resolution. It has 79 resident fonts (including eight foreign-language character sets), three Dynamic fonts that you can modify, two IC-card slots, seven built-in emulation modes, 512K RAM, and both parallel and serial ports.

Kyocera Unison Inc., 3165 Adeline St., P.O. Box 3056, Berkeley, CA 94703, 415-848-6680, $2,895.

Circle 554 on Reader Service card.

Voice Kit

Heathkit's half-size HV-2000 computer voice card includes a circuit board-based speech synthesizer and audio amplifier as well as the software-based punctuation rules necessary for translating ASCII data or high- or low-level languages into intelligible speech.

Heath Co., Department 350-020, Benton Harbor, MI 49022, 616-982-3200, $89.95

Circle 556 on Reader Service card.

Small and Wide

The 2.87 by 9.17 by 19-inch Diconix 300W ink-jet printer prints up to 310 cps and accommodates paper up to 14.8 inches wide.

Diconix Inc., 3100 Research Blvd., Dayton, OH 45420, 1-800-342-6649, $749.

Circle 555 on Reader Service card.

FOR THE PROGRAMMER

C-Like Assembler

RisC is a portable, object-oriented, high-level assembly language with C-like syntax.

IMSI, 1299 Fourth St., San Rafael, CA 94901, 415-454-7101, $79.95.

Circle 560 on Reader Service card.

Quick Basic Graphics

Xgraf is an assembly-language extended-graphics kernel for Quick Basic that adds full-featured calls that perform Basic's graphics functions in all graphics modes. Xgraf also offers screen packing, zooming (fatbits), file saving and loading, and importing of graphics screens.

Komputerwerk, 851 Parkview Blvd., Pittsburgh, PA 15215, 412-782-0384, $99.

Circle 558 on Reader Service card.

C Compiler and Debugger

Release 4.0 of the Eco-C88 C compiler supports four different memory models, incorporates proposed ANSI language enhancements, and has an expanded library that includes the new ANSI functions.

Release 4.0 of C-more, the C source-code debugger, can trace program execution, single-step it, monitor variable values with full attributes and indexing, set simple and conditional breakpoints, evaluate complex expressions, and examine CPU registers.

Ecosoft Inc., 6413 N. College Ave., Indianapolis, IN 46220, 317-255-6476, $99.95 for Eco-C88. C-more (usually $49.95) is offered free through the first quarter of 1988 when you buy Eco-C88.

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ADD-ONS

...To Dbase

Applications Plus includes three of Fox and Geller's Dbase enhancements: Quickcode Plus, Quickreport, and Dgraph, for bug-free applications and presentation-quality reports and graphs.

Fox and Geller Inc., 604 Market St., Elmwood Park, NJ 07407, 201-794-8883, $499.

Circle 582 on Reader Service card.

...To Word Processors

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Research Development Systems, P.O. Box 110216, Arlington, TX 76007, 817-860-0155 or 800-338-9181, $99.

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...To 1-2-3

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the statistical probability of falling short or exceeding the results of your model predictions. The program produces tables and graphs of its risk and sensitivity analyses.

Suntex National Corp., P.O. Box 772868, Houston, TX 77215, 713-783-9059, $89.
Circle 583 on Reader Service card.

...To Zyindex

Zyfeatures works with the text-search program, Zyindex, to let you define records and fields in a free-form search. You can define a field as existing from one word or character to another as it already exists in your data.

Zylab Corp., 3105-T N. Frontage Road, Arlington Heights, IL 60004, 312-632-1100, $95.
Circle 584 on Reader Service card.

LITERATURE

C Library

Eric Bloom's *The C Trilogy: A Complete Library for C Programmers* provides information on such topics as C language rules, syntax, and standard functions; C and MS-DOS; screen and printer control; and structured programming, data manipulation, financial calculating, and array-manipulation techniques.

Tab Books Inc., P.O. Box 40, Blue Ridge Summit, PA 17214, 717-794-2191, $32.95 (hardbound), $22.60 (paperback).
Circle 588 on Reader Service card.

ON LINE

Bank On It

Weatherbank sifts through mounds of weather data from various agencies and displays it in graphic form. They'll send you their software for free, and for 20¢ per minute, you can access color displays of radar scans, cloud maps, interstate weather reports, temperatures, forecasts and worldwide data.

Weatherbank, 2185 S. 3600 West, Salt Lake City, UT 84119, 801-973-3132.
Circle 589 on Reader Service card.

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Hudson Data is now offering hardware, computer supplies, household goods, and other merchandise via their on-line system. No subscription fee or on-line charge is required.

Hudson Data Inc., 18831 W. 12 Mile Road, Lathrup Village, MI 48076, 313-557-1613 (300/1,200/2,400 baud, 8-bit words, 1 stop bit, no parity) or 313-557-4504 (voice).
Circle 590 on Reader Service card.

USER GROUPS

Toledo Area Tandy Special Interest Group

TATSIG is dedicated to improving the serious user's abilities and to assisting the newcomer in discovering the machine's potential. Though the group is Tandy-specific, membership is not limited to Tandy owners. It supports all Tandy machines except Pocket and Color Computers. Dues are $20 per year. Now 4 years old, the group has 179 members, publishes a newsletter, and operates a BBS (313-856-8183 or 313-856-8184, 300/1,200/2,400 baud, 8-bit words, 1 stop bit, no parity).

1632 S. Wheeling St., Oregon, OH 43616. Contact A. F. Morel, 419-693-0951.

Milwaukee Area Tandy Users Group

MATUG disseminates information about software and hardware applications and helps new users get acquainted with Tandy computers. Tandy-specific, it supports the 1000, 2000, 3000, and TRS-80 machines. The club is 9 years old, has 50 members, and publishes a newsletter. Dues are $12 per year.

3822 N. 75th St., Milwaukee, WI 53216. Contact Ray Ratke, 414-463-5953. ■

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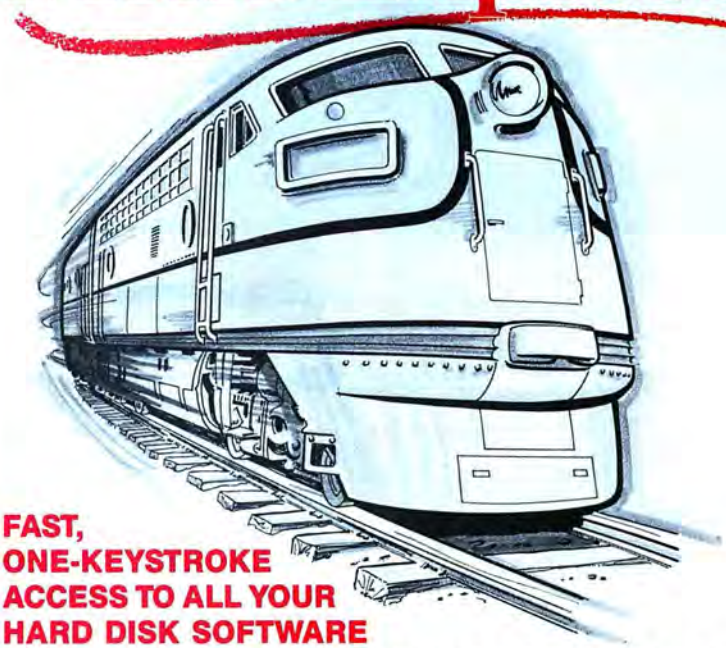

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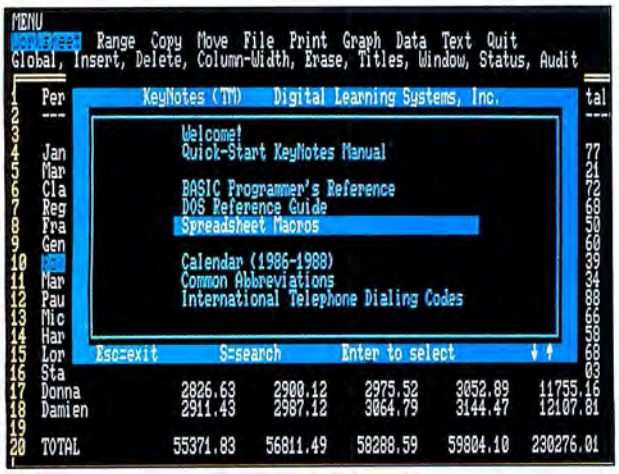
Keynotes: A Better Help Screen



Keynotes popped up over a Words & Figures worksheet.

by Eric Grevstad

If you've ever thought you could write a better help screen than the programmers who wrote the software you use, or wished for a customized on-line list of commands or addresses, Keynotes offers a simple, ingenious alternative. This memory-resident (35K) reference program works like a cross between a help system and a data base, popping up to show a series of notes or text windows over your application.

Press alternate-F1 (or alternate and another key of your choice), and Keynotes shows a scrolling menu of up to 100 items. Move the cursor to one and press enter, and the window shows either some explanatory text (up to 2,048 characters) or another menu, moving through up to five levels.

You'll never reach the theoretical limit of 10 billion items—Keynotes files, even though stored in a compressed format, can't be that big, and scrolling through more than 20 or 30 menu lines grows tiresome, despite the flexibility of using the up and down arrows or page up/page down, home, and end keys. But there's plenty of room to build as big a pyramid as you like.

A limited search function can find a word on the current level; whether it finds "Toronto" will depend on whether the displayed item, "Cities in Canada," is text (part of the currently loaded file) or a command to load another file.

The sample files, which range from a pop-up Keynotes manual to lists of Basic and DOS commands and international telephone codes, are just the beginning. Keynotes' easy-to-use editor lets you create and rearrange your own menus and specify a pop-up key, a path for menu files, and the name of the top file in your stack. If you need more editing power than backspacing or deleting characters, the editor can import and export ASCII files suitable for most word processors.

Except for its frequent disk access (I'd recommend a hard disk), Keynotes worked smoothly on my Tandy 1000, whether popping up over Xywrite III Plus or interrupting a 1-2-3 recalculation. It had no trouble blanking and then redrawing screens of graphics programs, though my Pac-Man game turned Keynotes' mildly annoying end-of-text beep (when you move to the end of an item with the page down key) into a continuous screech that lasted until I quit Keynotes and resumed play.

The program also coexisted with Sidekick, though I managed to fulfill the manual's warning and crash my system by using both at once (calling Keynotes while Sidekick was still on screen).

Memory-Resident Writing 101

For a sample of what Keynotes can do, or for those too lazy to make their own files, there's Writer's Handbook. This is a slightly different, bigger version of Keynotes (37K or 49K, depending on graphics support); it omits the editor that lets you change or create files, but adds the ability to set colors or remove Keynotes from memory without rebooting, features that a company spokesperson told me would appear in later versions of the parent program.

More important, Writer's Handbook uses Keynotes' layered topics to give a good pop-up rundown of writing rules and hints. A Letters section covers business, memo, and envelope styles and proper forms of address for every job title imaginable. An Info Bank holds copious lists of abbreviations, holidays, symbols, and foreign phrases, along with slightly thin definitions of computer terms.

The Rules selections range from capitalization and punctuation guides to help with Nyms (acronyms, homonyms, synonyms) and a first-class section on diction, redundant phrases, avoidable cliches, and non-sexist writing.

I could quibble with the Handbook's organization—abbreviations and spelling are each split across different sections—and wish for more examples, along with definitions of commonly misused words (great on *beside* and *besides*, okay on *affect* and *effect*, but disappointing with a wimpy copout on *that* and *which*).

But while Writer's Handbook can't compete with books like *The Elements of Style*, it can certainly help you avoid writing mistakes, without having to leave your word processor. For more serious writers, Digital Learning Systems has announced a Keynotes version of the Associated Press Stylebook ($49.95), which I'm tempted to endorse sight unseen.

That shows the kind of potential Keynotes has—the potential Borland used to claim for Turbo Lightning, a sort of smaller, homemade version of CD-ROM. The base program is somewhat expensive next to the bargain-priced Writer's Handbook, but it's fun to play with on your own and terrific if you teach or supervise computer users. ■

Keynotes ($99.95) and Keynotes Writer's Handbook ($29.95) are not copy-protected. Digital Learning Systems Inc., 4 Century Drive, Parsippany, NJ 07054, 201-538-6640.

Word Processing for the Power-Hungry

The Xywrite III Plus screen.

by Eric Grevstad

There are several good programs for serious word processing, but Xywrite III Plus is designed for fanatical word processing. Compared to Wordperfect (the corporate champion) or Microsoft Word (the desktop publisher's darling), Xywrite is for the user who writes a lot and demands a lot when writing—the kind of person who used to have a souped-up, hand-patched copy of Wordstar, though Xywrite III Plus is a much more elegant and powerful package.

It's *very* fast, packed with advanced features, and more customizable than anything short of writing your own program. (Indeed, the manual practically tells you how to rewrite Xywrite.)

But such power has its price. While not quite the monster it's made out to be, Xywrite is no cinch for beginners to learn. Its sophisticated spelling, thesaurus, and help functions are happier on a hard disk than on floppies. Some everyday functions are incompatible with the Tandy 1000 keyboard. The supplied Tandy keyboard driver offers only a partial solution.

Nevertheless, as you spend time with the program you progress from being daunted to impressed to amazed. Imagine a time-saving or formatting feature; Xywrite probably goes beyond what you've imagined. For example, a good word processor can indent the first line of each paragraph to spare you the effort of using the tab key; Xywrite can capitalize the first letter in each sentence so you don't need to press the shift key.

At Your Command

If you're used to many of today's programs, where F1 is the help key and the escape key pulls down a menu, you'll have to roll up your sleeves to learn Xywrite. There are no menus; some default function-key assignments seem almost random; and you give commands by literally giving commands, moving the cursor between the text area and a command line where you type abbreviated instructions such as LM 10 (set left margin) or TYPE (print).

What you see on screen isn't wholly what you'll get in terms of justification, spacing, and so on, but control-F9 helpfully toggles between displaying embedded formatting commands as little triangles (putting the cursor on one shows its meaning) and spelling them out between brackets.

You won't master Xywrite in an hour, but you'll soon learn the basics: F10 moves between the text and command areas, F5 or F6 clears the command line for a new entry, and F9 executes the most recently entered command, useful for a repeated search or periodic save.

Then, studying the two good tutorial manuals and the excellent detailed reference guide, you can spend a lifetime learning more expert commands—advancing from Type to Types,3-10,E (print a screen preview of even-numbered pages from 3 to 10), or from Change to the six different search-and-replace commands for on- or off-screen, global or individual, and case-sensitive or case-insensitive changes. The help menu gives you half a dozen ways to look something up, whether from a command index or by typing a key word like DOS or FOOTNOTE.

Xywrite is renowned as the world's fastest full-featured word processor. But a low-priced cult favorite, Ann Arbor Software's Textra, proved fractionally quicker at deleting lines or words. In my search-and-replace test, Textra performed over 2,300 replacements in 2.5 seconds, compared with Xywrite's 4.5; Wordstar Professional Release 4, on the other hand, took 40 seconds.

But make no mistake: Xywrite on an 8088 system beats other programs on an 80286, with amazingly fast file handling, scrolling, and on-the-fly formatting, not only wrapping words but optionally hyphenating them as fast as you can type. Even printing one file while editing another in one of Xywrite's nine document windows won't slow you down.

Speaking of printing, since Xywrite produces pure ASCII files, it's ideal for applications requiring importing files from or exporting files to other word processors. Xywrite can also produce a printer-ready file with proper control codes for printing from DOS. If your spreadsheet or graphics program can do the same, you can include the file in a Xywrite document.

Formats and Features

There's more to Xywrite's formatting than word wrap and hyphenation. The program offers default or dynamic control of everything from headers and footers to automatically numbered and positioned footnotes. You can not only specify flush left, right, or centered lines, but also flush tabs to mix such alignments on a single line.

You have a choice of two ways to print columns: a spreadsheet-like table on screen (the shift and arrow keys move the cursor among up to 10 independently formatted column areas) or one skinny column that "snakes" into two to six columns when printed.

As for vertical formatting, III Plus goes beyond manual or conditional page breaks to give you control of widow or orphan

(continued on page 56)

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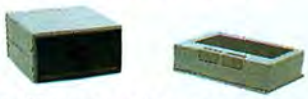

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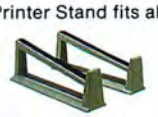

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The 1000 TX: Vive la Difference!

Newest 1000-series is faster—but how much?

by David A. Williams

The Tandy 1000 TX, the latest and most powerful computer in the 1000 series, differs only slightly from the earlier 1000 SX. But vive la difference!

Replacing the aging 8088 microprocessor with an 80286 running at 8MHz boosts processing speed by a factor of seven, according to a popular speed index, when compared with a standard PC. Other differences include a 3½-inch disk drive instead of the older 5¼-inch size, 640K of memory (up from 384K), the addition of a volume control, and a nine-pin serial port instead of a light-pen port.

Options include a battery-powered clock, a 128K memory expansion, and an 80287 math coprocessor. Five 10-inch, 8-bit expansion slots will accept most of the shorter PC-compatible accessory cards. Unlike most other 80286 computers, the 1000 TX has no 16-bit expansion slots. The second drive slot takes either size floppy drive.

Adding a hard disk presents some difficult choices. Tandy offers only a 20MB hard-disk card ($799) and a 20MB external drive ($699). The external drive requires a controller card ($299.95). While a third-party, half-height drive might fit in the second drive slot, the puny 67-watt power supply limits your choices.

The 3½-inch floppy drive exacerbates this problem. Although the 3½-inch drive may soon become the industry standard, a 5¼-inch drive will be an essential accessory for TX owners with an inventory of software. This leaves you with nowhere to put an internal hard drive unless you remove the 3½-inch drive. On the other hand, if you don't have a hard drive, the higher capacity of the 3½-inch disks greatly reduces the disk swapping you have to do.

Physical appearance is nearly identical to that of the SX. A red reset button, keyboard socket, joystick ports, volume control, and a phone jack are arrayed across the bottom of the front panel. The rear panel contains Tandy's usual non-standard, card-edge printer connector, the serial port, monitor connector, and jacks for video and audio outputs.

Software and Documentation

The 1000 TX comes with MS-DOS 3.2, GW-Basic, and Personal Deskmate 2. Documentation consists of an owner's guide, a command reference, and the Deskmate manual. The first half of the owner's guide tells you how to set up the computer and install options, and describes the keyboard. The second half introduces MS-DOS. Both are clearly written and amply illustrated.

The DOS documentation is the bare minimum you'll need to get started. For example, there's no mention of batch files, Config.SYS, or ANSI.SYS—a serious omission. A spreadsheet program refused to run until I installed a Config.SYS file to increase the files' and buffers' parameters.

The Quick Reference includes brief descriptions of DOS and Basic commands—too brief to impart adequate understanding of what they do. Plan on buying the separate *DOS/Basic Reference Manual* ($29.95).

You'll find several commands and utilities that don't appear in other versions of DOS 3.2. The Mode command has several options unique to the TX. The Spooler com-

The Tandy 1000 TX comes with 640K, one 720K 3½-inch disk drive, five 10-inch expansion slots, MS-DOS 3.2, GW-Basic, and Personal Deskmate 2. Tandy Corp., Fort Worth, TX 76102. Catalog no. 25-1600, $1199.

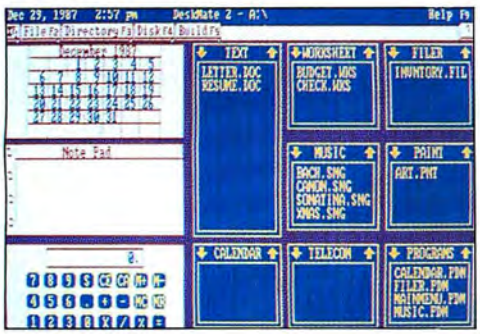

Photo 1. The Tandy Personal Deskmate 2 main menu shows all the available applications plus the files available under each. Applications are accessible from the keyboard or by using a mouse.

Photo 2. Filer is a computerized index-card filing system that simulates real file cards.

mand controls and gets the status of the print spooler, a device driver also included. The utilities include a disk cache, a file-compression program, backup and restore utilities said to be faster than the DOS commands, and a file-encryption utility.

Personal Deskmate 2 is an integrated program that includes seven main programs and several accessories (see Photo 1). In the former category are an appointment calendar, a filing system (Photo 2), a music program (Photo 3), a paint program (Photo 4), a communications program, a word processor, and a spreadsheet.

The five accessories you can call up from within the Deskmate applications (but not other applications) include a notepad, a monthly calendar, a calculator, a phone directory, a clipboard, and utilities to change certain program parameters. The program almost fills a 720K disk.

A 450-page reference manual tells you everything you need to know about Deskmate. Pages containing operating instruc-

Upgrade Kit Expands TX Memory

by David S. Veale

One of the features of the Tandy 1000 series is its enhanced CGA (color-graphic adapter) display modes. While the 1000 maintains the IBM standard CGA resolution (640 by 200 or 320 by 200 pixels), it provides twice as many colors as IBM (four instead of two in high-resolution mode and 16 instead of eight in medium-resolution mode). But these enhancements come at a price: Boot up a 1000, run CHKDSK, and you'll find that you've lost 16K of your total memory. Because of its enhanced CGA capabilities, the computer will grab between 16K and 128K of user RAM for video use.

This means that if you have a program that requires 512K to run on an IBM PC and you have 512K in your Tandy 1000, the program may not work because your machine really has only 496K—or less—available for programs.

But in the new 1000 TX, Tandy has provided a way to deliver the promised 640K. Four sockets on the system board accommodate additional memory; by installing the 128K RAM Upgrade Kit (catalog no. 25-4082, $49.95) it's possible to dedicate the extra 128K to the video circuitry and leave the main 640K memory intact.

The real beauty of this additional memory, however, is the effect it has on the speed of graphics operations. With the extra memory installed, the video circuitry has more room to run, without having to swap in and out of the user's RAM.

To test the effect of the additional memory, we ran several graphics demonstration programs included in Microsoft's Quick Basic 4.0. After compiling the programs to stand-alone EXE files, we ran them on a 1000 TX without the graphics memory installed and then ran them again with the memory installed. We measured an overall speed increase of between 311 and 430 percent on the programs we ran—a dramatic difference that makes the 128K upgrade a worthwhile option.

To install the additional RAM, remove the cover of the system unit and the metal RFI shield so you can get to the system board. Plug the RAM chips into the four empty sockets and remove the jumper connecting pins E9 and E10 on the system board. That's all there is to it.

Because performing this upgrade changes the entry address of the video memory, you may come across a few ill-behaved programs that fail to function properly. If this happens, replace the jumper on E9 and E10 to disable the additional video RAM. But then you'll just have to hope the program doesn't require a full 640K to run! ■

David S. Veale is a technical writer for 80 Micro. *Write to him at* 80 Micro, *80 Elm St., Peterborough, NH 03458.*

Table. Execution times of various graphics-intensive programs. Times are in minutes and seconds.

	BALLPSET.EXE	BALLXOR.EXE	SINEWAVE.EXE	MANDEL.EXE	TORUS.EXE
Tandy 1000A (640K)	01:46	02:36	00:16	14:02	01:40
Tandy 1000 TX (640K)	01:27	02:09	00:13	08:24	01:23
Tandy 1000 TX (768K)	00:28	00:39	00:03	02:48	00:21
Speed Increase 1000 TX with 768K vs. 640K	311%	331%	430%	300%	395%

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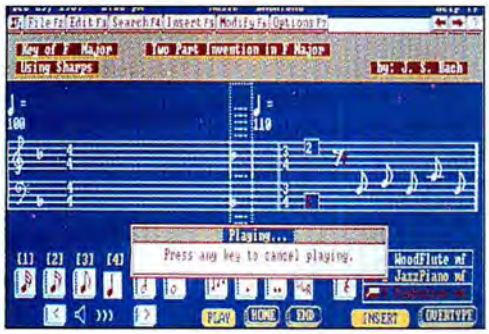

Photo 3. Personal Deskmate 2's music program produces melodies in three voices.

