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The listings included with 80 Micro *articles run on all Tandy MS-DOS computers except the Model 2000 and the Tandy 600 unless otherwise noted.*

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Welcome to the New *80 Micro*

■ **by Michael E. Nadeau** ■

80 Micro is entering 1988 with a new look, a new focus, and some new faces, but essentially the same goal: to provide hands-on information on the premiere Tandy computers to a unique community of enthusiasts.

What makes you unique? For one thing, you are brand loyalists in a market where PC compatibility is often a commodity to be bought at the lowest price. For another, you are curious to know more about your computer, even if you've mastered the tasks for which you bought it. You are also technically oriented, or are at least inclined to be so.

In a nutshell, the *80 Micro* reader is more involved, more informed, and takes more pride in his or her computer. You are not just *users*; you are, as I stated above, *enthusiasts*. *80 Micro* is the forum through which you share ideas, information, and a community spirit with other owners of Tandy MS-DOS computers.

Nuts and Bolts

80 Micro is unique, too. It is the only major publication dedicated solely to the nuts and bolts of Tandy MS-DOS computing. We are sensitive to the idiosyncrasies and features specific to the Tandy machines.

When we review a program or add-on board, we use the same computer you do. When we publish a utility or programming tutorial, we take *your* computer's abilities into account. When you ask us a technical question, you get answers from experts on *your* computer.

All Work and No Play. . .

The idea of using a computer for recreation is alien to some computer magazines, but not to *80 Micro*. We want to entertain as well as inform you, and we aren't afraid to try something different to achieve that goal. After all, computer articles can get stuffy if you're not careful.

Look at our Fine Lines column, for example. Each month, author Harry Bee poses a Basic programming challenge to test your skills. His wit and lighthearted approach belie the fact that he's as good a teacher as he is a puzzle poser. We try to emulate that approach throughout *80 Micro*.

One final thing that distinguishes *80 Micro* from other PC magazines is the amount of reader involvement. *80* has always been a reader-written publication and must remain so if it is to fulfill its role as a forum for owners of Tandy computers.

We encourage you to submit article ideas, tips, letters, and technical questions. The more we hear from you, the better *80 Micro* can serve you.

Speaking of Mail

As expected, we have heard from many Model I/III/4 owners concerning our dropping coverage of those systems. (For a sampling of those letters, see this month's Input column, p. 94.) When we announced this decision in the November issue, we also said that we were looking into the feasibility of publishing a small Model I/III/4-dedicated magazine.

I'm afraid that publication won't be. Our reasons for this decision are two-fold: We don't think we can find enough readers to support such a publication, and we want to devote our resources to the continued success of *80 Micro*. Our BBS will carry I/III/4 material indefinitely, however.

Several small publications still serve Model I/III/4 owners, though not all exclusively. (See the Table for addresses and prices.) *Code Works* is a monthly magazine dedicated to Basic programming on Model I/III/4, MS-DOS, and CP/M computers. It carries no advertising.

The Misosys Quarterly is a support publication for Misosys Inc. products, including Pro-Wam, Pro-Create, and LDOS. However, it also has good general I/III/4 information. *TMQ*, as it's often called, also contains MS-DOS-related material and only Misosys advertising.

Northern Bytes is published by The Alternate Source (TAS) on an irregular basis. TAS takes no subscriptions; you pay for each issue as it comes out. TAS will either bill you or charge a credit card. *Northern Bytes* covers the I/III/4 exclusively and offers assembly and Basic programs, hardware-related articles, technical advice, and a little advertising. You might know TAS as an excellent source of public domain TRSDOS software—27 disks worth at last count.

These publications are small, but they offer excellent technical coverage of the Model I/III/4 line. I urge you to give at least one of them a try.

Table. Publications covering the Model I/III/4 line.