Photo 4. A sample picture produced using Personal Deskmate 2's 16-color paint program.

tions are divided into two columns, one for keyboard use and one for the mouse. The reference section's encyclopedia format makes it easy to find what you're looking for.

Many first-time users will find Deskmate adequate for their needs, but most will soon want more powerful, stand-alone programs, and pop-up accessories they can use within any application. Experienced computer users can skip it entirely.

The Inside Story

The 1000 TX is sturdy and well built. The innards are neatly laid out and readily accessible once the covers are off. The overall effect is one of quality and attention to detail. The RFI shielding appears sufficient; my Walkman picked up no interference when I placed it beside the computer. I did have to turn the volume up, though, to drown out the louder-than-average fan noise.

The built-in video controller supports the color-graphics adapter (CGA) standard and can drive either a composite monochrome monitor or a color graphics monitor. You can install a separate video adapter, but some enhanced graphics adapters (EGAs) might not work.

It is unfortunate that Tandy elected to ignore the newer video standards. The CGA was mediocre from the beginning; the EGA, multi-color graphics array (MCGA), and video graphics array (VGA) standards have rendered it obsolete. Unlike the standard CGA, Tandy's requires no special snow-prevention programming.

As in other 1000-family computers, video memory is taken from the 640K system RAM. The 128K memory expansion gives this memory back to your programs and provides additional paging capability for programs written to take advantage of it (see "Upgrade Kit Expands TX Memory" on page 34).

I ran several benchmarks and application programs to check the TX's performance. It is slightly slower than an 8MHz AT clone, probably because of the TX's 8-bit memory bus. Compared with a standard PC, its true performance improvement is probably more like a factor of three rather than six, as stated in Tandy's ads. Since some software might not load or run at 8MHz, you can use the Mode command or hold down the F4 key during startup to change the clock speed to 4MHz.

I noticed an anomaly when running some compiled Basic programs. When running stand-alone programs, the TX performed normally, but its performance fell by a factor of four when it ran the same programs compiled to use the run-time module. The 1000 SX shares this fault to a lesser degree, but four other computers executed both program types at the same speed. I doubt this phenomenon would occur in an application, but it's possible.

The keyboard is the standard 1000-style, still an oddball even though IBM has adopted the 12-function-keys-across-the-top layout. Tandy has recognized that some users may not be happy with this keyboard and has provided an optional adapter ($99) that will let you connect an IBM-compatible keyboard.

The overall effect is one of quality and attention to detail.

The Bottom Line

Keep in mind that the 1000 TX is a compatible, not a clone. If you're upgrading from an earlier 1000, you've already learned to live with its idiosyncrasies. If you're moving up from a Tandy 1200 HD or another clone, the strange keyboard, the short expansion slots, and the possibility of compatibility surprises might bother you—though you probably don't need to worry about the latter.

Tandy has solved many of the compatibility problems present in the earlier 1000s. Every program I tried, including several memory-resident programs, worked perfectly.

It should be stressed that the TX is not an AT or Tandy 3000 compatible. With its 8-bit bus, it is not intended to run Xenix, OS/2, or other 80286-type operating systems. The only 80286 advantage you get with the machine is speed. Tandy could have economized by using an 8MHz 8086 instead of the 80286, without significantly compromising performance.

To compare value, though, you have to add the cost of the accessories you'll need to the TX's $1,199 price tag. Start with a 5¼-inch floppy drive from Tandy at $169.95. Since an 80286 computer without a hard drive just doesn't make sense, add $799 for the Tandy hard card. (You can save several hundred dollars—and improve performance—if you opt for a third-party hard drive instead of the Tandy hard card.)

Now add $399.95 for Tandy's better quality color monitor, $39.95 for the battery-powered clock, and $49.95 for the video expansion memory. The total, if you don't have your calculator handy, is $2657.80.

Although slightly more pricey than the clones, the TX is still $500 less than a comparably equipped IBM PS/2 Model 30, which would be considered the TX's closest competition. Compare that, however, with the price of a typical AT clone with 1MB of RAM, a 20MB hard drive, an EGA monitor, 16-bit, full-size expansion slots, a battery-powered clock, two serial and two parallel ports, and a 190-watt power supply for $2299.

Of course, you might have to order the clone by mail, and you won't have your friendly Tandy computer store to go to if you have trouble. You make the choice. ■

David A Williams is a staff engineer with a major aerospace firm and has 25 years of experience with computers. Write to him at 2452 Chase Circle, Clearwater, FL 33546.

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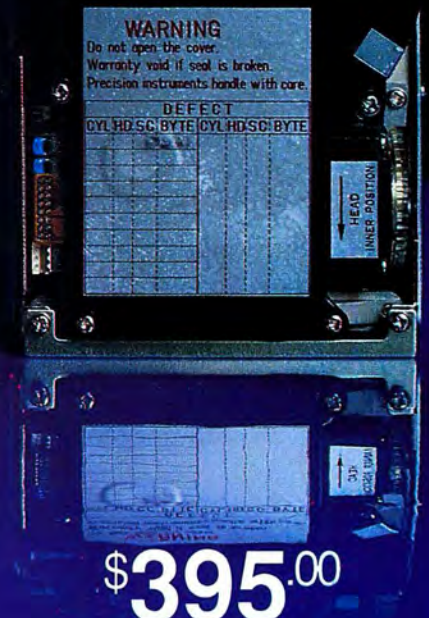

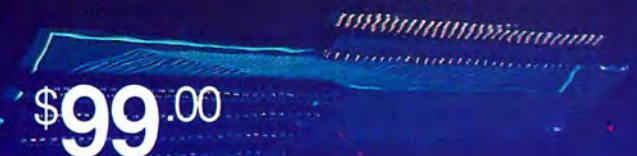

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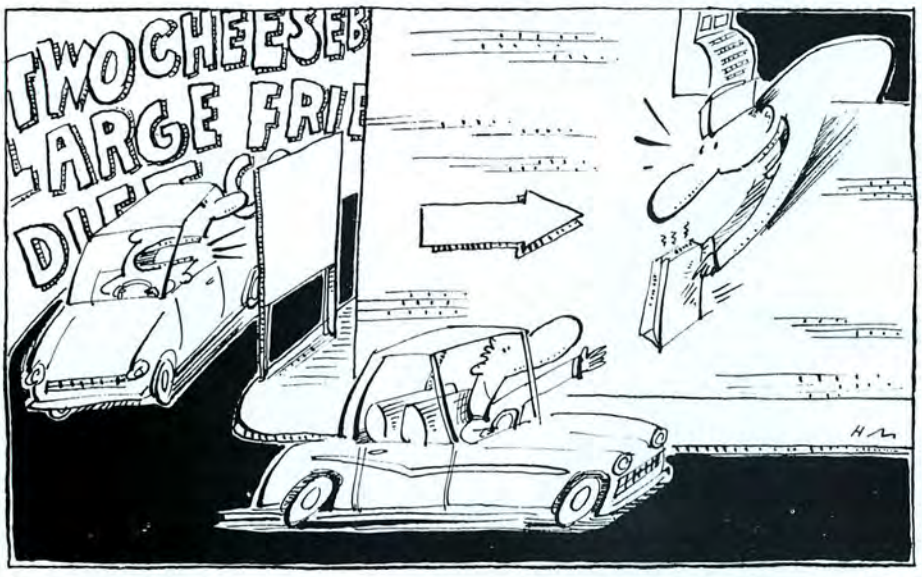

by William McMullan

Writing menus can be a tedious—though vital—part of the programming process. Whether your program is long or short, its menu will be surprisingly similar to the last one you wrote. Producing the same code over and over, therefore, is a tiring waste of time. To solve this problem, I've written Menu.MOD, a flexible, bug-free, menu-module program.

Just a Taste

Menudemo.BAS is a short, powerful program that will give you a taste of this menu module. To see how it works, type and run the program (see Program Listing 1).

You can use both upper- and lowercase, and don't worry about typing a wrong response; nothing will happen if you do. Lines 1010, 1020, 1030, and End in line 1040 represent routines in a normal Basic program. I used DOS commands for demonstration purposes. Save the program as Menudemo.BAS.

To use the menu module, delete lines 10–60 and lines 1000–11010. Then save a copy in ASCII by typing:

```
SAVE "MENU.MOD",A
```

This lets you merge it with the next program you write. You will need to add a Data statement containing the menu elements to the end of your program (see line 11010 in the demonstration program).

The first data is the menu title. Load the menu title into MT$ and use it in lines 110, 120, and 130. The second data is a number, in this case, the number 4, which tells the program that the menu will have four elements. It is used in lines 110, 120, and 140 as the variable MN. The rest of the data are the prompts that will appear in the menu.

Next, change the letters "ADSQ" in line 150 of the MID$ statement to the new menu's letters of choice that you will use in your program. Change the letters in line 210 of the INSTR( ) statement using the same sequence. Be sure to include the upper- and lowercase of each choice. You will notice a blank space before the letters. This permits you to type in a wrong response without anything appearing to happen; the Goto 200 in this same line actually takes you back for another try. Note that in line 210 you must change the numbers after the second 200 to match the locations to which you will branch in your program.

The calculations in line 120 let you center the menu vertically on the screen. The portions containing the variable MT center the menu header horizontally. The variable MR is used in the Locate statements. The "25" represents the 25 screen lines, and "5" is the overhead, which includes the top bar and bottom bar plus the spaces. The variable MN is the number of menu choices. If you need to add more rows, you can remove the spaces.

All the variables in Menu.MOD start with the letter M. This eliminates most conflicts with the program with which you will merge the menu. This also makes using the DEFINT statement easier. If possible, avoid using variables starting with "M" in the rest of your program. Be sure to include a DEFINT M in the beginning of your program; it is good programming practice to define integers whenever possible.

You can use the menu in a program as many times as you like. In fact, you can include different elements each time by adding Data statements that will be read

System Requirements: Basic. Available on the January–March 1988 Disk Series.

Illustration by Hal Mayforth

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26-2808	DMP 440 300 cps	699	480	490	500
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Program Listing 1. Menudemo.BAS demonstrates how the menu module works.

```
      | 10 ' *** FILE NAME MENUDEMO.BAS ==MS-DOS== VER 1.0 05/15/87 ***
      | 20 ' *** MENU'S THE EASY WAY
      | 30 ' *** WRITTEN BY WILLIAM MCMULLAN
      | 40 ' *** RT 6 BOX 1, BASTROP, LA. 71220
 1385 | 50 CLS:CLEAR:DEFINT M
      | 60 ' IF YOU USE MORE THAN TEN CHOICES IN THE MENU, YOU MUST DIM MA$().
  619 | 70 KEY OFF
      | 100 ' ********** START MENU ************
 3243 | 110 READ MT$,MN:FOR MY=1 TO MN:READ MA$(MY):NEXT MY
 2530 | 120 MR=(25-5-MN)/2:MT=LEN(MT$):MT=(38-MT)/2
 4409 | 130 LOCATE MR,19:PRINT STRING$(MT,CHR$(205))" "MT$" "STRING$(MT,CHR$(205
      |     ))
 1631 | 140 FOR MY=1 TO MN:MR=MR+1
 1524 | 150 LTR$=MID$("ADSQ",MY,1)
 1130 | 155 ML=LEN(MA$(MY))
 3915 | 160 LOCATE MR+1,23:PRINT MA$(MY);" ";STRING$(27-ML,"-");" <"LTR$">";
  701 | 170 NEXT MY
 2827 | 180 LOCATE MR+3,19:PRINT STRING$(40,CHR$(205));
 3515 | 190 LOCATE MR+4,26:PRINT "PRESS LETTER OF YOUR CHOICE"
 2342 | 200 MC$="":WHILE MC$="":MC$=INKEY$:WEND
 4616 | 210 ON 1+INSTR(" AaDdSsQq",MC$) GOTO 200,200,1010,1010,1020,1020,1030,10
      |     30,1040,1040
      | 1000 ' ********** START MAIN PROGRAM **********
 3799 | 1010 CLS:LOCATE 12,37:PRINT "<BEEP>":BEEP:GOSUB 10000:GOTO 120
 2507 | 1020 CLS:SHELL  "DIR":GOSUB 10000:GOTO 120
 2642 | 1030 CLS:SHELL  "DIR/W":GOSUB 10000:GOTO 120
 4268 | 1040 END:***** REM RETURN TO BASIC OR PUT SYSTEM AND RETURN TO DOS
      | 10000 ' ********** INKEY ROUTINE **********
 3376 | 10010 LOCATE 23,27:PRINT "PRESS ANY KEY TO CONTINUE";
 3264 | 10020 MD$="":WHILE MD$="":MD$=INKEY$:WEND:CLS:RETURN
      | 11000 ' ********** DATA STATEMENTS **********
 5032 | 11010 DATA "DEMO  MENU",4,"SOUND THE ALARM","LONG DIR","SHORT DIR","QUIT
      |         TO BASIC"
```

Program Listing 2. Menu.BAS provides a complete, ready-to-use menu module.

```
      | 1 '       ------ << Listing No. 2 >> ------
      | 10 '
 1385 | 50 CLS:CLEAR:DEFINT M
 2752 | 100 M1=1:REM ************* START MENU ****************
 1398 | 105 IF M1 THEN RESTORE
 2269 | 150 IF M1 THEN LTR$=MID$("ADSQM",MY,1)
 2127 | 152 IF M2 THEN LTR$=MID$("TDM",MY,1)
 5950 | 210 IF M1 THEN ON 1+INSTR(" AaDdSsQqMm",MC$) GOTO 200,200,1010,1010,1020
      |     ,1020,1030,1030,1040,1040,4000,4000
 4642 | 215 IF M2 THEN ON 1+INSTR(" TtDdMm",MC$) GOTO 200,200,2000,2000,3000,300
      |     0,5000,5000
 3349 | 2000 CLS:PRINT "THE TIME IS "TIME$:GOSUB 7000:GOTO 120
 3559 | 3000 CLS:PRINT "TODAYS DATE IS "DATE$:GOSUB 7000:GOTO 120
 1595 | 4000 CLS:M1=0:M2=1:GOTO 105
 1596 | 5000 CLS:M1=1:M2=0:GOTO 105
 5464 | 9010 DATA "MENU A",5,"SOUND THE ALARM","LONG DIR","SHORT DIR","QUIT TO B
      |     ASIC","GOTO MENU 'B'"
 2664 | 9020 DATA "MENU B",3,"TIME","DATE","GOTO MENU 'A'"
```

into the array MA$( ) and by using Boolean operators to direct program flow.

The Full Course

Now merge the Menu.MOD program with Menu.BAS (see Program Listing 2) and run the new version. By studying the new program, you will see how simply it works.

The Restore statement in line 105 ensures that the data is available when you want the first menu. To make sure that the first menu that comes up is the right one, make the Boolean operator not equal to zero in line 50 by setting the variable M1 = 1. To get to the second menu, make the variable M1 = 0 and M2 = 1 in line 4000. (In this case, you arrived at line 4000 through the first menu.) To return to the first menu, reverse the process in line 5000.

Only six more lines are required for the additional menu. The number of menu combinations you can devise using this technique is up to you. If you are using a number of menus and the reading and restoring of the Data statements give you a problem, you could delete line 105 and change line 110 so that MA$(n) = "element" for the number of elements you want. Include MT$ = "menu title" and MN = n ("n" being the number of menu choices), and add additional lines as needed. For example:

110 IF M1 THEN MT$ = "MENU A":MN = 4:MA$(1) = "FREE":MA$(2) = "LONG DIR.". . .etc.

112 IF M2 THEN MT$ = "MENU B":MN = 3:MA$(1) = "TIME":MA$(2) = "DATE". . .etc.

For those who don't understand how the If. . .(variable). . .Then statement works, here is a simple explanation: If the variable—in this case, M1 or M2—is less than or greater than zero, then the rest of the line is used. If the variable is zero, then the program skips to the next line. Some programmers consider Gotos outside a subroutine bad practice, and in some cases, I agree. You can get around this problem in line 210 if you use Goto statements to go to line numbers inside the menu routine, which, if necessary, can branch with Gosub statements to other parts of the program. Of course, you could change the Goto to a Gosub, but this would create a problem getting back to line 200 when you make a wrong entry.

Finally, renumber the Menu.MOD file so that it fits nicely into your program. This menu module should make your programming a little faster, more enjoyable, and give you more time to be creative. ■

William McMullan is a self-employed electronics technician and software consultant who enjoys ham radio and computing. Write to him at Route 6, Box 1, Bastrop, LA 71220.

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Files by Number

Select your data files without typing their names.

by David Leithauser

Many programs—most obviously, word processing and data-base programs—allow you to save files. Though others do not, it's possible to modify these programs to allow you to save data. For example, you can use a "Save Game" feature in games that run a long time (such as adventure games or complex simulations) to stop the game before it's finished. Any program that runs a long time can benefit from a save function; if you're writing a program, this is a feature you may want to include.

The usual procedure for saving a file is to enter a file name. Later, when you want to retrieve it, you type in the same file name. This requires that you remember the name you used to save the data.

You can use the Files command to call up a list of files to help you remember which files are on the disk, but this can create a few problems. First, the Files command will display all the files on disk, such as Command.COM, the program itself, and the data files. The Files command will also show any extension the program has added to the file name. For example, you may have the program add the extension DAT to the eight-letter name you give a data file. But seeing these extensions on the names can be confusing. Finally, you have to find the name of the file and type it in exactly to load the file. This introduces the possibility of error.

To give your programs a more professional look, you can have them list only the data files on that disk. You can have the program remove the extensions before it displays the names and even sort the names of the files alphabetically. Best of all, you can have the file names numbered in the list (see the Photo) so you can select a file by typing the number of the file instead of typing the whole name.

Program Listing 1 is a subroutine to let you do this. Type Listing 1 and save it in ASCII with the command SAVE "file name", A. The subroutine stores each file name in one element of the F$ array. Only files with specific extensions (such as DAT or BAS) are stored in the array; the extension is not stored. For example, if you were searching for all files with the DAT extension, and the files on the disk with this extension were Tom.DAT and Sue.DAT, then F$(1) would contain Tom and F$(2) would contain Sue when the computer returned from this subroutine. The variable F would contain the number of files found, which would be two in this case.

How It Works

The subroutine works by using the Files command to display the files on the screen, then actually reading the file names off the screen. To avoid messing up your screen, the subroutine performs this operation on screen 1 while allowing you to continue seeing screen zero. This makes the entire operation invisible. Unfortunately, this works only on computers with the CGA card, and only in the text mode. If you want the program to operate on computers without CGA, or if your program is operating in a graphics mode, you must omit the part of line 60000 before the CLS command and the part of line 60130 before the On Error command.

Line 10, which is not actually part of the subroutine, dimensions the F$ array to hold the file names. This subroutine can obtain a maximum of 79 names if the computer has a screen width of 80 and 39 names if the screen width is 40. Fortunately, this is usually enough.

Line 60000 stores the x and y positions of the cursor in CX and CY, respectively, so that the subroutine can return the cur-

System Requirements: GW-Basic. Available on the January–March 1988 Disk Series.

Illustration by Wilbur Bullock

Photo. A sample menu.

sor to its original position when the computer goes back to screen zero. Then the Screen command diverts all input and output to screen 1, while displaying screen zero. It then clears screen 1 and prints 45 spaces. After it has done this, the X position of the cursor tells the computer whether you have a screen width of 40 or 80. Depending on the screen width, the variable LW will have a value of 19 or 55. This variable tells the computer where to look for the file names on the screen.

Line 60010 clears screen 1 again. It then activates error trapping, which is designed to return the computer from the subroutine immediately if an error occurs while the computer is executing the subroutine. The only likely one would be a "File not found" error caused by the absence of files with the desired extension on the disk.

After setting the error trapping, line 60010 sets F = 0 and executes a Files command. If there are no files with the desired extension on the disk, the error trapping sends the computer to line 60140, which sends the computer to line 60130. This line returns the computer from the subroutine.

The command FILE "*." + EX$ causes the computer to display any files with the extension stored in EX$. I wrote the command this way for the sake of generality. You could store any extension you like in EX$. If you always use the same extension in your program, you could modify the Files command to contain a string constant instead of a variable. For example, if your program always looks for files with the extension DAT, you could change FILES "*." + EX$ to FILES "*.DAT".

Once the Files command has displayed the names of the files on the hidden screen (the one you cannot see), lines 60020–60120 read the names from the screen, picking letters off the screen one at a time. Lines 60060–60100 put these letters together into a name for each file. After these lines finish collecting the letters in one file name, line 60050 increases F by one and starts on the next name. As soon as line 60040 finds a space where a file name should start (which indicates the end of the list of files), it sends the computer to line 60130 to return from the subroutine.

The Locate statement in line 60130 returns the cursor to the position it had before the computer went to screen 1. The Screen statement returns to screen zero as the active screen (the one to which Print statements write).

The ON ERROR GOTO 0 statement turns off the error trapping that was activated in line 60010. If your program originally had error trapping before going to this subroutine, this error trapping should reactivate the original error trapping rather than turning off all error trapping. For example, if your program has an ON ERROR GOTO 50000 statement at the beginning, then the On Error statement in line 60130 should read ON ERROR GOTO 50000, not ON ERROR GOTO 0.

You can easily add this subroutine to your programs. I've already mentioned a few small changes you may want to make, such as deleting the parts of lines 60000 and 60130 that switch screens, changing the Files command, and changing the On Error Goto 0 command. You may also need to change some of the variable names (CX, CY, LW, F, EX$, F$( ), SC$, X, Y, and Z) if these variables are actively in use by your program when it goes to this subroutine. This is unlikely, because most programs are generally not performing other functions when they're loading or storing files, but you should be aware of the possibility. You'll also need to renumber the subroutine if your program already includes lines with the numbers 60000–60140.

Using the Subroutine

As I explained earlier, when the computer returns from this subroutine, the number of files has been stored in F and each file name has been stored in one element of the F$ array, from F$(1) to F$(F). You can do anything with this list of names that you can do with any other string array. For example, you can sort the array alphabetically or output the list of names to the screen.

You can also use the F$ array variables as file names in file commands, such as Open or Run. For example, you could use the command OPEN "I",1,F$(N) + "." + EX$ in your program. This would allow the program to input data from the file with the name stored in F$(N) and the extension stored in EX$. If the file names are Basic programs with the BAS extension, you could give the command RUN F$(N) in your program. You wouldn't need to add the BAS extension in the Run command, because the computer will add this automatically.

Program Listing 2 demonstrates a typical use of the subroutine. Type in Listing 2, then merge Listing 1 with Listing 2 with the command MERGE "LISTING 1". This listing is a simple data-base program that lets you create and store data files that are just lists of strings. It also allows you to load these files later and display them on the screen.

Line 10 dimensions the array that will hold the file names. Line 90 turns off the key list at the bottom of the screen and dimensions the array that will hold the data in the data files. It also stores DAT in EX$, because this program will add that extension to all the data files it saves. Lines 100–130 are a menu routine that lists your three choices: create and save a file, load a file and display its contents, and end the program.