Code Works
3838 S. Warner St.
Tacoma, WA 98409
206-475-2219
$24.95/year (12 issues)

The Misosys Quarterly
Misosys Inc.
P.O. Box 239
Sterling, VA 22170-0239
703-450-4181
$25/year (4 issues)

Northern Bytes
The Alternate Source Information Outlet
704 N. Pennsylvania Ave.
Lansing, MI 48906-5319
517-482-8270
$4/issue

Special Projects

Look for some interesting changes in our Disk Series this year. We will continue to offer the programs from *80 Micro* on disk quarterly, but we have several special disks in the works.

Some of these disks will contain programs not published in *80 Micro*—a collection of Quick Basic and Turbo Pascal utilities and subroutines, for example. We are also planning a "best of" disk covering 1986 and 1987.

Also in the works this year is a publication, to be sold largely on newsstands, aimed at the first-time Tandy owner. It will include articles on learning DOS, writing your first Basic program, and how to shop for hardware and software.

This year will be a busy one for us. We are working hard to bring you the best coverage of Tandy MS-DOS computing available. All we ask in return is that you let us know how we're doing and perhaps contribute an idea or article. What have you got to lose? ■

Photograph by Jane Billings

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80 MICRO Review, November 1985

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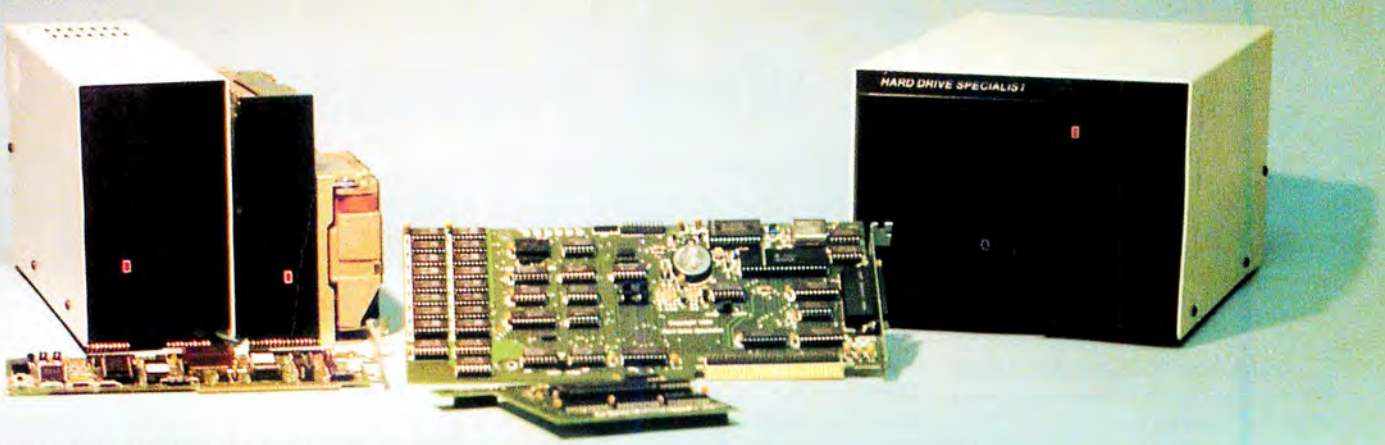

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Pushing Video Limits

JUNIOR IN DISGUISE

Q. Tandy's *1000 SX Technical Reference Manual* states that the 1000 SX offers the PCjr video modes 320 by 200 with 16 colors and 640 by 200 with four colors. Can I trick a program like Accolade's Mean 18 into thinking that my Tandy is a PCjr with its video mode capabilities? Mean 18 boots up on the PCjr with 16 colors. It boots up on mine with only four colors.