Lines 200–220 input the data for a file from the keyboard. When you've finished entering data into the file (which you indicate by pressing Return with no data), the computer goes on to line 230. This line clears the screen and prints "Files already on disk are:" at the top of the screen. It then executes a Gosub to line 60000 to get the list of files on the disk.

The program then executes a Gosub to a subroutine that starts at line 30000. If the subroutine doesn't find a file at line 60000, this subroutine prints the message "No files found." If files are found, the subroutine prints all the elements of the F$ array on the screen between screen lines 2 and 22. If there are more names to be printed when the computer reaches screen line 22, the subroutine goes back to screen line 2, moves over 15 spaces on the screen, and resumes printing.

This process repeats until all the file names have been printed. As each file name is printed, the number of that file is printed beside the file name. For example, if F$(2) equals "SAMPLE", it would be

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displayed as "2) SAMPLE".

The purpose of displaying all the existing file names at this point is to help you avoid giving the newly created file the same name as an existing file, which would result in overwriting the old file. After the subroutine at line 30000 lists all the files on disk with the extension DAT, line 240 positions the cursor at line 24 and inputs the name under which you want to save the data. Line 250 then opens a file with that name, plus the extension DAT. Lines 260–270 then save the data to disk, close the file, and send the program back to the menu.

Lines 300–380 load a file from disk and display it on the screen. Line 300 clears the screen and prints "Files on disk are:". It then executes a Gosub to line 60000 to get the list of files and to line 30000 to display this list. If F=0, the If. . .Then statement at the end of line 300 bypasses the entire operation of loading a file, since there are none to load.

With the list of files now displayed in front of you, line 310 asks you to select a file. Notice that it's asking for a number, not a file name. You type in the number; if it's less than 1 or larger than the number of files, line 310 displays an error message for a few seconds and then asks you to enter the number of your chosen file again.

Line 320 then opens a file with the name you select. For example, if you enter the number 5 in line 310 and F$(5)= "RECORDS", the file opened would be RECORDS.DAT. In this program, I replaced FILES F$(N)+"."+EX$ with FILES F$(N)+".DAT", since the only extension used in this program is DAT.

Lines 330–360 read the data from the file and display it on the screen, then close the file. Lines 370–380 send the program back to the main menu after you press Return. Line 400 ends the program. ■

David Leithauser is a free-lance writer with a bachelor's degree in electrical engineering. You can write him at 4649 Van Kleeck Drive, New Smyrna Beach, FL 32069.

Program Listing 1. A subroutine that lists only data files, without extensions, and lets you select them by number. See page 70 for information on using checksums.

```
 670 | 10 DIM F$(80)
5771 | 60000 CX=POS(0):CY=CSRLIN:SCREEN ,,1,0:CLS:PRINT SPC(45);:IF POS(0)=46 T
       HEN LW=55 ELSE LW=19
2864 | 60010 CLS:ON ERROR GOTO 60140:F=0:FILES "*."+EX$
1072 | 60020 FOR Y=2 TO 24
1617 | 60030 FOR X=1 TO LW STEP 18
1986 | 60040 IF SCREEN(Y,X)=32 THEN 60130
1020 | 60050 F=F+1:F$(F)=""
1028 | 60060 FOR Z=0 TO 7
1753 | 60070 SC$=CHR$(SCREEN(Y,X+Z))
1423 | 60080 IF SC$=" " THEN 60110
1091 | 60090 F$(F)=F$(F)+SC$
 720 | 60100 NEXT Z
 719 | 60110 NEXT X
 721 | 60120 NEXT Y
3479 | 60130 LOCATE CY,CX:SCREEN ,,0,0:ON ERROR GOTO 0:RETURN
1030 | 60140 RESUME 60130
```

End

Program Listing 2. A simple data-base program that lets you create and store data files.

```
1856 | 90 KEY OFF:DIM D$(100):EX$="DAT"
5514 | 100 CLS:PRINT "MENU:":PRINT "1) Create file":PRINT "2) Load file":PRINT
       "3) End"
2341 | 110 PRINT:INPUT "Your choice";C
1341 | 120 ON C GOTO 200,300,400
 671 | 130 GOTO 110
 640 | 200 CLS:D=1
4599 | 210 PRINT "Data item # ";D;" (press RETURN to stop)";:INPUT D$(D)
2004 | 220 IF D$(D)<>"" THEN D=D+1:GOTO 210
4782 | 230 CLS:PRINT "Files already on disk are:":GOSUB 60000:GOSUB 30000
3320 | 240 LOCATE 24,1:INPUT;"Name to save under ";N$
1293 | 250 OPEN "O",1,N$+".DAT"
2262 | 260 FOR C=1 TO D:PRINT #1,D$(C):NEXT C
1107 | 270 CLOSE:GOTO 100
4943 | 300 CLS:PRINT "Files on disk are:":GOSUB 60000:GOSUB 30000:IF F=0 THEN 3
       70
11570 | 310 LOCATE 24,1:INPUT;"File number to get ";N:IF N<1 OR N>F THEN LOCATE
       24,1:PRINT "Invalid file number!";:BEEP:FOR C=0 TO 500:NEXT C:LOCATE
       24,1:PRINT TAB(39);:GOTO 310
1436 | 320 OPEN "I",1,F$(N)+".DAT"
 644 | 330 D=1:CLS
1736 | 340 INPUT #1,D$(D):PRINT D$(D)
2190 | 350 IF NOT EOF(1) THEN D=D+1:GOTO 340
 559 | 360 CLOSE
3222 | 370 INPUT;"Press RETURN for main menu.",A$
 677 | 380 GOTO 100
 395 | 400 END
3401 | 30000 IF F=0 THEN PRINT "No files found.":RETURN
 704 | 30010 R=2:C=1
1035 | 30020 FOR X=1 TO F
 943 | 30030 LOCATE R,C
1271 | 30040 PRINT X") "F$(X);
2711 | 30050 IF CSRLIN=22 THEN R=2:C=C+15 ELSE R=R+1
 720 | 30060 NEXT X
 762 | 30070 RETURN
```

End

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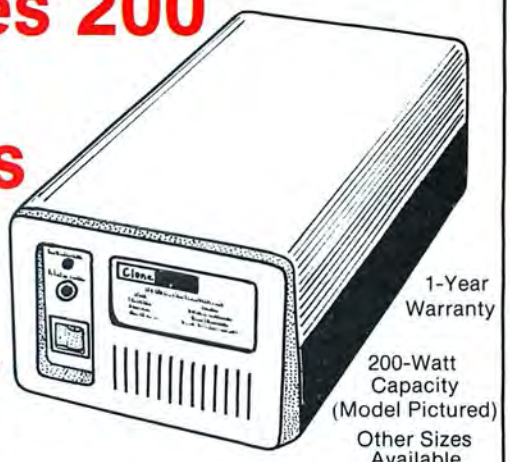

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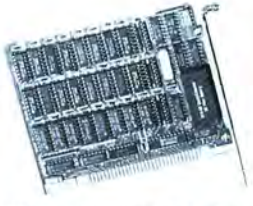

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Circle 81 on Reader Service card.

Page Previewer

See how your document will print—before you print it.

by Dale Rogerson

How many times have you tried to print the documentation from public domain disks, only to have it print incorrectly? Too many times?

That's why I wrote Page Previewer, which allows you to see—before you print—how your document will look after it's printed.

Page Previewer is a Turbo Pascal program that uses the standard Input facilities of MS-DOS. This means that input comes from redirection or piping, which I'll explain later.

Page Previewer (see the Program Listing) uses the color graphics adapter (CGA) high resolution mode of 640 by 200 pixels and displays reduced-size graphics representations of two pages (see Figures 1, 2, and 3) of your text or other output. Two pixels represent each letter that would be printed on the printer.

Page Previewer assumes the following:

- The page is 80 columns wide and 66 lines long.
- Automatic perforation skip is off.
- The program will respond only to carriage returns, line feeds, form feeds, and horizontal tabs; all other control characters will be ignored.

The program is designed to preview only those text files that are claimed to print correctly on your printer. It will not recognize special printer commands for boldface or italics, for example, since most public domain software documentation doesn't use these special faces. It will preview documentation of programs, such as Fansi Console, that use the four control characters named above to produce underlined and boldface type. Page Previewer is not a text formatter; the only formatting it does simulates a carriage return and line feed after every 80 characters.

What Page Previewer *Will* Do

Page Previewer can tell you much about the file you're about to print. For example, you can see if the program provides for a left margin. Have you ever printed out freeware documentation that had no left margin in which to punch holes? (This happens to me all the time.) By previewing the document before you print, you can adjust the paper to give you the margin you want.

Sometimes there's an extra message, one you don't want to print, at the beginning of shareware documentation. With Page Previewer, you can spot trouble before you print; just delete the unwanted text and run the file through Page Previewer again.

Page breaks are frequently the most troublesome problem with printing these files. If you need automatic perforation skip or want to start printing a few lines further down the page than usual, Page Previewer can help you do both jobs.

Page Previewer prints an asterisk next to the word "page" if the document tries to print on the 66th line. If your document doesn't skip the 66th line, the program assumes that it would print on the perforation. If the asterisk appears, two things can happen: Large spaces in the simulated pages indicate that your document is formatted for the page breaks, but the first page may include extra text or may not be set for the correct top margin. If you don't see large spaces, it means your document isn't formatted for page breaks and needs to be printed either with the perforation skip turned on or printed from your word processor.

System Requirements: Turbo Pascal 3.01 or later. Available on the January–March 1988 Disk Series.

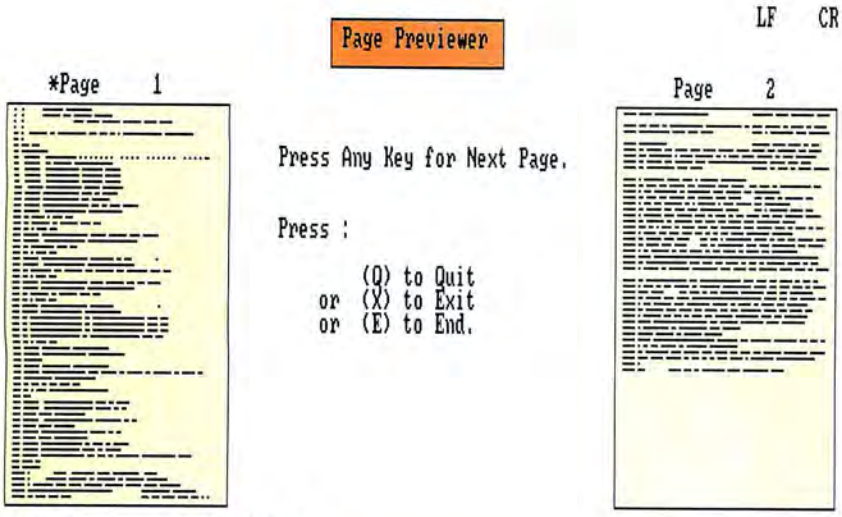

Figure 1. Preview of a Basic listing.

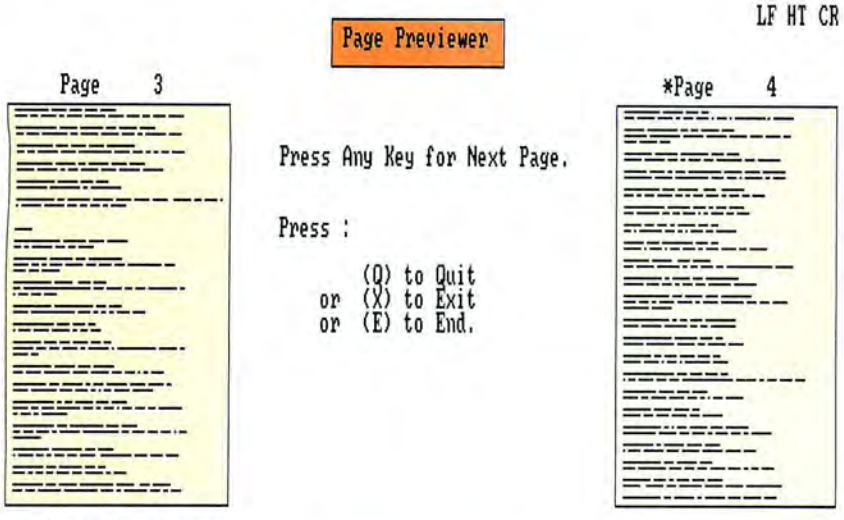

Figure 2. Preview of an index.

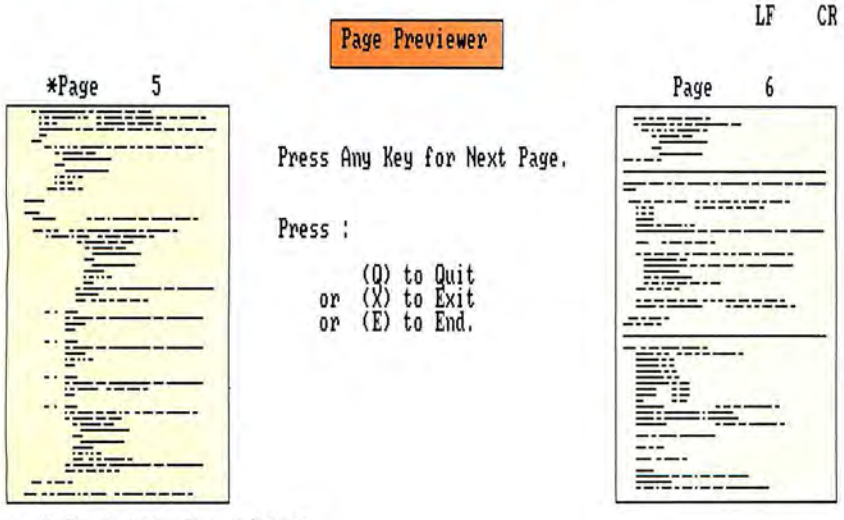

Figure 3. Preview of a Pascal listing.

The program can also tell you much more about the file you're trying to print. In the upper right corner of the display is the controls section, which displays each control character found: FF for form feed, and LF, CR, and HT for line feed, carriage return, and horizontal tab, respectively. If the document includes form feeds, make sure your printer's top of form is set correctly. If it has none of the control characters, print your document from a word processor.

How to Use Page Previewer

To use the program, you'll first have to compile it to a COM file. You do this by pressing "O" for option in the Turbo Pascal Menu. Then press "C" and "Q." I suggest naming it something like "PP." Also make sure that the Turbo Pascal Graph.P program is on your disk. My program includes it when compiling.

Page Previewer uses redirection to get its input. To process a file, enter the command:

```
PP<Filename.EXT
```

Because the program uses redirection for its input, you can pipe information to it. For example:

```
TYPE Filename.EXT| PP.
```

This sends Filename.EXT to the Page Previewer. Though this method is essentially equivalent to the first method, it is slower.

After Page Previewer displays the two simulated pages, you can press a key and examine the next two pages or press the Q, X, or E keys to end the program.

Anyone for Updates?

Though I originally wanted Page Previewer to remain a relatively simple program, I did have visions of a program that would allow some formatting—page margins, for example—or a shift feature that would permit adding space along the left margin for notebook holes or one that would permit text to be moved about the page with a mouse.

I decided I needed user feedback before continuing, however. How would *you* like to see this program improved? Which would be better—to have the program page directly from the disk or work only with files that fit into memory?

Page Previewer is a useful, powerful program. Send in your ideas and let's see how we can improve it! ■

Dale Rogerson is an electrical engineering student at Georgia Institute of Technology. You can reach him at 473 Mill Stream Road, Lexington, SC 29072.

Program Listing. A Turbo Pascal program to display reduced-sized representations of your text.

```
(*
                        ==> Page Previewer <==
                                By
                            Dale Rogerson
Uses CGA 640 x 200 graphic mode to simulate the printed page.
*)

($G2048,D-)  (* Standard Input to allow piping and redirection *)

PROGRAM PagePrt(input,ouput);
CONST
     HT             = #09;  (* Control Characters simulated. *)
     LF             = #10;
     FF             = #12;
     CR             = #13;
     CharPerLineMax = 80;
     LinePerPageMax = 66;
TYPE
    Crtl      =  SET OF CHAR;
    GenStr    =  String[80];
VAR
   Cmds,
   CtrlFound  : Crtl;
   Quit,
   PageFlag   : Boolean;
   Key,
   Ch         : Char;
   PageNum,
   X,Y,Xmax,Ymax,Xstart,Ystart
          : Integer;
($I graph.p )

(*-------------------------------------------------------------------------*)

PROCEDURE NumberPage;  (* Number the Pages. *)
BEGIN
     GotoXY(12,4);
     Write(PageNum:4);
     GotoXY(71,4);
     PageNum := PageNum + 1;
     Write(PageNum:4);
     PageNum := PageNum + 1;
end;

(*-------------------------------------------------------------------------*)

PROCEDURE SetScreen;   (* Set the screen up. *)
begin
     HiRes;             (* This program uses HiRes Graphics *)
     HiResColor(Blue);  (* I like it blue. *)

     draw(0,34,171,34,1);          (* Draw Left Page *)
     draw(0,169,171,169,1);
     draw(0,34,0,169,1);
     draw(171,34,171,169,1);

     draw(468,34,639,34,1);         (* Draw Right Page *)
     draw(468,169,639,169,1);
     draw(468,34,468,169,1);
     draw(639,34,639,169,1);

     GotoXY(6,4); Write('Page ');
     GotoXY(65,4); Write('Page ');
     GotoXY(33,2); Write('Page Previewer');          (* Put Title on Screen *)
     draw(248,5,380,5,1);      draw(380,5,380,21,1); (* Box in Title *)
     draw(380,21,248,21,1);    draw(248,21,248,5,1);

     GotoXY(1,25); Write('Dale Rogerson');          (* Put on credits *)
     GotoXY(70,25); Write('Aug 1987');

     (*--- Write the instructions for use on the screen. ---*)
     GotoXY(27,7); Write('Press Any Key for Next Page.');
     GotoXY(27,10); Write('Press :');
     GotoXY(27,12); Write('        (Q) to Quit');
     GotoXY(27,13); Write('    or  (X) to Exit');
     GotoXY(27,14); Write('    or  (E) to End.');

     (*--- Write Page numbers on screen and set up window. ---*)
     PageNum := 1;
     NumberPage;
     GraphWindow(6,36,166,166);

end;
(*-------------------------------------------------------------------------*)

PROCEDURE DispStatus;   (* Display control characters received. *)
VAR col : integer;
    St  : String[2];
BEGIN
     CASE Ch OF
          CR   :  begin            (* Carriage Return Received *)
                  Col := 79;
                  St  := 'CR';
                  end;
          HT   :  begin            (* Horizontal Tab Found *)
                  Col := 76;
                  St  := 'HT';
                  end;
          LF   :  begin            (* Line Feed Found *)
                  Col := 73;
                  St  := 'LF';
                  end;
          FF   :  begin            (* Form Feed Found *)
                  Col := 70;
                  St  := 'FF';
                  end;
     end; (* Case *)
     GotoXY(Col,1);                (* Print the character found. *)
     Write(St);
     CtrlFound := CtrlFound - [Ch];  (* Remove character found from set so
                                        we don't print it again. *)
end;

(*-------------------------------------------------------------------------*)

PROCEDURE NextSpace;      (* Print a space for move to next print position. *)
Begin
   IF x = Xmax - 2 then begin  (* Reached end of Line? *)
      x:= 0;                   (* If so then simulate a CR/LF *)
      Y:= Y+2;
      end
   ELSE                        (* Otherwise just move to next char location *)
      x := x+2;
 end;

(*-------------------------------------------------------------------------*)

BEGIN
     CtrlFound := [CR,LF,FF,HT]; (* Control Chars we look for. *)
     Cmds := ['X','x','Q','q','E','e'];  (* Exit/Quit/End Commands. *)
     Xmax := CharPerLineMax*2;           (* Max x and y position + 2 *)
     Ymax := LinePerPageMax*2;
     SetScreen;                          (* Set up screen. *)

     PageFlag := False;      (* False := Page 1 *)
     Quit := False;

     WHILE NOT Quit DO begin   (* Do it until it is time to QUIT. *)
        y := 0;                (* Start at top of page. *)
        x := 0;

        REPEAT
           Read(Ch);             (* Read a character from standard Input. *)
           IF CH IN CtrlFound Then DispStatus;  (* Find Control character?*)
           CASE Ch OF       (* Act correctly depending on Character *)
                '!'..#255 : begin   (* Normal Character *)
                            IF (y = Ymax - 2)  (* On Line 66? *)
                            THEN begin         (* If so then print "*" *)
                                 IF PageFlag Then
                                    GotoXY(64,4)
                                 else
                                    GotoXY(5,4);
                                 Write('*');
                            END;  (* If Then *)
                            Draw(x,y,x+1,y,1); (* Each character is two dots*)
                            NextSpace;
                            end;  (* End of Char case *)

                ' ' : NextSpace;

                CR  : x := 0;   (* Back to beginning of line. *)

                LF  : begin
                      y := y + 2;  (* Next Line. *)
                      x := 0;
                      end;

                FF  : Y := Ymax;   (* Next Page. *)

                HT  : X := ((X+2) DIV 16)*16 + 14;  (* Next tab position. *)

           end;  (* Case *)

        UNTIL  (y >= Ymax ) OR (EOF);   (* Finished with this page. *)

        IF (y >= Ymax ) AND NOT(PageFlag) Then begin (* Setup For First Page *)
            GraphWindow(474,36,633,167);  (* Change window for right page. *)
            PageFlag := True;   (* Now do right page. *)
            end
        ELSE begin
             Read(kbd,Key);   (* Done right page now wait for key. *)
             IF Key IN Cmds  Then  (* Time to exit? *)
                Quit := True;   (* Yes let's quit. *)
             IF EOF Then Quit := True;  (* If No more file then quit. *)
             ClearScreen;               (* Clear out right page. *)
             GraphWindow(6,36,165,167); (* Set window to left page. *)
             ClearScreen;               (* Clear left page. *)
             PageFlag := False;         (* Time to do left page. *)
             NumberPage;                (* Number the pages. *)
             GotoXY(64,4); Write(' ');  (* Clear any "*"'s *)
             GotoXY(5,4); Write(' ');
             end; (* ELSE *)

     end; (* While *)
   TextMode;       (* Let's go back to text mode. *)
   GotoXY(1,1);
```

End

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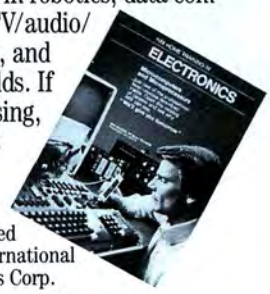

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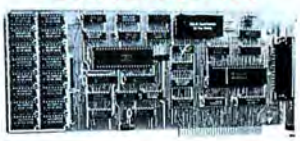

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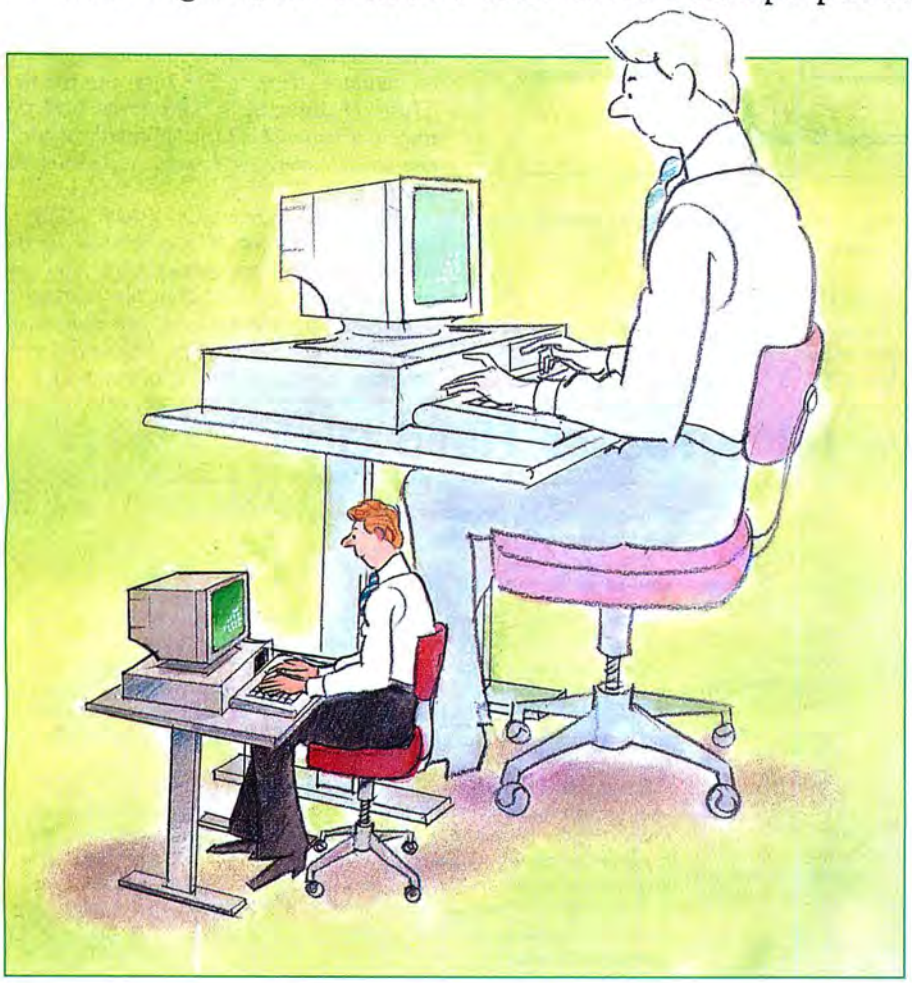
The Big Backup

A little organization makes hard-drive backups painless.



by David A. Williams

Most hard-disk users eventually bemoan the lack of a backup system that is fast, reasonably priced, and, most important, easy to use. Both hardware and software commercial systems have their drawbacks in at least one of these categories. The DOS Backup command, while inexpensive, is time-consuming and cumbersome.

The ideal backup system should also be automatic, since backups are usually neglected until it is too late. Individual files should be readily available without having to restore the entire disk. Cockpit errors account for more lost files than do hardware failures.

Major Concerns

You probably have considered the problem without realizing the extent of your exposure. Your work is at greater risk on a hard-disk system than it is on floppy disks. The hardware is fairly reliable, but if anything goes wrong with your hard disk, your files, while perhaps safe in the long run, are inaccessible until the machine is fixed. If your files are on floppy disks and your work is urgent, you can get a replacement machine.

Until someone invents an automatic backup system, you can do the following to ease the problem. First, decide what files you need to back up and when. Then organize your drive's directory structure to make the backup process as easy as possible.

Selective backup is the key to the solution. You don't need to back up your programs repeatedly when they reside safely on their original disks. Your data files are your first concern, but you should back them up only when they change. For example, you do not need to back up your spreadsheets every day if you haven't worked on them in a week. If you access some data-base files often, but rarely update them, then they, too, need backup only when changed.

You are also concerned about backing up your configuration files, batch files, and similar items that are unique to your system and change on occasion. Most programs generate a configuration file at the time of installation. You can repeat the installation process, but you save time if you have a backup copy of the files. When you add words to your dictionary, you create a file that you won't want to lose, especially if

Illustration by Glenn Dodds

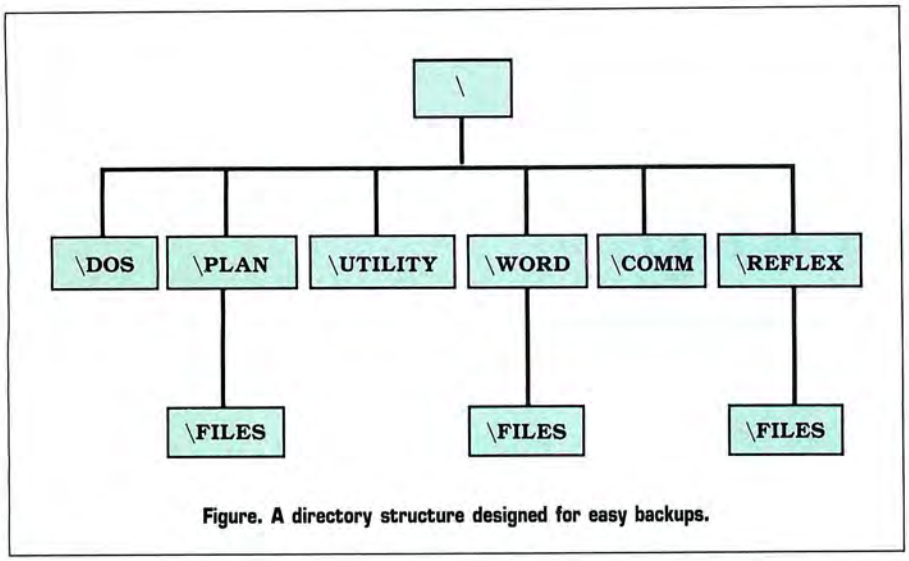


Figure. A directory structure designed for easy backups.

you have been adding to it for a long time. Still, you don't have to save this file every day.

The following system is not a panacea. It requires discipline and an understanding of the directory structure you use on your computer. It makes the job as easy as possible considering the tools you have at your disposal.

Disk Inventory

First, you need to know what is on your disk. This is not a trivial matter. A hard disk is like a storage closet—things tend to accumulate. Usually, you only use a few of many printer drivers and configuration files for a program. If you have a list of the contents of each directory on your hard disk, reconstruction is much easier.

You can inventory your hard disk with three DOS commands. Build your batch file, named List.BAT, with the following lines:

```
DIR > LIST
TREE /F >> LIST
CHKDSK >> LIST
```

This program, which you must execute from the root directory, creates a file named List that lists the subdirectories and the names of the files in them. DIR copies the contents of the root directory into the file. TREE /F lists the subdirectories and the files in them. CHKDSK primarily records the space taken by system and other invisible files.

The double arrow (>>) tells DOS to append the output of a command to the file rather than to overwrite it. You can make a hard copy of this file and get a backup when you back up the root directory. Run List only when you add a new program or change the configuration.

Interleave for a Faster Hard Disk

by Alan L. Zeichick

According to Sysinfo, a utility packaged with the Norton Utilities 4.0, the factory-installed 10-megabyte (MB) hard drive in my 1000 HD rates a 1.2—which means it's 20 percent faster than the drives sold with the original IBM PC/XT. Not bad. But could it do better?

Yes—and by a factor of 8–25 percent, depending on the test you used.

When my computer wants information from the hard drive, it reads one full sector at a time. If DOS is trying to load a program file that occupies three sectors, for example, it reads one sector, digests it, reads the next, digests it, and finally reads and digests the third.

Bear in mind that the hard-disk surfaces are spinning at about 3,600 rpm. So while the hard drive controller is busy digesting sector 1, sector 2 has spun right past the head. To read sector 2, the machine has to wait for the disk to spin all the way around again. That's a lot of wasted time.

The above assumes that the sectors are contiguous on the disk. In actuality, they're not; they're interleaved, or separated by other sectors, to compensate for disk movement during data digestion.

Like many computers, the 1000 HD is set for an interleave level of three. This means that each sector is three sectors away from its predecessor, giving the computer slack time to digest the information. How much time? At 3,600 rpm, it takes about 1 millisecond (ms) per sector. At an interleave of three, that's about 2 ms to handle 512 bytes of information.

What if a hypothetical computer needs only 1.5 ms to decipher the sector? The one-half millisecond wasted isn't much to worry about. But if the computer requires 2.5 ms, the read head will miss its mark, causing a delay of about 19 ms between the reading of each sector. However, with an interleave of four, our hypothetical 2.5-ms computer wouldn't have this problem.

System Requirements: Tandy 1000 HD. Caution: these procedures will not work and should not be tried on non-8088 machines such as the 1000 TX, 2000, 3000, or 4000.

Low-Level Formatting

There's no easy way to determine a computer's best interleave setting save trial and error. Realizing this, I decided to experiment with several different interleave values on my 1000 HD. The first step was to back up all information on the hard drive, since formatting would destroy all the data on it. For safety's sake, I created two backups and verified each backup floppy's integrity with Norton's Disk Test utility. I don't take chances with my data!

A hard drive's interleave level is set during a process known as low-level formatting, which is different from the DOS-level formatting performed by the Format and HFormat commands. Many hard drives are low-level formatted, and therefore interleaved, at the factory before it's known what type of computer they'll go into. Even though the usual default interleave level of three is reasonably efficient, the interleaving level isn't optimized for the computer's CPU speed or for hard-drive controller efficiency.

The Western Digital hard-drive controller included with the 1000 HD has its low-level format program in ROM, which is easily accessible from DOS. To redo the low-level format, insert your MS-DOS boot disk in drive A and reboot the computer. When the system's ready, type DEBUG. You'll see a minus sign. Type the letters R AX and press enter; that tells Debug that we want to store a value in one of the 8088's registers. It responds with the following:

```
AX 0000
```

This tells you that the AX register currently contains the value zero and then prompts you for a new value. After the colon, type the desired interleave level, preceded by three zeros; for example, if you want an interleave of four, type 0004 and press enter.

You'll see the minus sign again. This time, type:

```
G=C800:5
```

Press enter. This tells Debug to branch to a certain memory address—the

Organizing Your Directories

You might need to reorganize your directory structure before developing a satisfactory backup technique. If you mix everything in one huge directory you might as well forget streamlining your backup procedure. The Figure shows the directory structure I use. Tailor yours to fit your own requirements, but this should serve as a guide. The idea is to separate files that change often from those that do not.

The root directory contains Command.COM, Config.SYS, ANSI.SYS, and the BAT files I use to change directories and call programs. The DOS subdirectory contains all the other DOS programs that I use. I don't waste space on a copy of Edlin, and I don't keep a copy of the command that reformats the hard disk.

The Utility subdirectory is a collection of short utility programs that I find useful on occasion. The rest of the subdirectories are associated with particular programs. Plan, where I keep Multiplan, is typical. Under it is a subdirectory called \Plan\Files that contains the data files.

My Autoexec.BAT file contains the following path command:

```
PATH\;\DOS;\UTILITY;\PLAN;\
  WORD;\REFLEX
```

The first backslash (\) designates the root directory, which allows me to execute my BAT files from any subdirectory. With \DOS and \Utility you can execute any of the DOS commands and the utility programs from any subdirectory. The other three are the directories that have \Files subdirectories. They are included in the Path statement so that DOS can find the main program. For example, my BAT file to execute Multiplan, M.BAT, looks like this:

```
ECHO OFF
CLS
CD\PLAN\FILES
MP %1
CLS
```

If you want to run Multiplan, type M and press the return key regardless of the subdirectory you are in. DOS finds the BAT file in the root directory and executes it while changing to the \Plan\Files subdirectory. DOS finds MP in the \Plan subdirectory. Because it maintains \Plan\Files as the current directory, Multiplan looks there for the data files.

Using the System

After you organize your directory structure, you can back up the disk with minimal effort. Starting at the top, keep a backup of the root directory. Update this backup when you change an existing file or add a new one. I don't worry about the DOS subdirectory because I have several copies of DOS and the List file reminds me which programs I keep there. I have copies of the programs in \Utility on several disks, but I back up this directory for convenience. My communications program uses several configuration files, one for each system that I access. I back up the \COMM directory to record these files.

Other miscellaneous configuration files are not covered elsewhere. You can copy all of these on one disk, so you won't have to re-create them if there is a problem. It's best to do this when you add a new program and the purpose of the various files is fresh in your mind. You need to make a backup only when you change the basic configuration of your system.

Data files change more often, but you won't need to back up files that haven't changed. If you are working on a docu-

address of the low-level formatting program—and begin execution. When it begins running, you'll see the following:

```
WX2 Format Revision 3.0
(C) Copyright Western Digital Corp. 1984
(AH) = Relative drive number (0 - 7)
(AL) = Interleave factor (3 is standard)
Press "y" to begin formatting drive C with
interleave 04
```

The last number should be your chosen interleave level. If it isn't, or if you're having second thoughts about the integrity of your data backup, press control-break or the reset button to cancel the low-level formatting. When you're ready to proceed, type "Y." The low-level formatting process should take about 10 minutes.

If you have a Tandy 20MB hard card, you can use the LLFormat.COM program that came with the card to adjust the interleave. Use an interleave level of 5. The syntax is LLFormat C:X, where X is the desired interleave factor. If you have another brand of hard disk, see if the software that came with it allows you to set the interleave.

When you're done, insert your hard disk utilities program and execute the hard-drive partitioning program (it's called Part on my system). Tell the partitioner to create an MS-DOS partition, use the entire drive, and make that partition the active one. When you're done, reinsert your DOS floppy and reboot.

When the computer's ready, reinsert the hard disk utilities disk and format the hard drive at the DOS level. In my system, the command HFormat /S formats and installs the operating system on the hard drive. When HFormat is complete, you should be able to boot from your hard drive, restore your backup (if you're finished experimenting), and resume business as usual.

I ran through the above procedure three times, comparing interleave levels 2, 4, and 5 against the system's default 3, using Norton Utility 4.0's Sysinfo and Core International's Disk Performance Test 2.7. If you want to perform similar tests on your system, you can create and time any disk-intensive operation. A good test would be to first copy your entire DOS floppy to a directory named DOS, and then time the execution of a Timer.BAT batch file such as the following:

```
MKDIR\DOS1
MKDIR\DOS2
MKDIR\DOS3
```

Table. Speed results on Tandy 1000 HD.

Interleave Level Index	Norton's Disk Index	Coretest's Data Transfer Rate	Coretest's Performance
2	0.5	27.0 KB/sec	0.724
3	1.2	100.2 KB/sec	1.159
4	1.3	124.9 KB/sec	1.305
5	1.2	100.2 KB/sec	1.159

```
COPY\DOS\*.*\DOS1
COPY\DOS\*.*\DOS2
COPY\DOS\*.*\DOS3
```

Keep testing higher interleave levels until the execution time increases, which will mean that you've passed the optimal interleave level.

My test results demonstrated that an interleave of four is a substantial improvement over the computer's original interleave of three (see Table). My results should be consistent with those of other Tandy 1000 HDs, for which an interleave of four should also be optimal.

If you have a different 8088-based computer, such as a Tandy 1200, you should perform your own series of tests at different interleave levels to determine your drive's best performance level. *Do not try these procedures on non-8088 machines such as the 1000 TX, 2000, 3000, or 4000.* And if your computer's response to G = C800:5 is substantially different from what I've described, follow the directions in your hard-drive controller's manual instead.

If you find a better interleave value for your hard drive, you will have improved your computer's speed without buying additional hardware and software, without consuming precious RAM, and without introducing any potential compatibility problems. ■

Alan L. Zeichick is a technical editor for CD-ROM Review. *You can write to him at IDG Communications/Peterborough, 80 Elm St., Peterborough, NH 03458.*

ment, back it up whenever you accumulate more than you are willing to do over again.

If you're working on several projects, it may not be easy to remember to back them up. You can copy the entire \Files subdirectory to your backup disk, but this takes time if you have long files. I have a secret weapon that makes this job a snap. A simple utility program, Kopynew (or Knew), copies only those files in the current directory that have a more recent time and date than the corresponding files on the backup disk.

Public Domain

This program, copyrighted by Glen C. Siegel, is in the public domain. I downloaded it from a bulletin board in my area. You can find it on some of the national bulletin boards. It is also available on the 80 *Micro* BBS (603-924-6985, 300/1,200 baud, 8-bit words, 1 stop bit, no parity).

Use Knew with a file name and wildcard characters to selectively back up a certain class of files. My word-processing directory contains documents with the extension DOC and style sheets with the extension STY. I can back up only the documents by using Knew *.DOC. You can automate the backup by changing the BAT file to the following:

```
ECHO OFF
CLS
CD\PLAN\FILES
MP %1
CLS
KNEW
```

When you exit Multiplan, Knew executes automatically. Knew prompts you to insert the backup disk in drive A and then copies anything from the present session to the backup disk.

With . . . a little luck you should not have to restore your hard disk.

One more problem to consider is when you have a data-base file larger than the capacity of a single floppy disk. Here I must rescind what I said earlier: You should use the Backup command to back up single files of any size. The following command:

BACKUP C:\PATH\File name.EXT A:

only backs up the named file. If it extends to more than one disk, Backup prompts you to insert another one. Both disks must be formatted and empty. A file backed up this way can only be read by the Restore command. Restore the file with this command:

RESTORE A:*.* C:\PATH

Shareware

Shareware programs that copy long files to multiple disks are also available. With care on your part and a little luck you should not have to restore your hard disk. But if the worst should happen, these procedures will reduce a catastrophe to a mere inconvenience. ■

David A. Williams is a staff engineer with a major aerospace firm and has 25 years of experience with computers. Write to him at 2452 Chase Circle, Clearwater, FL 33546.

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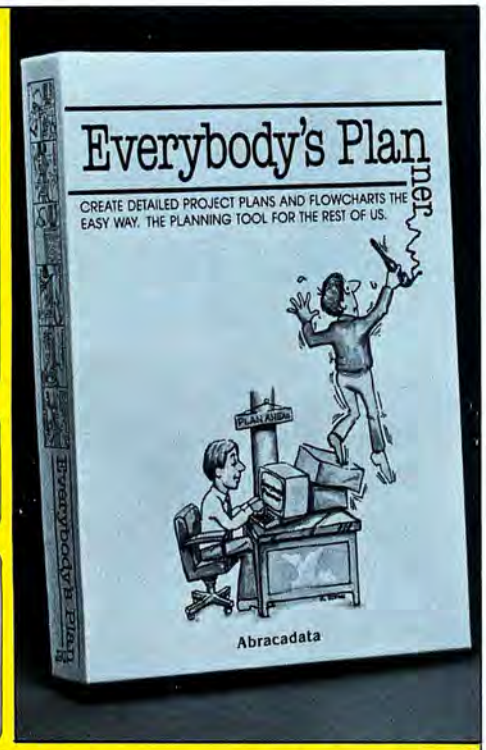

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PC-Four even works with assemblers such as **ALDS, EDAS** and **MZAL** and debugger/monitors such as **TASMON** so you can write, assemble, debug and run Z80 machine code programs on your PC. To use it you must transfer your old files to MSDOS disks first. For this we **recommend PCXZ or Hypercross** - see below for details.

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HyperCross reads CP/M and PC-DOS on TRS-80s

Using **HYPERCROSS** 3.0 you can **COPY** files between TRS-80 disks and those from many **CP/M** and **IBM-PC** type computers on your own TRS-80 Model I, III, 4/4P or Max-80. If you have access to more than one kind of computer, or you are changing to a new machine then you need **HYPERCROSS** to transfer your files. You can FORMAT alien disks, read their directories, copy files to and from them, even copy directly from one alien disk to another.
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(continued from page 27)

lines. You also get unbreakable blocks, detailed commands for page length (nominal, minimum, and maximum), top and bottom margins, headers, footers, page numbers, single- or multi-page footnotes, and footnote and text separators.

Indeed, page layout was almost overwhelming: It took careful reading and plenty of trial-and-error experiments to sort out all the choices available. So was Xywrite's generation of up to nine custom-formatted indexes or tables of contents. In this area, Xywrite III Plus makes Wordstar 4 seem simple. Setting up a mail-merge data file and document, however, is easier in Xywrite than in Wordstar, though I missed the latter's ability to sum or calculate numeric merge fields.

Earlier versions of Xywrite were known for seizing control of the keyboard and causing trouble with memory-resident programs. Xywrite III Plus proved well-behaved when I tried it with Sidekick and Pop-Up Deskset, but its built-in utilities make most accessory programs unnecessary.

Need a calculator? Xywrite lets you type an equation on the command line or sum the numbers in a defined block. Want a macro program? You can record any string of text or layout commands as one of 36 Save/Gets—macros summoned with a keystroke such as alternate-Z—and save and load different sets of these macros.

Intrigued by memory-resident shorthand programs? The same Auto Replace feature that corrects mistakes from your personal spelling dictionary—changing "alright" to "all right" as soon as you type the former and press the space bar—can instantly change "vtl" to "Very truly yours" or "atpt" to "at this point in time".

The spelling checker requires that you create and load your own personal dictionary file; it doesn't make one for you. But this lets you have more than one dictionary (such as lists of legal and medical words) in addition to the main one.

The checker is also fast and easy to use, and has the ability to work unattended—to check one file or a disk full of files, present you with a list of unrecognized words, then go back and implement your corrections. The thesaurus is Microlytics' popular Word Finder, as efficient and flexible in Xywrite as in Wordstar or Word.

Corporate users or fussy authors will like III Plus's redlining feature, which vividly shows changes to a file (with additions in bold and deletions in reverse video). You can print a marked-up version of the file showing the changes, or remove or install them one at a time or globally.

A similar embedded command lets you insert a non-printing note or label. You can use this not only as a reminder of changes or questions but also for references such as "See Madison's opinion on page 6"; the proper page number will be inserted when you print out, no matter where you move Madison's opinion.

Problems and Possibilities

I've always liked the feel of the Tandy 1000 keyboard, but its layout is the Tandy 2000's revenge from beyond the grave—and Xywrite is one of those programs that see the 1000 keyboard as if it were an IBM keyboard.

Instead of using the arrow keys, you must move the cursor with the even numbers on the numeric keypad (the Tandy's right and down arrows serve, respectively, as the keypad plus and minus). Keypad zero becomes the insert key, and while the page up, page down, and end keys work normally, home is keypad 7 instead of the home key.

Tandy's KEYCNVRT.SYS driver doesn't help, but, if you can afford it, Xywrite works fine on a 1000 with Tandy's Universal Keyboard Adapter and an IBM-style keyboard.

Since my other computer has such a keyboard, I found it almost easier to adapt to this than to use the supplied remedy. You can modify the word processor's Startup.INT file (similar to Autoexec.BAT, it sets various defaults and loads your spelling dictionaries and printer driver) to load a special Tandy.KBD file.

This isn't difficult—the startup file, like the printer and keyboard drivers, is a Xywrite document you can edit like any other—but it does only a partial job. The conversion enables the home key, but disables end and makes you use the shift key to get page up and page down. The arrow keys work within text, but you still need the keypad numbers to steer through Xywrite's help screens. Oddly, with or without Tandy.KBD, you must press numbers lock twice to unlock the numbers mode.

On the positive side, Xywrite's reliance on typed commands instead of keyboard shortcuts means that the incompatibility affects only a few functions. Better yet, some study of Xywrite's extensively documented codes and function calls will let you customize Tandy.KBD yourself, reassigning function keys or implementing your favorite features. (Under the section headed Table = , for example, the changes 73 = PU, 81 = PD, and 79 = BS will give you a shiftless page up and page down and activate the end key.)

You alter Xywrite by editing Xywrite files; consequently, it's the easiest program to modify that I've ever seen. And since it's not copy-protected, you'll always have a backup if you hopelessly scramble something.

End of File

You'll hit a few moguls skiing the expert slope, and you'll never mistake Xywrite III Plus for Personal Deskmate. But for a famously Spartan, command-driven program, Xywrite's documentation, spelling checker, and certain other features are almost luxurious. If you have some money, some patience, a lust for power, and a passion for word processing, Xywrite is a spectacular piece of software. ■

Xywrite III Plus 3.52 requires one 720K or two 360K disk drives and 256K RAM (384K for spelling checker). Xyquest Inc., P.O. Box 372, Bedford, MA 01730, 617-275-4439. $445.

The Show-Me State

by David Williams

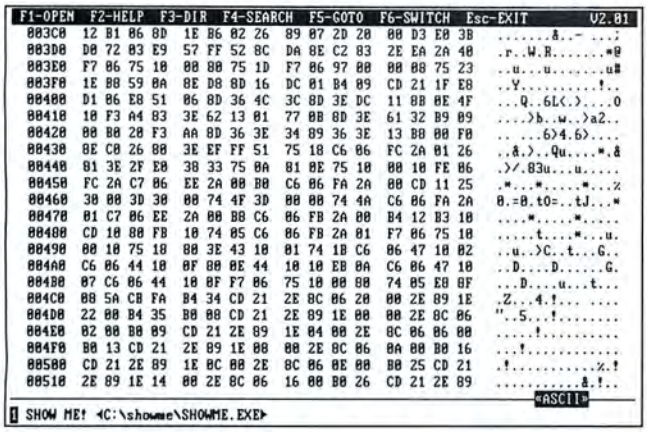
DOS has only limited capability for displaying ASCII files and throws up its hands if you want to display a binary file. But Show Me!—one of several utilities available for improving its pathetic performance in this area—can help.

How many times have you wanted to read a documentation file while running a new program? Show Me!, in its memory-resident mode, can do just that. You can also cut material from a file and paste it into the current program. There's no limit to the file size that Show Me! can handle, and you can open up to four files at one time.

Show Me! is anything but small; the program requires 36K plus a nominal 16K for the file buffers. If you have limited memory space and Show Me! is the last memory-resident program you've loaded, you can use the Unload command to free up the space it occupies without rebooting. You can also operate Show Me! in a non-resident mode, but much of its usefulness stems from memory-resident operation.

Options you can specify on the command line let you customize many of the program's characteristics. Screen colors, the buffer size, the maximum number of open files, and the default display mode—hexadecimal (hex) or ASCII—are all under your control. You can also change the activation key and the paste key combinations.

The selected buffer size is divided by the maximum number of open files (from one to four) to create separate buffers for each file. You can reduce disk activity when viewing large files if you specify larger buffers. If you expect to view only one or two



Show Me! works best as a memory-resident utility.

files simultaneously, you can make more efficient use of memory if you specify this on the command line.

You can select a file for display in either of two ways: You can press F1 to display a file-selection menu, type the file name (including a path, if necessary), and select the hex or ASCII display mode, or you can press F3 to display the current directory. Use the arrow keys to move the highlight bar to the desired file and press return to select a file. You can also view and select files from other directories.

A help menu across the top of the screen displays the function key assignments. A status line across the bottom of the screen displays the file name and the line number of the first line displayed. Once you have a file displayed, you can page through it with the cursor keys. Normally you'll use the full screen for file display, but you can change to a smaller window if you prefer.

You can jump to a specific line number in the case of an ASCII file or to a hex offset if the file is displayed in the hex mode. A special mode translates Wordstar files to a readable format. Press the escape key (ESC) to exit back to the interrupted program. The next time you invoke Show Me!, the same file will be displayed without having to be reselected.

A search function lets you find specific entries in a file. If the display is in ASCII, press F4 and enter a search string. If the display is in hex, enter hexadecimal values. The search speed isn't the fastest I've seen, but it is adequate for the job.

Once you load Show Me! in the memory-resident mode, another program can call it. The distribution disk includes demo programs in C, Basic, and Pascal to illustrate the calling procedure. Once called, the program performs in the usual manner.

Show Me! is reasonably priced considering the performance it delivers. The 50-page manual is clearly written, but you won't have to refer to it often; the program is easy to use. If you can afford the memory, you'll want to load it every time you boot up. ■

Show Me! requires 52K. Serengeti Software, P.O. Box 27254, Austin, TX 78755, 512-345-2211, $39.

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REVIEWS

Vapor Wealth

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Avg share gained/lost:	....
Advanced:	253
Declined:	268
Unchanged:	252
New highs:	26
New lows:	11
Total volume (000's):	5,957
Session high:	232.75
Session low:	200.37

AMEX MAJOR MARKET INDEX (XMI)	
The XMI closed at:	261.12
Net change:	-0.62
High:	263.62
Low:	260.62
Call volume:	9,243
Put volume:	7,716
Call open interest:	71,651
Put open interest:	64,957
Session high:	263.62
Session low:	227.58

DOW JONES INDUSTRIAL AVERAGE	
The DJIA closed at:	1334.00
Net change:	-3.12
Total volume (000's):	00,632
Session high:	1353.50
Session low:	1154.62

S&P 500 INDEX	
The S&P 500 closed at:	192.00
Net change:	-0.37
Session high:	193.25
Session low:	160.00

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The American Investor reveals market information at the close of the trading day.

by Harry Green

These two programs give new meaning to the term "paper profits." With the American Investor, you don't invest cash; the program simulates stock transactions on the American Stock Exchange to help you learn how to make investment decisions. You get feedback almost instantaneously, and you can compress months of investments and observations into a few hours at the keyboard. Millionaire II is a game in which one or two players try to parlay a modest investment into one million dollars, all on paper.

The American Investor

Each American Investor session represents a 190-day period. You begin by establishing an initial investment, which the program keeps in a money-market fund until you decide how to invest it. From the main menu, you can advance to a new day or get information about the market.

As each trading day ends, the program displays four market indexes, news headlines, dividend notices, and trends in key interest indicators (see the Photo). You can also choose a complete table of price quotations for the 47 stocks used in the simulation. The stocks are real companies and the investment information is from actual market history.

Another main menu selection is fundamental research, which provides data on companies, industry groups, or one of the four indexes. You can also do a technical analysis, which many investors rely on to predict major shifts in the market.

You can start a simulation with any amount of money up to $999,999. The program charges brokerage commissions and purchases stock at some value between the high and low price on the trading day. When you decide to open a position in a stock, you can opt to buy it, sell it short, purchase put and call options and spreads, or open a straddle. If you're unfamiliar with any of the terms, a 77-page supplementary manual explains their meanings.

You can also place orders to buy or sell stocks at a specified price, or you can write a stop-loss order to sell a stock automatically if its price drops below a specified level. Most of the transactions you would execute or strategies you would employ on the market are available with American Investor.

As the simulation progresses, you can take long or short positions in any of the stocks and deal in options if they are actually available on the exchange. The program pays dividends automatically, issues margin calls if you don't have enough cash to meet federal requirements, and purchases or sells stocks according to your orders. It takes several minutes to page through all the screens and interpret them, so the program provides a fast-advance feature for skipping through daily sessions without reviewing the data.

The program calculates your net worth daily. You can stop at any time to inspect your portfolio; the program reports how much of each stock you own, what it cost, its current value, and the percentage of unrealized gain or loss. You can get a complete report on any stock, including an indicator of the effects on profitability if you sell today.

At the end of each trading month, the program issues a detailed financial report. Graphs display your net worth and compare it to the performance of the Standard and Poor's 500. Another graph displays your annualized return on investment.

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It combines the features of a word processor, database manager, and information retrieval and display utility. You compose information records on the screen using the word processing feature in any format you like. Each record is described by 1-17 character key phrases that you specify. Once created, the information file's keyphrases can be scanned as a list on the screen, using an impressive key scan bracket. You scroll the keyphrases thru the brackets with the arrow keys on your keyboard. When the desired keyphrase is found, you press a single key and the corresponding information record is retrieved from disk and displayed on the screen. The record displays in exactly the same format as you used to create it. You can even design your own forms to "fill in."

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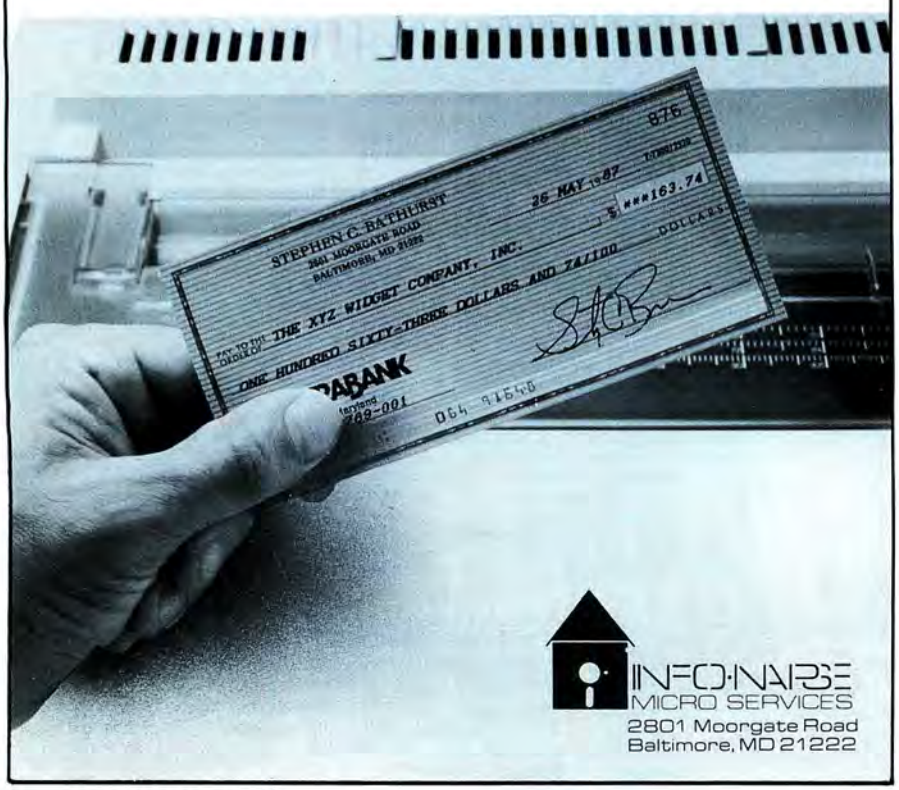

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REVIEWS

Millionaire II

Millionaire II incorporates similar features into a game. Each player begins by selecting from five status levels, ranging from Novice, with a net worth of $10,000, to Broker, with a net worth of $100,000. The objective is to make a million dollars.

Windows at either side of the main menu show the players' net worth, interest paid and earned, and the net change from the previous week. Players can research the corporate history of any stock they are considering or see how the stock tracks with its industry.

After completing research, you can buy or sell short the stock or purchase options (if your status permits). The program lets you view your portfolio and graph your net worth at any time. At the end of the game, which covers 77 weeks, the computer reports your net worth and investment success—or lack of it.

Conclusion

Both programs teach you something about the market. The American Investor is particularly effective with its impressive graphics and detailed information. The simulation is about as exciting as stud poker played for matchsticks, but it lets you play the market without risking more than the price of the package. ■

The American Investor ($149.95) requires 512K, MS-DOS 2.x, two floppy drives or one floppy and a hard disk, and a color graphics adapter (CGA) or Hercules graphics card.

Millionaire II ($59.95) requires 256K and MS-DOS 2.x.

Britannica Software, 185 Berry St., San Francisco, CA 94107, 415-546-1866.

Forms Generator

by Wynne Keller

A form generator lets you design a form, save it to disk, and then either print it out as is or return to the template, fill it in, and print it out in finished form.

Except for drawing grids, EZ-Forms does a fine job of creating forms. It also performs a variety of math functions within a form. The program comes with more than 100 ready-made forms on a disk; additional disks can be purchased at $39 each. A special font disk for the Hewlett-Packard Laserjet printer is also available.

Like most form generators, EZ-Forms has one limitation you should be aware of: It won't put lines and text in the same space, because a line counts as a character. Thus, you can't type text onto a line unless you use two rows, type the line on the bottom row, and float the text on the row above it. I found it useful to keep two versions of some forms: a lined version I could fill out by hand or on a typewriter and an unlined version I could fill out on the computer.

To design a form, you start by giving it a name and selecting a size—the minimum is 23 rows, and the maximum is 126 rows by 255 columns.

Although you can create borders easily, there's no direct command to create a grid. To make a line, you mark its beginning and end points, then press a function key to draw it. In the graphics mode, you can even create simple drawings with the cursor keys. This feature is a pleasure to use; it's as easy to erase what you don't want as it is to create what you do. Diagonal lines, however, are not supported. If your linear artwork looks a bit ragged, the Patch function straightens it up by erasing extra nubs and connecting intersections that don't quite work.

It's possible to design forms so that users can use the tab key to jump from entry to entry when filling them out. To do so, it's necessary to replace all blank spaces (such as spaces between words) that aren't meant to receive input with tilde marks (~). The tildes are not printed. Though this sounds cumbersome, it works easily: Just fill the entire page with tildes, then type your form over them.

EZ-Forms supports ASCII file import or export. An option converts any special characters to blank spaces, preventing some word-processor codes from wrecking your form.

The most obvious use for EZ-Forms' math feature is customer invoicing. You can arrange a form to work with a formula that will total entries each time you fill it out. The formulas look like hieroglyphics and using them takes some effort, but this is a potentially important feature.

EZ-Forms has a number of block functions. It's annoying, though, that block markers don't appear on screen; you can't tell if you've marked the area you intended. The program supports wordwrap (from one line to the next) only within a marked block.

You can mark a master form for automatic date, time, and form counting. Each time such a form is filled out, the computer displays the correct date and time and the number of times the form has been completed.

If you have pre-printed forms, such as invoices, you can use your computer to fill them out. Design an EZ-Form to match them, fill it out on the computer, feed the pre-printed forms through your printer, and print only the data you entered. The EZ-Form will not be printed over the pre-printed forms. The program's limited ASCII data-base file-merge function might be useful in combination with this feature.

EZ-Forms offers a number of print options. You can specify the number of copies, draft or final mode, and whether you want six or eight lines per inch, compressed or normal print, and extra dark or normal graphics. You can print several forms as a batch. You can also number forms incrementally as they print. A quick-print function lets you see your work on paper before you leave the edit mode.

EZ-Forms has much to recommend it. Any problems I encountered were only minor annoyances. Designing forms isn't difficult, but the program comes with so many ready-made forms that you might not even need to devise your own. Your results will be near print-shop quality on a laser printer and quite satisfactory on a good dot-matrix machine. ■

EZ-Forms Executive 1.2 requires 384K. EZX Corp., 403 Nasa Road 1E, Webster, TX 77598, 713-338-2238, $89.

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The Electronic Placeholder

by Alan L. Zeichick

It can happen to anyone. Someone trips over your computer's power cord, or there's a sudden blackout. The annual budget, the Great American Novel, the data base you slaved over is gone.

Bookmark is a utility designed to prevent such catastrophes. At periodic intervals, Bookmark makes a copy of working memory—system and video RAM—and stores it on your hard disk. If the system collapses suddenly, Bookmark can reload the stored work session and resume execution at the point where it was saved.

Setting Up

The Bookmark package contains one 5¼-inch, non-copy-protected system disk, a good 16-page user's manual, and, appropriately enough, a little bookmark (which doubles as a quick-reference card). A 3½-inch disk is optionally available from Intellisoft.

Bookmark has one of the easiest installation procedures I've seen. While logged onto the hard disk, place the Bookmark disk in drive A and type A:LOADMARK. Unlike other products that ask you what type of monitor and disk you have, Bookmark finds out for itself; its device summary menu correctly listed my 640K RAM, MS-DOS 3.1, color graphics adapter, hard disk, and single serial and parallel ports.

Bookmark doesn't use, or protect, memory described by the Lotus-Intel-Microsoft Extended Memory Specification (LIM/EMS). If you rely on LIM/EMS, then Bookmark's not for you.

You'll need to decide which hard disk to use (the default is C), which directory to store the backup file in (the default is the root), and whether you want a single or double backup. Double backups use the two-tape backup theory; if there's calamity during the actual backup process, and the current backup is destroyed, there's always an earlier one available. It's a practical theory, but in practice, it consumes twice the hard-disk space.

You're also given the opportunity to install a device driver that extends the computer's type-ahead buffer from 15 to 127 characters, and to select password protection. The password protection is *only* for restoring a stored work session and doesn't provide any protection against general access to the computer.

The Bookmark software, once installed, consumes over 750K of hard-disk space. The Bookmark program is about 29.5K, a small hidden configuration is a mere 17 bytes, and the hidden read-only backup file, named BM1.CKP, occupies 721,920 bytes on my 640K system.

Taking Off

You insert a command invoking Bookmark at the end of your hard disk's Autoexec.BAT file; whenever the computer boots, you're asked, "Resume, y/n?" If the response is "yes," Bookmark restores the previous work session; this took about 16

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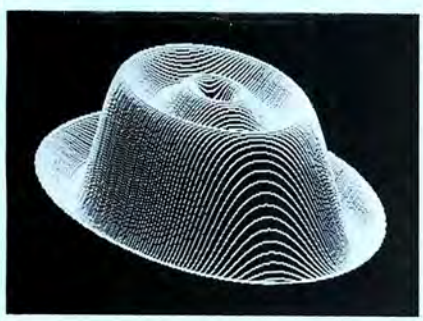

Superior Hardware. The Grafyx Solution provides 153,600 pixel elements which are arranged in a 640 × 240 or on the Model III a 512 × 192 matrix. Hundreds of new business, personal, engineering, and educational applications are now possible. The hi-res display can be shown on top of the standard display containing text, special characters, and block graphics. This simplifies program debugging, text labeling, and upgrading current programs to use graphics. The Grafyx Solution fits completely within any tape or disk based Model 4, 4D, 4P, or III. Installation is easy with the plug-in, clip-on Grafyx Solution board.

Superior Basic. Over 20 commands are added to the Basic language. These commands will set, clear or complement points, lines, boxes, circles, ellipses, or arcs. The hi-res screen can be printed on any of 30 popular printers or saved or loaded to disk without leaving Basic. Areas may be filled in with any of 256 patterns. Sections of the screen may be saved and then put back using any of five logical functions. Labels can be printed in any direction. The viewing area can be changed. The entire screen can be complemented or cleared. Graphics Basic provides dot densities of 640 × 240, 320 × 240, 160 × 240, and 160 × 120, all of which can be used in the same display.

Superior Software. The board comes with over 40 programs and files which make it easier to use, serve as practical applications, demonstrate its capabilities, and serve as programming examples. The software works with TRSDOS 1.3, 6.1.2, 6.2, 6.3; Dosplus 3.4, 3.5, 4; LDOS; and Newdos80. The Grafyx Solution is also supported by 30 optional applications programs: Draw, Bizgraph, xT.CAD, 3D-Plot, Slideshow, Mathplot, Surface Plot, Chess, etc.

The Grafyx Solution package is shipped complete for $149.95 (reduced from $299.95). The manual only is $12. Payment may be by check, Visa/MC, or COD. Domestic shipping is free on pre-paid orders. Texas residents add 7% sales tax.

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seconds on my Tandy 1000. If you answer "no," the Autoexec batch file continues or you're returned to MS-DOS.

By default, Bookmark saves your work every five minutes or every 2,000 keystrokes, whichever comes first. On my system, each save took about 10 seconds. You can change the backup schedule in three ways: by manually initiating a backup with a hot key, by selecting different values in the Loadmark installation program, or by command-line options you've added to your Autoexec.BAT file. Backups can be at any time interval, after any number of keystrokes. I found the default values satisfactory.

Command-line options include Auto, which causes an automatic restoration of the work session after a reboot; Console, which invokes a backup immediately after the conclusion of disk I/O; Delete, which deletes passwords and removes the BM1.CKP file; and Off, which disables the automatic backup process. Bookmark suggests you use the Auto option when you run your computer unattended, as in a remote bulletin-board system; if there's a power failure, the system can resume wherever it left off.

The Bookmark owner's manual is well written and describes the installation and program options clearly. The manual includes an index, a two-page description of Bookmark's error messages, and two pages of technical advice. These notes offer suggestions about using Bookmark with modems, RAM disks (Bookmark saves the contents of RAM disks located in regular memory), streaming tape drives, and memory-resident utilities.

A note warns you to remove the CPK files before optimizing or unfragmenting the hard disk. This is accomplished painlessly by typing BOOKMARK DELETE from MS-DOS; the CPK files will be automatically re-created the next time you boot your computer.

Potential Problems

Bookmark worked effortlessly on my Tandy 1000 and didn't conflict with any of my RAM-resident software. However, I'm more concerned about unusual situations in which data may be lost or corrupted.

Imagine you're entering data into an accounting system. You've typed in transaction 3000, and the automatic backup takes place. After the backup, you type in the next few transactions, up to number 3010, and the power goes out. A few minutes later the power comes back, and your system reboots.

If you didn't have Bookmark, you'd reload your accounting software and check on the status of transactions 3009 and 3010. If the software saves each transaction to disk, you may only have lost one or two. But with Bookmark, you're restored to transaction 3000—the last backup. Who knows if the accounting software in RAM accurately knows what's stored on the disk, and what effect reentering data will have on the contents of the hard disk? The results might be disastrous.

Bookmark's RAM-snapshot backup approach may not be appropriate for all software or workstation situations. Bookmark's not at fault here and in fact recognizes the pitfalls by letting you turn the program off or on in batch files.

Summary

If you're conscientious about saving your work, you probably don't need Bookmark. The product meets its manufacturer's claims, but I recommend it only if you have a specific application that's well suited to Bookmark's automatic execution restart, or if people are constantly tripping over your power cord. Otherwise, just train yourself to save your work often. ■

Bookmark 1.2 requires 256K, MS-DOS 2.1 or higher, and a hard disk. Intellisoft International, 70 Digital Drive, P.O. Box 5055, Novato, CA 94948, 415-883-1188. $99.95.

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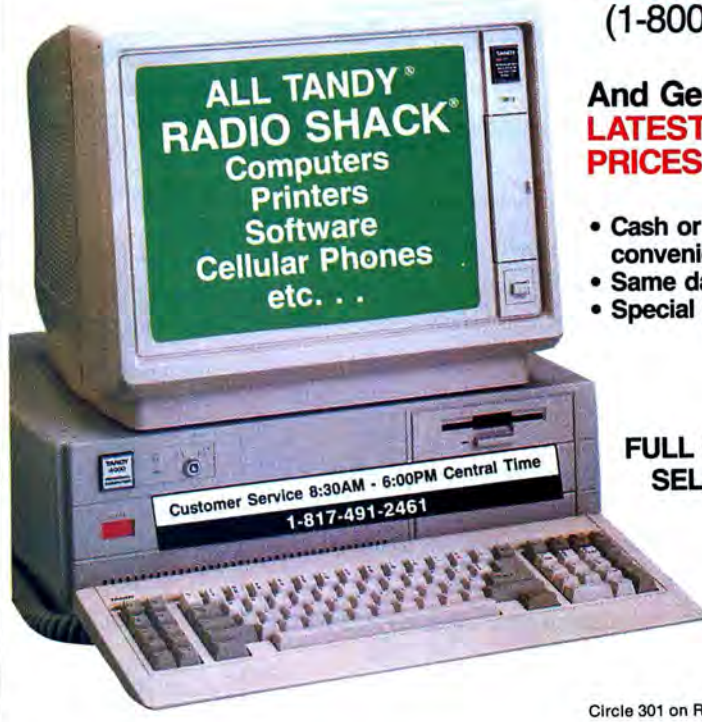

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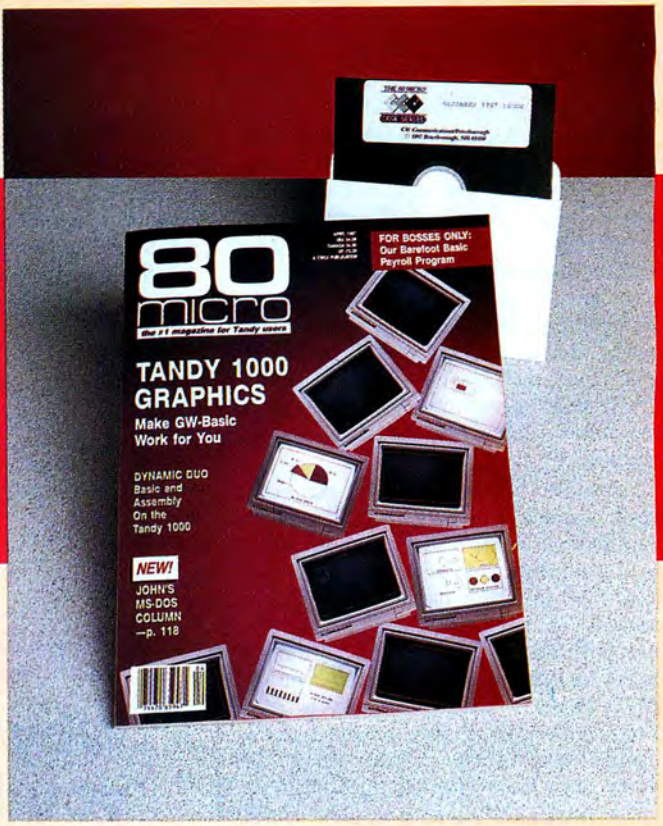

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- **In the Marketplace** -- commodities futures trading simulator.
- **Time Keeper** -- manages several projects simultaneously, and calculates time spent on each project.
- **Clear-Cut Trends** -- draws, displays, and prints hi-res line and bar graphs.
- **Don't be Late** -- critical path scheduling brings your projects in on time.
- **Made-to-Order Sorts** -- creates custom sorts by answering 10 prompts.
- **Next Generation Software** -- recreates the agricultural experiments of Gregor Mendel.
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4 9 14 19 24	154 159 164 169 174	304 309 314 319 324	454 459 464 469 474
5 10 15 20 25	155 160 165 170 175	305 310 315 320 325	455 460 465 470 475
26 31 36 41 46	176 181 186 191 196	326 331 336 341 346	476 481 486 491 496
27 32 37 42 47	177 182 187 192 197	327 332 337 342 347	477 482 487 492 497
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103 108 113 118 123	253 258 263 268 273	403 408 413 418 423	553 558 563 568 573
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READER FORUM

edited by Mare-Anne Jarvela

USING SORT AND SHELL

■I am using the Sort command with the Shell command by placing them in Basic programs. The example in the Program Listing will sort and show time started and completed. Lines 1030–1050 delete and rename files. I'm using drive C in the sample.

Shell works with random or sequential files. You can sort on any variable within the file. With sequential files, make sure you provide equal length for all variables, or the program won't work. Add the following lines to the Listing:

```
3775 | 1000 LOCATE 13,1:PRINT"SORTING JOHN'S MAILING LIST "; TIME$
3086 | 1010 SHELL "SORT <C:JOHNFLE.DAT >C:SORTOUT.DAT"
2940 | 1020 LOCATE 15,1: PRINT"SORT COMPLETED "; TIME$
1855 | 1030 SHELL "DEL C:JOHNFLE.DAT"
2954 | 1040 SHELL "RENAME C:SORTOUT.DAT JOHNFLE.DAT"
2533 | 1050 OPEN "C:JOHNFLE.DAT" FOR INPUT AS #1
```

Program Listing. Sort routine shows starting and ending times.

900 INPUT N$
995 IF LEN(N$)<25 THEN N$ = N$ + " ": GOTO 995

If you assume that LEN (N$) = 25, LEN(A$) = 30, and LEN(C$) = 40, and you want to sort on A$, change line 1010 to:

1010 SHELL "SORT /+26 <C:JOHNFLE.DAT>C:SORTOUT.DAT"

To sort on C$, change line 1010 to:

1010 SHELL "SORT /+56 <C:JOHNFLE.DAT>C:SORTOUT.DAT"

Tom Limerick
Williamsburg, VA

OH, MY ACHING BACKSLASH

■After using a hard disk on my Tandy 1000 for a while, I became frustrated with the backslash (\ ) key's inconvenient location on the numeric keypad. I wrote a short data file that allows me to use the control-slash (^ /) combination to enter the backslash.

The file is a sequence of codes that inform the ANSI.SYS video driver to substitute the scan code for a backslash with the scan code for a control-slash. Make sure you have ANSI.SYS installed in your system by adding it to your Config.SYS file (DEVICE = ANSI.SYS).

To create the data file with the code sequence necessary to perform the substitution, you need to do two things. First, create the data file with the Copy con routine and then use Debug to fill in the proper binary codes and save the modified file.

Type the following lines from DOS, pressing the enter key at the end of each line:

```
COPY CON CTRLSLSH.DAT
+[0;251;92p^Z
```

Note that you can enter the control-Z by pressing the F6 key. This creates the file CTRLSLSH.DAT with 11 characters plus 1A hexadecimal (^Z) as the terminating byte. The first byte in this string (+) is not the correct byte for the file; it should be an escape character (27 decimal). Since the Copy con routine can't enter the escape character from the keyboard, you have to use Debug to enter the proper code. Type in the following command:

```
DEBUG CTRLSLSH.DAT
```

When you see the dash (—) press "D" and enter to see what the byte representation of the data file looks like (see Figure 1).

The first four digits of the address might be different on your computer and can be ignored. The bytes marked with xx will vary and can also be ignored. The codes indicated for the first 12 bytes on the first line, including the end-of-file marker 1A hex, should show from address xxxx:0100. If they don't, press "Q" to exit and start again from creating the data file.

If everything matches up, you can continue by typing in and pressing enter after the following lines:

```
-E0100
-52F0:0100 2B.1B
```

(Note that the dash (-) is the prompt provided by Debug.)

Now type D0100 and press enter to check your result. You should see something like Figure 2. If the first 12 bytes of line 0100 are the same as shown below, you are ready to write the file to disk and exit Debug by typing these lines and pressing enter:

```
-W
-Q
```

Your data file is now ready. To invoke the ^/ feature, all you need to do is send it to the console by entering:

```
TYPE CTRLSLSH.DAT
```

Now try pressing ^/ a few times; you should see a backslash on the screen. Be aware that some application programs don't honor the ANSI.SYS driver and therefore won't recognize the ^/ combination.

Include the command "type CTRLSLSH.DAT" in your Autoexec.BAT file on your boot disk to invoke the ^/ every time you turn on your computer.

For those who are interested in learning more about the ANSI.SYS driver, the CTRLSLSH.DAT file basically consists of four parts of information: the code that notifies the driver that a keyboard switch follows; the scan code of the key to change; the scan code to which it's to be changed; and the end-of-file marker. Specifically, the first 2 bytes are the escape code, 1B hex, followed by the left bracket code, 5B hex, which tells the driver that a screen control code follows.

The second part of information consists of the next 5 bytes, which make up the scan code for the control-slash given in decimal ASCII format. Scan codes that begin with a zero are called extended ASCII codes and are 2 bytes long. The scan code for ^/ is 0;251. The third part of information is the scan code for the backslash, which is 92 decimal. And finally, the last part is the end-of-file marker (^Z), which is 1A hex.

The ANSI.SYS screen driver provides a myriad of screen control options. The *Programmers Reference Manual* for the Tandy 1000 provides more information about this most useful driver.

Robert A. Petolillo
Jacksonville, NC

```
52F0:0100 2B 5B 30 3B 32 35 31 3B 39 32 70 1A xx xx xx xx +[0;251;92p>.
52F0:0110 xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx ..............
```

Figure 1. Byte representation of data file.

```
52F0:0100 1B 5B 30 3B 32 35 31 3B 39 32 70 1A xx xx xx xx <[0;251;92p>.
52F0:0110 xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx ..............
```

Figure 2. Byte representation of modified data file.

Illustration by Chris Demarest

Circle 124 on Reader Service card.

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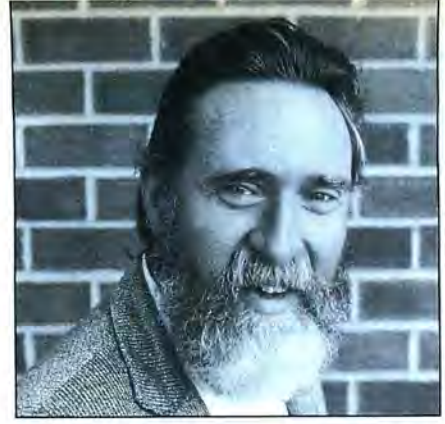

Back to Front

■ by Harry Bee ■

Occasionally, I forget that some of you may have wandered into this corner only recently. In just such a fit of oblivion, I suggested you devise an efficient way to take a list of strings and reverse its order (see "As Time Goes By," December 1987, p. 29). List manipulation, a recurring theme in this column, is important in certain kinds of programs—text editors and data managers, to name two.

I assumed everyone knew that S% is my standard designation for the current size of the list, regardless of how much larger the array may be, and that the first item in the list is number 1. (The zeroth element of the array remains available as a place to put things that need a place to be put.)

Although I took things for granted, a couple of new readers didn't, with fortunate results for the rest of us. Reading S% as the unknown size of some array, they invented ways to find the highest numbered element, also known, as the upper bound, of any array.

Out of Bounds

Sure, you can argue (correctly) that when you write a Basic program, you know exactly how you've dimensioned each array; that even when a program's events determine a dimension of some array, you'll keep the dimension in a variable, if you intend to use it; that if compiled versions of the language like Quick Basic and Turbo Basic include among their features a function to return the upper bound of an array, it's because they also have the tools, including the upper bound function itself, to generalize subroutines; that interpretive Basic doesn't lend itself to generalization; and that, therefore, a synthesized upper bound routine has no practical value in interpretive Basic.

That's all that practical stuff. But what if you were curious and wanted to find out how and where Basic stores the dimensions of its arrays? What if, just for the heck of it, you wanted to see if you could discover the size of any given array if you had to? How would you go about it?

Lewis Seiden (Tappan, NY) wrote a routine that made creative use of the purposeful error. He climbed the array until a subscript out of range error message signaled he'd gone too far by one. In general, it looks like this:

```
100 E=0:ON ERROR GOTO 1000
110 X=ARRAY(E):E=E+1:GOTO 110
120 UBOUND=E-1:ON ERROR GOTO 0
130 ' More program code here...
1000 RESUME 120
```

Kenneth Gash (Rancho Palos Verdes, CA) consulted the description of the array in the table where Basic stores such things. When you use the VARPTR function with the lowest element of an array, the address the function returns is 1 byte above the array descriptor. The 2 bytes immediately below the VARPTR address hold the number of elements in the array's first dimension. If it has more than one dimension, each lower pair of bytes describes the next dimension.

I made a general function out of Ken's routine, and Program Listing 1 demonstrates how it works. In the function, FNUbound, the variable D represents the dimension you're interested in. When the lowest element (lower bound) is zero, the number of elements is one more than the highest numbered element, which accounts for subtracting one at the end of the function. That brings up a question or two—just for the heck of it.

Can you write a complementary function, FNLbound, to determine which base, zero or 1, is in force? And can you use such a function to modify FNUbound and make it accurate for both bases? Can you think of a legitimate application for both functions?

Back to Backward

Meanwhile, I asked you to take a list of strings and reverse its order. S% is the current size of the list, and the first item is number 1. The reversed list had to wind up in the original array. One application of such a routine is to let you change your mind after you sort a list into ascending or descending order. You could sort again, but what a waste of energy!

I also asked you to do the job efficiently, because I'd seen a couple of examples of how to reverse a list inefficiently. Program Listing 2 shows you both of those subroutines. Both of them work. They reverse lists. Therefore, neither is wrong. According to Bee's first rule of programming, anything that gets the job done is correct, but some routines are more efficient than others. The ideal is the most efficient way to accomplish every task; the most compelling reason to keep working at programming is that ideals are elusive and rarely attained.

The routine that starts at line 100 of Listing 2 uses a second array, TEMP$. To transfer the list from the original array to the temporary one and back again, it steps through the entire list twice. The temporary array is temporary only in the way the routine uses it. The list, held in two arrays, takes up twice the memory in the variable table and at least three times the string storage space. If the list and program are long, the routine guarantees garbage collection—those irksome pauses while Basic cleans the deadwood out of its string storage area. You can make the TEMP$ array truly temporary and improve the routine in the bargain by creating the second array with DIM TEMP$(S%) at the beginning and destroying it with ERASE TEMP$ at the end.

The second routine, at line 200, is a big improvement. It uses the original array exclusively, and the loop steps just half way up the list: INT(S%/2). (You can use Fix in place of Integer [INT]). If S% is even, the loop cycles through exactly half the list; if S% is odd, the routine never handles the middle element.

However, to exchange the bottom half of the list with the top, the routine uses a temporary string, and each exchange takes three statements. While the variable table isn't unnecessarily elongated by an extra array, the amount of deadwood left in the string storage area is still enormous. You can eliminate half the arithmetic in the loop by adding 1 to S% once (T=S%+1) at the beginning. You can get rid of the three-step exchange, a throwback to earlier Basic dialects, with a Swap command:

SWAP LST$(LOOP),LST$(T-LOOP).

James Haher (Oneonta, NY) came up with

a couple more noteworthy improvements. You'll find them in line 1000 of Program Listing 3. In the first place, he figured out that you don't have to fix S%/2 to define the loop. FOR L=1 TO 3.5 will run its last cycle with L as 3. In the second place, the purpose of TOP=TOP−1 is much easier to understand than S%+1−LOOP or even T-LOOP. The program demonstrates that the routine works equally well for odd and even numbers of elements.

Side Orders

Fully half the string reversal routines that came in this month didn't use Swap. This is a valuable command, especially when used with strings.

Swap doesn't use the string storage area. When you swap the contents of two string variables, all the command does is quickly and cleanly exchange the pointers between the two string descriptors in the variable table.

Swap or no Swap, when you work with strings, you can't avoid collecting a lot of junk in string storage. Several events will cause Basic to take time out to tidy up the space. The most certain cause of so-called garbage collection is the storage area growing too large to accept another string without crashing into something. If a program gets to that point, you can have piles of deadwood lying around, and your program may slow down noticeably while Basic sorts things out.

In any program that manipulates a lot of string data, it's a good idea to take control of string storage yourself. One way to do that is to write efficient string handling routines. Another aid is the FRE function, with which you can pick the places in your program where it's convenient to sweep up and put things away.

The FRE function operates two ways. When you use it with a numeric argument, PRINT FRE(X), it returns the amount of free memory your program has to play with. With a string for an argument, X=FRE(X$), the function still returns the amount of free memory but after Basic straightens up string storage.

Reversals

I also asked you to take the same principle you used to reverse the order of a list and use it to turn a string around—to turn *reviled* into *deliver*, for example. No one came up with a way to use Swap to do the job, nor did I, short of stuffing each character of the string into an array, which is too much investment for the payoff.

In fact, there is no very efficient way to reverse a string. You could find the string in storage and peek and poke the characters. It's easy on storage space but slow. The equivalent routine using Mid$ functions and another variable for transient storage is quicker, even though cleaning up string storage is a factor. (See Program Listing 4, line 100.) More importantly, such a routine is easier to read and understand.

Notice how that routine, which represents the most popular method of string reversal among the ones you sent, follows my suggestion and applies principles from list reversal routines: It steps half way through the string and performs simulated swaps.

Tony Kyle (Oklahoma City, OK) was one of a few who ignored my advice and looked for an easier way. His was the earliest postmarked example of building a second string backwards. (Listing 4, line 200.)

But the grand prize for inventiveness has to go back to James Haher. Instead of a second, temporary string, James builds the reversed string onto the end of the original string and slices it off with a Right$ function. (Listing 4, line 300.) No, it's not efficient, but it's cute.

On the Menu

The art and craft of menu making has come a long way since Scripsit on the Model I. These days menus are slick. If you've ever used a product of Software Publishing Corporation—PFS: this or that—you know what I mean by slick. They pop up, pull down, and push over. They're in neat boxes or attractive bars. You can point and shoot at them (i.e., highlight your selection, and press the enter key) or select by number or initial letter. Even when the menu isn't visible, you can still select from it with a function key or a hot key.

I have a dessert menu. On it are Apple Pan Dowdy, Bananes Flambés, Croissants au Courant, Dainty Doughnut Holes, and Etruscan Eclairs. If an *80 Micro* T-shirt, not to mention fame, is your heart's desire, put the menu in a box or bar, and give me the three methods of selection I mentioned—point and shoot, number, and letter—to branch to subroutines at lines 1000, 2000, 3000, 4000, and 5000. If you want to add more ways to select, that's fine. If you want to include ways to use a joystick or a mouse, that's good too, but make sure that folks without those peripherals can still use their arrow keys. For extra credit, you might set up some hot keys I can use when I can't see the menu.

As always, the routines I'm looking for are small, compact, efficient, and clever. Amusing wouldn't hurt. Don't get too fancy with the menu; it's the selection routine that's important.

The Rules:

1. Write your program(s) or routine(s) in Basic.
2. Your solution(s) to this month's poser(s) must reach us by March 15, 1988, to be considered for the June 1988 issue and a T-shirt if we use it.
3. Employees of IDG Communications already have T-shirts and are not eligible.
4. Send your solutions, comments, criticism, suggestions, and T-shirt size to: *80 Micro*, Fine Lines, 80 Elm St., Peterborough, NH 03458. We cannot return entries. ■

Harry Bee is a free-lance writer, programmer, puzzle creator, and dreamer. You can contact him at P.O. Box 567, Cornish, ME 04020, or on Compuserve (74076,3461).

Program Listing 1. Dr. Gash's upper bound.

```
3220 | 100 DEF FNUBOUND(V,D)=PEEK(V-2-2*D)+256*PEEK(V-1-2*D)-1
1602 | 110 DIM X$(29),Y(444),Z#(11,22)
4130 | 200 PRINT"The highest numbered element of:":PRINT
3090 | 210 PRINT"X$ array =";FNUBOUND(VARPTR(X$(0)),0)
3021 | 220 PRINT"Y array =";FNUBOUND(VARPTR(Y(0)),0)
4812 | 230 PRINT"Z# array, first dimension =";FNUBOUND(VARPTR(Z#(0,0)),0)
4898 | 240 PRINT"Z# array, second dimension =";FNUBOUND(VARPTR(Z#(0,0)),1)
```

Program Listing 2. Two array reversers.

```
     | 100 ' The double reverse -- assuming TEMP$ array properly dimensioned.
3469 | 110 FOR LOOP=1 TO S%:TEMP$(LOOP)=LST$(LOOP):NEXT LOOP
4739 | 120 FOR POOL=S% TO 1 STEP -1:LST$(S%-POOL+1)=TEMP$(POOL):NEXT POOL:RETUR
     |     N
     | 199 '
     | 200 ' The end around.
7146 | 210 FOR LOOP=1 TO INT(S%/2):TEMP$=LST$(LOOP):LST$(LOOP)=LST$(S%-LOOP+1):
     |     LST$(S%-LOOP+1)=TEMP$:NEXT LOOP:RETURN
```

Program Listing 3. James Haher plays fair about turns.

```
3606 | 10 DIM LST$(18):FOR L=1 TO 18:READ LST$(L):NEXT L:CLS:S%=18
6997 | 20 DATA ark,bog,cam,dot,elf,fig,gum,hat,ink,jug,kit,lap,mud,nut,owl,pig,
     |    rag,sun
2381 | 100 FOR L=1 TO S%:PRINT LST$(L):NEXT L
 787 | 110 GOSUB 1000
3136 | 120 FOR L=1 TO S%:LOCATE L,25:PRINT LST$(L):NEXT L
3725 | 130 IF INKEY$="" THEN 130 ELSE IF S%=18 THEN CLS:S%=17:GOTO 100
 418 | 999 END
5989 | 1000 TOP=S%:FOR BOTTOM=1 TO S%/2:SWAP LST$(BOTTOM),LST$(TOP):TOP=TOP-1:N
     |      EXT BOTTOM:RETURN
```

Program Listing 4. Reviled solos deliver!

```
4123 | 10 LINE INPUT"Enter a string: ",W$:LN=LEN(W$):S=LN+5:PRINT
2527 | 20 PRINT"String"TAB(S)"Time":PRINT
10148| 30 PRINT W$TAB(S):S1=TIMER:GOSUB 1000:GOSUB 100:PRINT W$TAB(S):GOSUB 100
     |    0:GOSUB 200:PRINT W$TAB(S):GOSUB 1000:GOSUB 300:PRINT W$TAB(S):GOSUB
     |    1000:PRINT:GOTO 10
     | 99 '
     | 100 ' The hard way.
6023 | 110 T=LN+1:FOR L=1 TO LN/2:T$=MID$(W$,L,1):MID$(W$,L,1)=MID$(W$,T-L,1):M
     |     ID$(W$,T-L)=T$:NEXT L:RETURN
     | 200 ' Tony Kyle's clear example.
4254 | 210 T$=W$:W$="":FOR L=LN TO 1 STEP -1:W$=W$+MID$(T$,L,1):NEXT L:RETURN
     | 300 ' James Haher's devious thinking.
6777 | 310 W$=W$+STRING$(LN,32):T=LEN(W$):FOR L=1 TO LN:MID$(W$,T)=MID$(W$,L,1)
     |     :T=T-1:NEXT L:W$=RIGHT$(W$,LN):RETURN
     | 999 '
4905 | 1000 S2=TIMER:PRINT USING"#.## seconds.";S2-S1:X=FRE(X$):S1=TIMER:RETURN
```

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How to Use *80 Micro* Program Listings

Basic program listings in *80 Micro* include a checksum value at the beginning of each line. This value is the sum of the ASCII values of all characters and spaces in the line. If a line begins with an apostrophe as the first character after the line number, no checksum is calculated. If a remark is at the end of a line of code, it is not included in the checksum. Use Checksum to enter Basic programs found in *80 Micro* and test the accuracy of your typing a line at a time as you enter the program.

To enter a program, load and run Checksum. Enter the program exactly as listed, omitting the checksum number and bar at the beginning of the line. Omit the indentations when program lines continue to a second or third magazine line. Do *not* type in comments at the end of a line. When you press enter, the line will be redisplayed with a checksum.

Compare this number with the one found in *80 Micro*. If they are not the same, you made a typing error. Use the arrow keys to move the cursor to the first space of the line just typed. Press the delete key seven times to delete the checksum. Move the cursor to the error, and correct it by typing over the error or use the insert and delete keys to add or delete information. Press enter and recheck the checksum number.

After you enter the entire program, save it to disk with the Save command.

Checksum simulates Save, List, LList, Load, Files, and New commands and adds three new commands: Basic, Check, and LCheck. The Basic command exits the Checksum program back to Basic, leaving Checksum in memory. Check and LCheck work like List and LList, except they show the checksums along with the listing.

Checksum saves the new program as an ASCII file. By saving the program again with Basic, you shorten it on disk and make it load faster, but you can no longer edit it with Checksum unless you convert it back to an ASCII file by using the SAVE"file name", A command in Basic. ■

Program Listing. Checksum.

```
      | 10 'Automatic Checksum Program Version 1.0 by Randall D. Hamilton
 4440 | 20 DIM L$(500),LNUM(500):COLOR 13,1,1:KEY OFF:CLS:MAX=0:LNUM(0)=65536!:CLS
 1671 | 30 DEF SEG=&H40:W=PEEK(&H4A)
 4380 | 40 ON ERROR GOTO 620:PRINT:PRINT"Checksum Program Ready."
 3389 | 50 LINE INPUT L$:Y=CSRLIN-INT(LEN(L$)/W)-1:LOCATE Y,1
 7499 | 60 DEF SEG=0:POKE 1050,30:POKE 1052,34:POKE 1054,0:POKE 1055,79:POKE 105
      |    6,13:POKE 1057,28:LINE INPUT L$:DEF SEG:IF L$="" THEN 50
 2679 | 70 IF LEFT$(L$,1)=" " THEN L$=MID$(L$,2):GOTO 70
 2204 | 80 IF ASC(L$)>57 OR ASC(L$)<48 THEN 210
 4235 | 90 BL=INSTR(L$," "):IF BL=0 THEN BL$=L$:GOTO 100 ELSE BL$=LEFT$(L$,BL-1)
 3089 | 100 LNUM=VAL(BL$):TEXT$=MID$(L$,LEN(STR$(LNUM))+1)
 4974 | 110 IF LNUM>65529! THEN PRINT"Line number greater than 65529":GOTO 30
 4770 | 120 IF TEXT$="" THEN GOSUB 540:IF LNUM=LNUM(P) THEN GOSUB 550:GOTO 50 ELSE 50
  961 | 130 WORK$=TEXT$
 3512 | 140 IF LEFT$(WORK$,1)=" " THEN WORK$=MID$(WORK$,2):GOTO 140
 3482 | 150 IF LEFT$(WORK$,1)="'" THEN A$="        ":LOCATE Y,1:GOTO 180
 4711 | 160 CKSUM=0:FOR I=1 TO LEN(L$):CKSUM=CKSUM+ASC(MID$(L$,I)):NEXT:LOCATE Y,1
12314 | 170 IF CKSUM<10 THEN A$="    "+STR$(CKSUM)+" " ELSE IF CKSUM<100 THEN A$
      |    ="  "+STR$(CKSUM)+" " ELSE IF CKSUM<1000 THEN A$="  "+STR$(CKSUM)+"
      |     " ELSE IF CKSUM<10000 THEN A$=" "+STR$(CKSUM)+" " ELSE A$=STR$(CKSUM)+" "
  870 | 180 PRINT A$+L$
 3408 | 190 GOSUB 540:IF LNUM(P)=LNUM THEN L$(P)=TEXT$:GOTO 50 'replace line
 1253 | 200 GOSUB 560:GOTO 50 'insert the line
 5579 | 210 TEXT$="":FOR I=1 TO LEN(L$):A=ASC(MID$(L$,I)):TEXT$=TEXT$+CHR$(A+32*
      |    (A>96 AND A<123)):NEXT
16376 | 220 DELIMITER=INSTR(TEXT$," "):COMMAND$=TEXT$:ARG$="":IF DELIMITER THEN
      |    COMMAND$=LEFT$(TEXT$,DELIMITER-1):ARG$=MID$(TEXT$,DELIMITER+1) ELSE
      |    DELIMITER=INSTR(TEXT$,CHR$(34)):IF DELIMITER THEN COMMAND$=LEFT$(TEX
      |    T$,DELIMITER-1):ARG$=MID$(TEXT$,DELIMITER)
 2210 | 230 IF COMMAND$="LIST" THEN GOTO 330
 4283 | 240 IF COMMAND$="LLIST" THEN OPEN "lpt1:" FOR OUTPUT AS #1:GOTO 340
 4910 | 250 IF COMMAND$="LCHECK" THEN CKFLAG=1:OPEN "lpt1:" FOR OUTPUT AS #1:GOTO 340
 2839 | 260 IF COMMAND$="CHECK" THEN CKFLAG=1:GOTO 330
 5011 | 270 IF COMMAND$="SAVE" THEN GOSUB 570:OPEN ARG$ FOR OUTPUT AS #1:ARG$=""
      |    :GOTO 340
 2194 | 280 IF COMMAND$="LOAD" THEN GOTO 490
 9571 | 290 IF COMMAND$="NEW" THEN INPUT "Erase program - Are you sure";L$:IF LE
      |    FT$(L$,1)="y" OR LEFT$(L$,1)="Y" THEN MAX=0:LNUM(0)=65536!:GOTO 30:ELSE 30
 4028 | 300 IF COMMAND$="BASIC" THEN COLOR 7,0,0:ON ERROR GOTO 0:CLS:END
 2265 | 310 IF COMMAND$="FILES" THEN GOTO 520
 2381 | 320 PRINT"Syntax error":GOTO 30
 2172 | 330 OPEN "scrn:" FOR OUTPUT AS #1
 2690 | 340 IF ARG$="" THEN FIRST=0:P=MAX-1:GOTO 380
 5903 | 350 DELIMITER=INSTR(ARG$,"-"):IF DELIMITER=0 THEN LNUM=VAL(ARG$):GOSUB 5
      |    40:FIRST=P:GOTO 380
 4462 | 360 FIRST=VAL(LEFT$(ARG$,DELIMITER)):LAST=VAL(MID$(ARG$,DELIMITER+1))
 4797 | 370 LNUM=FIRST:GOSUB 540:FIRST=P:LNUM=LAST:GOSUB 540:IF P=0 THEN P=MAX-1
 2954 | 380 FOR X=FIRST TO P:N$=MID$(STR$(LNUM(X)),2)+" "
 2049 | 390 IF CKFLAG=0 THEN A$="":GOTO 450
  881 | 400 WORK$=L$(X)
 3512 | 410 IF LEFT$(WORK$,1)=" " THEN WORK$=MID$(WORK$,2):GOTO 410
 2770 | 420 IF LEFT$(WORK$,1)="'" THEN A$="        ":GOTO 450
 4635 | 430 CKSUM=0:A$=N$+L$(X):FOR I=1 TO LEN(A$):CKSUM=CKSUM+ASC(MID$(A$,I)):NEXT
12314 | 440 IF CKSUM<10 THEN A$="    "+STR$(CKSUM)+" " ELSE IF CKSUM<100 THEN A$
      |    ="  "+STR$(CKSUM)+" " ELSE IF CKSUM<1000 THEN A$="  "+STR$(CKSUM)+"
      |     " ELSE IF CKSUM<10000 THEN A$=" "+STR$(CKSUM)+" " ELSE A$=STR$(CKSUM)+" "
 1324 | 450 PRINT #1,A$+N$+L$(X)
 1567 | 460 IF INKEY$<>"" THEN X=P
 1677 | 470 NEXT :CLOSE #1:CKFLAG=0
  632 | 480 GOTO 30
 3046 | 490 GOSUB 570:OPEN ARG$ FOR INPUT AS #1:MAX=0:P=0
 8316 | 500 WHILE NOT EOF(1):LINE INPUT #1,L$:BL=INSTR(L$," "):BL$=LEFT$(L$,BL-1
      |    ):LNUM(P)=VAL(BL$):L$(P)=MID$(L$,LEN(STR$(VAL(BL$)))+1):P=P+1:WEND
 1603 | 510 MAX=P:CLOSE #1:GOTO 30
 2911 | 520 IF ARG$="" THEN ARG$="A:"ELSE SEL=1:GOSUB 570
 1343 | 530 FILES ARG$:GOTO 30
 3610 | 540 P=0:WHILE LNUM>LNUM(P) AND P<MAX:P=P+1:WEND:RETURN
 4677 | 550 MAX=MAX-1:FOR X=P TO MAX:LNUM(X)=LNUM(X+1):L$(X)=L$(X+1):NEXT:RETURN
 6911 | 560 MAX=MAX+1:FOR X=MAX TO P+1 STEP -1:LNUM(X)=LNUM(X-1):L$(X)=L$(X-1):N
      |    EXT:L$(P)=TEXT$:LNUM(P)=LNUM:RETURN
 3211 | 570 IF LEFT$(ARG$,1)=" " THEN ARG$=MID$(ARG$,2):GOTO 570
 3565 | 580 IF LEFT$(ARG$,1)<>CHR$(34) THEN 320 ELSE ARG$=MID$(ARG$,2)
 3761 | 590 IF RIGHT$(ARG$,1)=CHR$(34) THEN ARG$=LEFT$(ARG$,LEN(ARG$)-1)
 3278 | 600 IF SEL=0 AND INSTR(ARG$,".")=0 THEN ARG$=ARG$+".BAS"
 1058 | 610 SEL=0:RETURN
 2218 | 620 PRINT "Error #";ERR:RESUME 50
```

Putting AI to Work

■ by Hardin Brothers ■

Anyone with even a passing interest in computer technology has certainly heard the term "artificial intelligence" (AI). Whether you believe that computers have intelligence or ever will depends more upon your definition of the term than on computer technology: It's possible to define intelligence to include even the most primitive If...Then constructs, and it's also possible to define it in such a way that only human beings could ever be classified as intelligent.

More important than the terminology and arguments it has provoked, AI research has resulted in new software technologies that can be applied to a number of programming problems. These techniques are built into Prolog and other AI languages and can be implemented in less esoteric computer languages such as C, Pascal, and Basic. This month, I'll explore one of the fundamental techniques of AI as it might be implemented in a Basic program.

Much of this month's column was inspired by the early chapters of Herbert Schildt's book, *Artificial Intelligence Using C*. Published by Osborne McGraw-Hill in 1987, it's an excellent introduction to AI programming techniques, regardless of what language you prefer to use.

Searching Data Bases

Most significant computer programs either create or manipulate a group of data. Data-base programs often search through the data, either collecting a set of records that meet a certain criterion or looking for a specific piece of information. Programming techniques for this kind of search are well known and often depend on indexes or specialized organization of the data records.

AI programs frequently have another purpose for searching through a data base: finding a path from one record to another. This month's programs show how such a search can be performed.

Suppose you have a data base consisting of airline schedule information. A data-base program could retrieve information about any flight and could probably generate a list of all the direct flights between any two cities. However, if no direct flight is scheduled between the two cities that you're interested in, the data-base program would be of only marginal use. An "intelligent" program could suggest an indirect route that would get you from one city to another until you reached your destination.

Perhaps the most obvious way to perform such a search would be to make a list of all the possible combinations of flights in the data base and then search the list to see which combinations connect the two cities. Unfortunately, building such a list is nearly impossible if the data base has more than a few entries. A mere 10 items can be arranged in over 3.6 million ways; the list of possible arrangements of 100 flights is more than 9 * 10^157, or 9 followed by 157 zeros. Even if a computer could generate such a list in a reasonable amount of time (and no current computer could), it would still have to search through the list, perhaps forever, to find all the possible routes.

Since such an exhaustive, brute-force search is impossible, an intelligent program must use a different tactic to find possible flights between two cities. Creating algorithms for searches like this is a fundamental problem for AI researchers, somewhat akin to a data-base programmer's quest for a perfect sort routine.

Searching and Backtracking

A basic tenet of this kind of data-base search is that no reasonable way to find all possible solutions exists—but a program can find one or more good solutions to any problem presented to it. Nor is there any reasonable way to prove that any particular solution is the best, since doing so would necessitate generating all possible solution paths.

At first it may be difficult to get used to the idea that a computer program cannot find all solutions—or just the one best solution—to such a seemingly simple problem. If a mailing list program can name everyone who lives in Illinois, it seems logical to expect an airline flight program to list all possible routes from Boston to Boise. But should flights through Mexico City or Anchorage be included? How about flight lists that require plane changes in 50 different cities? Or one-week stopovers in Aspen? The problem is so complex that you could probably *walk* from one city to the next before the computer could list all possibilities.

The second important concept in search programs like this, as well as in most AI programming in general, is backtracking. Most such programs work towards a goal one step at a time, in a method reminiscent of a mouse in a maze. If they reach a dead end, they back up to the last decision point, select a different branch, and try again.

Assume that our program is looking for a set of airline flights that will take us from Boston to Boise. It begins by finding a flight from Boston to St. Louis. Then it finds a flight from St. Louis to Denver and one from Denver to San Diego. But then it discovers that there aren't any direct flights—perhaps not even any connecting flights—out of San Diego. It must then backtrack to Denver and try to find another path, perhaps one to San Francisco. But again, it may arrive at a dead end.

Suppose the program backtracks to Denver and discovers that there are no remaining choices to try. It then backtracks to St. Louis and tries other flights from there. Perhaps it finds a flight to Salt Lake City and, from there, a flight to Boise.

In its search, the program has visited "choice nodes" at St. Louis (twice), Denver (three times), and San Diego, San Francisco, and Salt Lake City (once). It obviously needs a way to keep track of where it has been and a method of marking the unsuccessful routes it has tried so that it won't try them again.

The second problem, marking the unsuccessful routes, is easier to solve. As the program explores each choice, it sets a flag to show that a particular route was tried. When it backtracks to look for a different route, it ignores the paths for which flags have been set.

The first problem, remembering where the program has been and to what city it should return, is easily solved with a data

structure called a stack. Technically, a stack is a last-in, first-out (LIFO) queue or line of data. Less technically, a stack is analogous to a stack of plates in a cafeteria. The new plates added to the top of the stack are the first ones available to be used.

Almost all programs and all programming languages use stacks internally to keep track of subroutine calls and other program structures. In fact, all microprocessors of which I'm aware use a hardware stack (often a section of regular memory) to do the same. This month's program, however, creates its own stack to control backtracking. It does so by designating a special array as a stack and keeping a separate stack pointer that always contains the index number of the first available position in the stack array.

This month's program uses four stack operations: "pushing" a new piece of data on the top of the stack, "popping" the top stack item off the stack, reading the entire stack from beginning to end to find a history of choices, and clearing the stack of all data. To push a new data item on the stack, the program stores that item at the location stack(stacktop). ("Stack" is the name of the array; "stacktop" is the stack pointer.) After pushing a data value on the stack, the program then increments stacktop to point to the next free location on the stack.

Popping a value from the stack is a similar operation. The program decrements the value of stacktop to point to the last item pushed and then reads the value at stack (stacktop). This leaves the stacktop with the correct value for the next push or pop operation.

Reading the stack is a matter of examining every value stored in the stack array from zero to stacktop-1 (remember that stacktop points to the first unused stack position). To clear the stack, the program sets stacktop to zero. Notice that it's never necessary to actually erase the values stored in the stack array. Unused stack positions, locations in the array from stacktop to the end of the array, are always assumed to contain garbage values and are ignored by the program.

The Program

I wrote this month's program in Microsoft's Quick Basic 4, which, in my opinion, is a quantum leap ahead of every other Basic I've seen, both as a programming language and as a programming environment. The program will need revisions to run under other Basics, including earlier versions of Quick Basic.

The most important change necessary will be rewriting the declared subprograms and functions as normal subroutines and handling the values returned from the functions. Also, the recursion in the FindFlight function will have to be eliminated unless you are using Turbo Basic.

To make the program as clear as possible, I have adopted the following convention: Basic's own keywords are always in uppercase letters (Quick Basic does that automatically), names of subprograms and functions are in mixed case, and names of variables are in lowercase.

Program Listing 1 demonstrates the simplest kind of path search. The program knows nothing about geography or which flights are most likely to lead to an acceptable solution. However, it will find a set of flights between any two cities in a data base if such a set exists. Before you read the following description, I urge you to type in the program and try it. The description will then be much clearer.

First Search Program

Listing 1 begins by declaring a number of functions and subprograms. Actually, Quick Basic (which I'll refer to as "QB4" from now on) writes the declarations automatically; I've rearranged them and added comments. As you read through the program, you can look back at these declarations to find out how the program blocks are related.

Next, the program defines a number of constants, which are values that won't change during the program but will make the program easier to read. The last constant in the list is perhaps the most interesting. If you set the value of trace equal to true, the program will display each step it takes. If you set trace equal to false, the program will find an answer and display it. The constant trace is used by procedures throughout the program to determine if they should report what they are doing.

The next section declares global or shared variables as well as a record structure, KBItem, which holds one entry in the data base (or "knowledge base," as AI programmers like to call it). Each record in the data base contains a city of origin, a city of destination, the distance between the two, and a flag used to control traceback. The program creates an array of the data-base records and a variable to record how many items actually exist.

The main program loop begins by calling the Setup subprogram continually until there is at least one entry in the knowledge base. It then enters a main loop that clears the traceback flags, making all entries available. Next, the program gets the names of the target cities from the user and sends those names to the FindFlight subprogram for processing. If FindFlight finds a path from the origin to the destination cities, it leaves that path on the stack, and the PrintAnswer routine then searches through the stack and prints the result.

```
New York,  Chicago,          1000
Chicago,   Denver,           1000
New York,  Toronto,           800
New York,  Denver,           1900
Toronto,   Calgary,          1500
Toronto,   Los Angeles,      1800
Toronto,   Chicago,           500
Denver,    Salt Lake City,   1000
Denver,    Houston,          1500
Houston,   Los Angeles,      1500
Denver,    Los Angeles,      1000
```

Figure. A sample data base for Program Listing 1.

The Routines

QB4 prints out subprograms and functions in alphabetical order, but that isn't necessarily the best order for discussing the logic of a program. I'll therefore follow the order of the declarations at the top of the program; you'll have to skip back and forth in the program to read the individual procedures.

The Setup and Input routines are fairly standard. The program asks if you want to read the data base from a disk file or type it in directly. The KeyInput routine ends by asking if you want to save what you've typed to a disk file. The Figure shows the data base that I used for testing the program. You can either create it with a text editor or select keyboard input the first time you run Listing 1 and then read the data base from the file every other time. Whenever Listing 1 asks for a file name, you can press the enter key to use the default name, if you want, a feature that is built into the GetFilename$ function.

The interesting part of the program is in the FindFlight subprogram and its associated functions. FindFlight begins by searching for a direct route from the city of origin to the destination. If it finds such a flight, it pushes its location in the data base onto the stack by calling the Push subprogram and then returns. That's all it has to do.

If it can't find a direct flight, it calls FindAnyFlight to find a flight from the city of origin to anywhere else at all. If the subprogram finds such a flight, it is pushed onto the traceback stack. The destination of that flight then becomes the new city of origin. FindFlight calls itself recursively to look for this new path.

Any time a program routine calls itself, the program is using recursion. This means a routine is invoking itself with new values. The key to writing a recursive routine (besides using a language that supports recursion) is to make sure that there is always a condition that will cause the routine to come to an end eventually. FindFlight ends if it finds a direct flight, a flight from the city of origin to anywhere else (after calling itself recursively), or if it can't find any flight at all.

You can eliminate the recursion in FindFlight, if you want, by changing the values of orig$ and dest$ directly and then using Gotos to return to the top of the

routine. However, be sure that you don't alter the original values of targetorig$ and targetdest$ in the main program.

If no flight exists from the current orig$ to anywhere, FindFlight attempts to trace back to the last choice point and try again. The last section of the routine pops a value, if one exists, from the stack and then looks for a new route.

The secret to finding a new route is in the FindAnyFlight function. This function not only searches the data base to find a flight from one city to anywhere else but also marks the flights that should no longer be considered. Whenever FindAnyFlight finds a possible route, it resets the traceback flag for that route. For example, if FindAnyFlight is looking for a flight from Denver to anywhere, it may find a flight from Denver to Houston. It then sets the flag for the Denver to Houston flight so it won't choose that flight again. Otherwise, the entire program could lock up in a loop and try the same flights repeatedly.

Both FindAnyFlight and FindMatch read through the data base, one record at a time, to locate a particular flight. In a more complex data base, this would take too long. Such routines are more likely to use a data-base index, perhaps one based on a B-tree, to determine quickly if a flight exists. I'll explore such indexing techniques in a future column.

Once FindFlight ends, by either finding a route or determining that none exists, the PrintAnswer routine is responsible for displaying the actual route. It does so by reading through the entire stack and printing the flights it finds. It also adds up the distances between cities and reports the total mileage.

The remainder of the routines provide support for the search. Push and Pop manipulate the stack. Each must check the condition of the stack to make sure there isn't an overflow or underflow. The Pop function returns a value of zero if an underflow has occurred. Push reports an error and halts the entire program if there's a stack overflow, since no other routine could then function properly.

All the other routines should be self-explanatory. They are routines that could occur in any program: prompting for a yes/no response, asking if the user wants to run the program again, etc. One thing to notice throughout the program is that fixed-length strings are used for the city names. If you have enabled tracing, this makes the trace reports a little messy but keeps the string comparisons simpler. The PrintAnswer routine, however, strips trailing blanks from each city name before printing them.

Adding Intelligence

Listing 1 isn't very smart. It always selects the first possible record it comes to during each search, regardless of how promising that flight looks. If you ask it to find a flight from New York to Los Angeles, for example, it finds neither the shortest route nor the route with the fewest plane changes—it finds the first possible answer it can find.

By changing the FindAnyFlight routine, you can modify Listing 1 so that it makes more intelligent choices as it moves through the data base.

Program Listing 2 shows one such change. Instead of selecting the first available flight from a city, the FindAnyFlight function in Listing 2 looks for the longest possible flight. This algorithm makes the assumption that a longer flight will take you closer to the desired destination; therefore, you can get there in fewer steps. If you use the FindAnyFlight routine in Listing 2, you'll find that, with the sample data base, this assumption holds true.

Program Listing 3 is another version of FindAnyFlight that looks for the shortest possible flight from a given city. It is based on the assumption that we can find the shortest route from one city to another by constantly selecting the shortest flight at

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each choice node. With the sample data base, it does indeed find the shortest flight from New York to Los Angeles.

Both Listing 2 and Listing 3 make assumptions about the data base in general. If we had a flight from New York to London in the data base and another from London to Chicago, Listing 2 would produce a ridiculous solution, finding a flight from New York to Los Angeles by way of London. On the other hand, if the data base included a number of short flights—from New York to Boston, from Boston to Washington, D.C., from Washington, D.C. to Philadelphia, etc.—Listing 3 would generate an inefficient total path. Although the algorithms in Listings 2 and 3 know nothing about the nature of the data base, selecting one to use means that the programmer needs to have an idea about how the information is arranged. Some programs generate solutions by several different algorithms and then compare the results before presenting a solution to the user.

Perhaps you'd like to generate more than one solution. You can do this by removing one or more parts of the data base after every solution is generated. Program Listings 4 and 5 show two ways it could be done. The first leaves the traceback flags set on the solution path so none of the original flights can be used in a later solution. Listing 5 removes the final flight from the data base by erasing the name of the city of origin.

It's interesting to note that each modification of Listing 1 results in a different solution or set of solutions if the program is asked to find a flight from New York to Los Angeles. Even a data base as simple as this one contains many different possibilities, and a slight change in the program can cause a major change in the outcome. Also, the order of the information in the data base is often as important in finding an acceptable solution as the algorithm chosen.

These programs are only an introduction to the kinds of algorithms used in path-finding and goal-finding AI programs. Schildt's book and several new ones provide additional insight into the problems and techniques of AI programming. You may not need to create a full-fledged expert system, but these techniques can often be used to solve otherwise difficult problems in more traditional programs. ■

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

Program Listing 1. Simplest kind of path search finds sets of flights between any two cities if such sets exist.

```
'+++++++++++++++++++++++++++++++++++++++++++++++++
'  Depth-first search program
'  This program is designed specifically to search
'  a knowledge base of air distances between cities
'
'  Compiled with QuickBasic v. 4.Ø
'+++++++++++++++++++++++++++++++++++++++++++++++++

'++++++++++
'  These routines initialize the database
'++++++++++
DECLARE SUB Setup ()
DECLARE SUB KeyInput ()
DECLARE SUB FileInput ()
DECLARE FUNCTION GetFilename$ ()

'++++++++++
'  These routines do the actual searching
'++++++++++
DECLARE FUNCTION FindAnyFlight% (orig$)
DECLARE SUB FindFlight (orig$, dest$)
DECLARE FUNCTION FindMatch% (orig$, dest$)

'++++++++++
'  These routines handle the traceback stack
'++++++++++
DECLARE SUB Push (p%)
DECLARE SUB Pop (p%)

'++++++++++
'  Miscellaneous routines
'++++++++++
DECLARE SUB ClearFlags ()
DECLARE SUB GetTarget ()
DECLARE SUB PrintAnswer ()

'++++++++++
'  Handy utility routines
'++++++++++
DECLARE FUNCTION Again$ ()
DECLARE FUNCTION YesNo$ ()
DECLARE SUB Pause ()
DECLARE FUNCTION Strip$ (s$)

'+++++++++
' Variable declarations:
'+++++++++

DEFINT A-Z

CONST false = Ø                         'These values don't change
CONST true = NOT false                  '  during the program.
CONST available = true                  '"const" declarations are
CONST unavailable = false               'available to all functions
CONST forever = true                    'and subprograms in this
CONST maxint = 32767                    'module (the entire program)
CONST maxsize = 1ØØ                     'Maximum size of database
CONST trace = false                     'Set to true watch the action

DIM SHARED stack(Ø TO maxsize)          'Define the stack
COMMON SHARED stacktop                  '  and stack pointer

COMMON SHARED filename$
DIM SHARED targetorig AS STRING * 2Ø
DIM SHARED targetdest AS STRING * 2Ø
COMMON SHARED default$
'+++++++++
'  Each entry in the knowledge base has 4 parts:
'  a city of origin, a city of destination, a distance, and a flag.
'+++++++++

TYPE KBItem
   origin      AS STRING * 2Ø
   destination AS STRING * 2Ø
   distance    AS INTEGER
   flag        AS INTEGER
END TYPE
DIM SHARED kb(1 TO maxsize) AS KBItem

COMMON SHARED entries                   'Number of entries in the
                                                  'knowledge base

'+++++++++
'  Main Program Loop
'+++++++++

default$ = "KBASE.DAT"                  'Default database file name

DO
   Setup                                'Initialize the database
LOOP WHILE entries = Ø

DO
   ClearFlags                           'Make all routes available
   GetTarget                            'Get user's origin & destination
   FindFlight (targetorig$), (targetdest$)   'Can we get there from here?
   PrintAnswer                          'Let's find out
LOOP WHILE Again$ = "Y"                 'Repeat if user is still curious
CLS
END

FUNCTION Again$
'++++++++++
'  Does user want to run program again?
'++++++++++
   CLS
   PRINT "Run program again? ";
   Again$ = YesNo$
END FUNCTION

SUB ClearFlags STATIC
'+++++++++
'  Clear all knowledge base flags and stack
'+++++++++
   FOR lp = 1 TO entries
      kb(lp).flag = available
   NEXT lp
   stacktop = Ø
END SUB

SUB FileInput
'+++++++++
'  Read the database from a file
'+++++++++
   entries = Ø
   filename$ = GetFilename$
   OPEN filename$ FOR INPUT AS 1

   DO UNTIL EOF(1)
      IF entries >= maxsize THEN
         PRINT "The database is full"
         Pause
         EXIT DO
      END IF
      entries = entries + 1
      INPUT #1, kb(entries).origin$
      INPUT #1, kb(entries).destination$
      INPUT #1, kb(entries).distance
   LOOP
   CLOSE
END SUB

FUNCTION FindAnyFlight (orig$)
'+++++++++
'  Look for a flight from Orig$ to anywhere
'+++++++++
      IF trace THEN
```

Listing 1 continued

Listing 1 continued

```
            PRINT "Looking for a flight from "; orig$; " to anywhere"
            WHILE INKEY$ = "": WEND
         END IF

   FOR lp = 1 TO entries
      IF orig$ = kb(lp).origin$ AND kb(lp).flag = available THEN
         kb(lp).flag = unavailable
         FindAnyFlight = lp
         EXIT FUNCTION
      END IF
   NEXT lp
   FindAnyFlight = 0
END FUNCTION

SUB FindFlight (orig$, dest$)
'+++++++++
'  Find a flight path from Orig$ to Dest$
'+++++++++
         IF trace THEN
            PRINT "Looking for flight from "; orig$; "to "; dest$
            WHILE INKEY$ = "": WEND
         END IF

   '++++++++++
   '  First look for a direct flight
   '++++++++++
   p = FindMatch(orig$, dest$)
         IF trace AND p THEN
            PRINT "Direct flight found"
            WHILE INKEY$ = "": WEND
         ELSEIF trace THEN
            PRINT "Can't find a direct flight"
            WHILE INKEY$ = "": WEND
         END IF

   IF p THEN                        'Direct flight found if p <> 0
      Push p
      EXIT SUB
   END IF

   '+++++++++
   '  No direct flight so find a flight from Orig$ to anywhere
   '+++++++++

   p = FindAnyFlight(orig$)

         IF trace AND p THEN
            PRINT "Found a flight from "; orig$; "to "; kb(p).destination$
            WHILE INKEY$ = "": WEND
         ELSEIF trace THEN
            PRINT "Can't find a flight from "; orig$; "to anywhere"
         END IF

   IF p THEN
      Push p
      FindFlight (kb(p).destination$), (dest$)
   END IF

   '+++++++++
   '  No flights to anywhere from Orig$, so try to trace back
   '+++++++++

   IF stacktop THEN
      Pop p
      IF p THEN
         FindFlight (kb(p).origin$), (dest$)
      END IF
         ELSEIF trace THEN
            PRINT "The stack is empty -- no flights exist"
   END IF
END SUB

FUNCTION FindMatch (orig$, dest$)
'+++++++++
'  Find a direct flight from Orig$ to Dest$
'+++++++++

         IF trace THEN
            PRINT "Looking for a direct flight from "; orig$; " to "; dest$
         END IF

   FOR lp = 1 TO entries
      IF orig$ = kb(lp).origin$ AND dest$ = kb(lp).destination$ THEN
         FindMatch = lp
         EXIT FUNCTION
      END IF
   NEXT lp
   FindMatch = 0                'Signal that no match was found
END FUNCTION

FUNCTION GetFilename$
'+++++++++
'  Get file name from user or use default
'+++++++++
   PRINT "Enter a file name or press <Enter> ==> ";
```

Listing 1 continued

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DMP - 100, LP VII, COMMODORE 1525, GORILLA BANANA	(1424)	Inker Loop	$18/2	$ 51/6	$ 96/12	----------			----------		
DMP - 200, 120, 130 (430 INSERTS & RELOADS)	(1483)	1/2 x 20	$20/2	$ 57/6	$108/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
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DMP - 500	(1482)	1/2 x 20	$22/2	$ 63/6	$120/12	$7/1	$6 ea	2 or more	$4.25/1	$4.05/12	$3.85/72
DMP - 2100, TOSHIBA P1340-1350-1351-351	(1442)	1/2 x 20	$4.00/1	$3.95/6	$3.90/12	$3.90/1	$3.85/6	12 or more	$3.25/1	$3.10/12	$2.95/72
DMP - 2200, C ITOH 3500	(1233)	1/2 x 52	$35 GENERIC		$30	$18/1	$16ea	2 or more	$30/3	$ 57/6	$108/12
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NEC Spinwriter-Carbon Film - 2000-3500 (Reloads BCCOMPCO Only)		5/16 x 145	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
- 5500-7700 (Can Reload Most Types)		NOT EZ LOAD 1/4 x 145	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
PC PR 103 / 105A		1/2 x 13	----------			$7/1	$6 ea	2 or more	$3.25/1	$4.05/12	$3.85/72
Pinwriter P1-P2-P6, P-5 (1/2 x 14)		1/2 x 20	$25/2	$ 69/6	$126/12	$7/1	$6 ea	2 or more	$4.25/1	$4.05/12	$3.85/72
P3-P7		1/2 x 27	$30/2	$ 84/6	$156/12	$8/1	$7 ea	2 or more	$18/3	$66/12	$360/72
COMREX 420 Fabric (INSERTS & RELOADS ONLY)		5/16 x 52	----------			$10/1	$9 ea	2 or more	$30/3	$57/6	$108/12
DX-15, II } Fabric		5/16 x 17	$15/2	$ 42/6	$ 78/12	----------			----------		
BROTHER HR-15-25-35 } Carbon Film (Multistrike)		5/16 x 82	$18/3	$60/12	$342/72	----------			----------		
OKIDATA Pacemark 2350-2410 Black		1/2 x 100	$20	EACH		$20/1	$18ea	2 or more	$36/3	$132/12	$720/72
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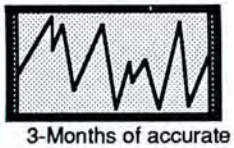

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THE NEXT STEP

Listing 1 continued

```
    LINE INPUT file$
    file$ = Strip$(file$)
    IF file$ = "" THEN
       file$ = default$
    END IF
    GetFilename$ = file$
END FUNCTION

SUB GetTarget
'+++++++++
'  Get Target Origin and Destination Cities
'+++++++++
    CLS
    DO
       PRINT "Find flight from ==> ";
       LINE INPUT targetorig$
       targetorig$ = Strip$(targetorig$)
    LOOP WHILE targetorig$ = SPACE$(20)
    DO
       PRINT "               to ==> ";
       LINE INPUT targetdest$
       targetdest$ = Strip$(targetdest$)
    LOOP WHILE targetdest$ = SPACE$(20)
END SUB

SUB KeyInput
'+++++++++
'  Get database from the user
'  Save it in a file if the user wishes
'+++++++++

    PRINT "Enter up to"; maxsize; "sets of data.  Press <Enter> as origin city"
    PRINT "to signal the end of the data list"
    PRINT
    DO
       IF entries >= maxsize THEN
          PRINT "The database is full"
          Pause
          EXIT DO
       END IF

       PRINT "Origin city      ==> ";
       LINE INPUT origin$
       origin$ = Strip$(origin$)
       IF origin$ = "" THEN EXIT DO
       entries = entries + 1
       kb(entries).origin$ = origin$
       DO
          PRINT "Destination city ==> ";
          LINE INPUT destination$
          destination$ = Strip$(destination$)
          kb(entries).destination$ = destination$
       LOOP WHILE destination$ = ""
       DO
          PRINT "Distance         ==> ";
          LINE INPUT distance$
          kb(entries).distance = VAL(distance$)
       LOOP WHILE kb(entries).distance = 0
       PRINT
    LOOP WHILE forever

    IF entries > 0 THEN
       PRINT
       PRINT "Save the database in a file ";
       IF YesNo$ = "Y" THEN
          filename$ = GetFilename$
          OPEN filename$ FOR OUTPUT AS 1
          FOR lp = 1 TO entries
             WRITE #1, kb(lp).origin$, kb(lp).destination$, kb(lp).distance
          NEXT lp
          CLOSE 1
       END IF
    END IF
END SUB

SUB Pause
'+++++++++
'  Wait for user to read the screen
'+++++++++
    LOCATE 25, 27
    PRINT "Press any key to continue";
    WHILE INKEY$ <> "": WEND
    WHILE INKEY$ = "": WEND
END SUB

SUB Pop (p)
'+++++++++
'  Retrieve a database entry from the traceback stack
'+++++++++
    IF stacktop <= 0 THEN
       p = 0
    ELSE
       stacktop = stacktop - 1
       p = stack(stacktop)
             IF trace THEN
                PRINT "Popping "; kb(p).origin$; ", "; kb(p).destination$
                WHILE INKEY$ = "": WEND
             END IF
    END IF
END SUB

SUB PrintAnswer
'+++++++++
'  Print out the list of flights and the distance
'+++++++++
    distance = 0
    FOR p = 0 TO stacktop - 1
       PRINT RTRIM$(kb(stack(p)).origin$); " to ";
       distance = distance + kb(stack(p)).distance
    NEXT p
    IF distance > 0 THEN
       PRINT targetdest$
       PRINT distance; "miles"
    ELSE
```

Listing 1 continued

Listing 1 continued

```
      PRINT "No path exists from "; RTRIM$(targetorig$);
      PRINT " to "; RTRIM$(targetdest$)
   END IF
   Pause
END SUB

SUB Push (p)
'+++++++++
'  Save a database entry on the traceback stack
'+++++++++
   IF stacktop >= maxsize THEN
      PRINT "Stack overflow -- program halting"
      END
   ELSE
      stack(stacktop) = p
      stacktop = stacktop + 1
            IF trace THEN
               PRINT "Pushing "; kb(p).origin$; ", "; kb(p).destination$
            END IF
   END IF
END SUB

SUB Setup
'++++++++++
'  Read the database from the keyboard or a file
'++++++++++
   entries = Ø                'Clear the database
   CLS
   PRINT "Input the database from keyboard or file (k/f) ==> ";
   DO
      ch$ = UCASE$(INPUT$(1))
   LOOP UNTIL INSTR("KF", ch$)
   PRINT ch$
   SELECT CASE ch$
      CASE "K"
         KeyInput
      CASE "F"
         FileInput
   END SELECT
END SUB

FUNCTION Strip$ (s$)
'+++++++++
'  Strip leading and trailing spaces from a string
'+++++++++
   Strip$ = LTRIM$(RTRIM$(s$))
END FUNCTION

FUNCTION YesNo$
'+++++++++
'  Prompt and wait for a y/n response
'+++++++++
   PRINT "(y/n) ==> ";
   DO
      ch$ = UCASE$(INPUT$(1))
   LOOP UNTIL INSTR("YN", ch$)
   PRINT ch$
   YesNo$ = ch$
END FUNCTION
```

End

Program Listing 2. The FindAnyFlight function looks for the longest possible flight.

```
FUNCTION FindAnyFlight (orig$)
'+++++++++
'  Alternate FindAnyFlight function.
'  This routine looks for the longest flight leaving a city,
'  assuming that longer flights will take us closer to our destination
'  and therefore lead to a solution sooner.
'+++++++++
                        IF trace THEN
                              PRINT "Looking for a flight from "; orig$; " to
                              WHILE INKEY$ = "": WEND
                        END IF

       maxdist = Ø
       maxpos = false
       FOR lp = 1 TO entries
              IF orig$ = kb(lp).origin$ AND kb(lp).flag = available THEN
                        IF kb(lp).distance > maxdist THEN
                              maxdist = kb(lp).distance
                              maxpos = lp
                        END IF
              END IF
       NEXT lp
       FindAnyFlight = maxpos
       IF maxpos THEN
              kb(maxpos).flag = unavailable
       END IF
END FUNCTION
```

End

Program Listing 3. Alternate FindAnyFlight subroutine seeks shortest possible route between cities.

```
FUNCTION FindAnyFlight (orig$)
'+++++++++
'  Second alternate FindAnyFlight function.
'  This routine looks for the shortest flight leaving a city,
'  assuming that selecting shorter flights will lead to a
'  solution with a shorter total distance
'+++++++++
         IF trace THEN
            PRINT "Looking for a flight from "; orig$; " to anywhere"
            WHILE INKEY$ = "": WEND
         END IF
```

Listing 3 continued

```
      leastdist = maxint
      leastpos = false
      FOR lp = 1 TO entries
         IF orig$ = kb(lp).origin$ AND kb(lp).flag = available THEN
            IF kb(lp).distance < leastdist THEN
               leastdist = kb(lp).distance
               leastpos = lp
            END IF
         END IF
      NEXT lp
      FindAnyFlight = leastpos
      IF leastpos THEN
         kb(leastpos).flag = unavailable
      END IF
END FUNCTION
```

End

Program Listing 4. To generate more than one solution, remove one or more parts of the data base after every solution is generated. This approach omits previously tried routes.

```
'+++++++++
'  Changes to search for more than one solution:
'     1. Change the main program loop as shown below
'     2. Add the function Another shown below
'     3. Remove the call to Pause at the end of the PrintAnswer routine
'+++++++++

'+++++++++
'  Main Program Loop
'+++++++++

default$ = "KBASE.DAT"                  'Default database file name

DO
   Setup                                'Initialize the database
LOOP WHILE entries = Ø

DO
   ClearFlags                           'Make all routes available
   GetTarget                            'Get user's origin & destination
   DO
      FindFlight (targetorig$), (targetdest$)'Can we get there from here?
      PrintAnswer                       'Let's find out
   LOOP WHILE Another
LOOP WHILE Again$ = "Y"                 'Repeat if user is still curious
CLS
END



FUNCTION Another
   PRINT
   PRINT "Press <Space> for another route, any other key to end"
   PRINT
   Another = (INPUT$(1) = " ")
   stacktop = Ø                         'Reset the stack
END FUNCTION
```

End

Program Listing 5. This approach allows multiple solutions by deleting the city of origin.

```
'+++++++++
'  A second way to generate multiple solutions:
'              1. Change the main loop as shown below
'              2. Change Function Another as shown below
'              3. Be sure the Pause is removed from the end of PrintAnswer
'+++++++++

'+++++++++
'  Main Program Loop
'+++++++++

default$ = "KBASE.DAT"                      'Default database file name


DO
       DO
              Setup                         'Initialize the database
       LOOP WHILE entries = Ø
       DO
              ClearFlags                    'Make all routes available
              GetTarget                     'Get user's origin & destination
              FindFlight (targetorig$), (targetdest$)'Get there from here?
              PrintAnswer                   'Let's find out
       LOOP WHILE Another
LOOP WHILE Again$ = "Y"                     'Repeat if user is still curious
CLS
END


FUNCTION Another
   PRINT
   PRINT "Press <Space> for another route, any other key to end"
   PRINT
   Another = (INPUT$(1) = " ")
   IF stacktop THEN
         p = stack(stacktop-1)
         kb(p).origin$ = ""             'Erase last flight of last solution
   END IF
   stacktop = Ø                         'Reset the stack
END FUNCTION
```

End

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■ I did not understand the invective Eric Maloney used to describe the Tandy market—in his last editorial, he said it consists of misfits and rednecks (see "Farewells," December 1987, p. 9). Whom does he include in this group? I consider myself neither a misfit nor a redneck.

Maloney has a right to his opinion, but he should justify his opinion with a few qualifying statements.—*Edward J. Ganley, Melfa, VA*

■ In the December 1987 issue, Peter Hutchinson calls Eric Maloney a "first-rate curmudgeon" (see "Changing of the Guard," p. 109). I agree wholeheartedly—but I don't consider it a compliment.

Maloney said he'll miss Tandy Corp. like he'll miss his last migraine. I feel the same way about his disparaging remarks, belligerent attitude, and propensity to quote an expert (himself).

Many owners of Tandy products realize better ones exist, but they also feel they have a good product at a generally reasonable price. Don't just badmouth those items—*teach* us about them.

With Maloney's departure, I may consider renewing my subscription.—*Lowry Riggins, Monroe, LA*

■ As a longtime subscriber to *80 Micro* and an owner of Models I, III, 4, and a Tandy 1000 SX, I've fought the battle of Tandy along with your staff and other computerists. We all agree that often the people selling computers don't know enough to help solve our problems, but I've also dealt with Tandy's competitors; I can't say they were much better.

In spite of all this, I stick with Tandy because it answers my questions, solves my problems, and gives me more value for my money than the competition. What sends me into orbit is how Wayne Green used to tell Tandy how to run its business; now we get Maloney lipping off in his Side Tracks column. I suppose they both made a good living all these years because of Tandy. Maloney reminds me of a spoiled kid who has to have the game played his way, or he'll go home.—*Larry R. Moore, Mount Vernon, IA*

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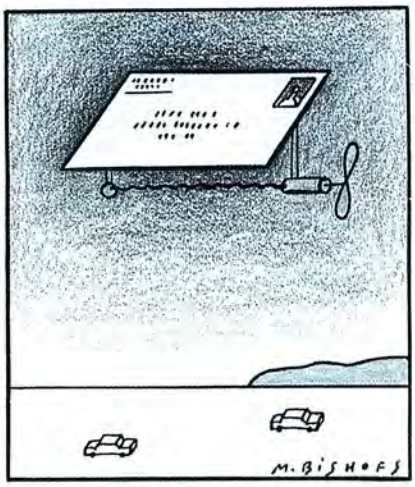

■ Eric Maloney's constant destructive criticism of Tandy is nauseating. I've agreed with some of his points, but most seem unfounded. Not everyone has had his bad experiences.

Maloney is a good writer, and he exudes an authoritative and knowledgeable style. But he should be wary of how his readers will interpret his editorials. Many of them accept his writing as law.

I've been a Tandy customer for five years and have never found a reason to complain about the service I got from the people at its computer centers. If I had a problem with hardware, they fixed or replaced it. If I had a problem with software, they taught me how to run it correctly or gave me a new copy.

If Maloney knows so much about how a company should market its products, run its manufacturing plants, price its products, and handle its customers, why isn't he the president of a Fortune 500 company? Why doesn't he become president of our great nation and solve the country's economic problems?—*Rick Perry, El Sobrante, CA*

A Vote for Eric

■ I would like to commend Eric Maloney for his editorial guts in writing his "Farewells" column. He said what seemed to bother him in a most direct manner.

Unfortunately for Model 4/4P owners, what Maloney said about Tandy was true. Tandy never intended to fully support the Model 4 line for any length of time. Otherwise, it would have reduced the price of the 4 and factory-installed a high-resolution board, color, and considerably more RAM. Tandy seemed to purposely keep the price high enough to inhibit further sales of the 4 and thereby phase it out completely. We all know the 4 is a "dead duck," and many of us are now looking to upgrade to MS-DOS.—*Fred Mass, Garnerville, NY*

A Vote for Misosys

■ In response to the fireworks between David Williams and Roy Soltoff of Misosys Inc. (see "At Sixes and Sevens with ED/ASM," December 1987, p. 110), I side with Soltoff. In reply to Soltoff's comment that reviewers should call software publishers and report their response when something is wrong with a product, Williams said he was tired of serving as a quality-control department for software developers.

But I want to know how a business responds to its customers, reviewers or not. I've bought almost $3,000 worth of hardware and software in eight months. For my company, the sum is quite a bit higher.

I also want tutorials, even when they discuss what is supposedly fundamental knowledge for a data processing manager such as myself. Too much information exists for one person to keep track of, and there isn't a master reference to all the other references. Believe it or not, even professionals use tutorials. Tutorials also sprout legs.

If a company makes the effort to include a tutorial, they must be trying to produce a quality product. Successful products deliver, despite the level of the user's computer illiteracy.

Know what else? I prefer a line editor. That's because I usually correct one line at a time. It's easier to read and correct the target line when it's away from the rest of the text, even if by only one blank line.—*David L. Kuzminski, Petersburg, VA*

Missing One

■ In "Save Pictures to Disk," (Feedback Loop, January 1988, p. 13), the number for screen modes 1 and 2 should be 16384, not 6384. I apologize for the inconvenience.—*Beverly Woodbury* ■

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