Also, Tandy's *MS-DOS Advanced Applications*, by David A. Lien, states that Setup.COM is a file on my DOS 3.2 disk, but it's not there. Should it be? All the files on my DOS disk are dated Aug. 19, 1986. —*Mark R. Aughenbaugh, Provo, UT*

A. The next to the last byte in the top of memory contains a code to indicate the computer identity. An FF byte identifies the 1000s and an FD byte identifies the PCjr. I am not familiar with Mean 18, but I assume it is an EXE or COM file. Disassemble the beginning of the Mean 18 file and look for a command that compares for an FD byte in the top of memory. Change the compare to FF or eliminate it by jumping directly to the PCjr routine.

The Setup.COM file is on the system utilities disk for computers with the 80286 chip, such as the 3000s. The 3000 has a CMOS (complementary metal-oxide semiconductor) RAM chip, a battery-powered real-time clock that also stores drive and memory information about the system. Setup.COM is used to set up your system initially and any time you add or remove memory, disk drives, or a video display card. You can also use it to set or change the system time or date.

WANTS IT BIG AND COLORFUL

Q. I am one of many computer users with impaired vision who cannot read standard 80-column print and must resort to 40- and 20-column displays. I want to replace the standard color monitor I use with my Tandy 1000 with a 19-inch color monitor. Color makes the screen easier to read for people with limited vision. None of the commercial hardware and software that provide larger print work in color with a 19-inch monitor.

I want to know which 19-inch monitor takes an RGB input, how to connect it, and where I can get the proper connecting plug and cable. Can I use a standard 19-inch color television without sacrificing

quality? I tried using a modulator with a TV receiver, but the output is not in color, and the screen quality is poor. —*John R. Spalding, Coudersport, PA*

A. I wish I could tell you an easy way to improve your TV receiver, but as far as I know, you should expect poor quality. Several 19-inch high-resolution monitors should provide sharp print and color. They cost $2,000–$3,000. You can probably attach them normally to your computer. With a 1000, you can only use the color graphics adapter (CGA) mode. You can't use the powerful enhanced graphics adapter (EGA) available with the monitors. Suppliers include Conzac (600 N. Rimsdale Ave., Covina, CA 91722, 818-966-3511); Hitachi Ltd. (Tokyo, Japan—available at Information Peripherals Corp., 110 Middlesex St., North Chelmsford, MA 01863, 617-251-2742); Aydin Controls (414 Commerce Drive, Fort Washington, PA 19034); and Moniterm Corp. (5740 Green Circle Drive, Minnetonka, MN 55343, 612-935-4151).

BAD CLUSTER SPACE

Q. I have a 1000 SX with a 20-megabyte hard-disk card and DOS 3.2. When I tried to run Norton's Wipedisk 4.0 with the /E option to clean my erased areas, the disk made a loud noise. I couldn't break it, so I booted the system. I ran Norton's Disktest, which reported cluster 10,353 as bad. Since Wipedisk starts at the end of the unused space, I wonder if it's just a coincidence that this cluster was found to be bad, or could Wipedisk have done something?

My second question is about function keys. I use the DOS Prompt command (in conjunction with ANSI.SYS) to redefine my keys, but I only have the codes for F1–F10. Could you give me the codes for F11 and F12 including their shift, alternate, and control combinations? —*Stephen R. Smith, Stoneham, MA*

A. Norton's Wipedisk should not destroy any clusters. Run Norton's Disktest first, mark damaged clusters, and use Wipedisk.

These are the decimal codes for F11 and F12:

	Normal	Shift	Control	Alternate
F11	0;152	0;162	0;172	0;182
F12	0;153	0;163	0;173	0;183

With ANSI.SYS installed by Device = ANSI.SYS in your Config.SYS file, you can use the Prompt command to define the F11 key to DIR:

```
PROMPT $E [0;152;"DIR "p
PROMPT
```

HEARD IT THROUGH THE GRAPEVINE

Q. What's the story on using an IBM PC–compatible hard disk in the 1000? I heard that if you have the BIOS ROM 1.01 it will work, but not from anyone who actually did it or has seen it done. Do you know if it is compatible (assuming the controller will fit the short slot)? My 1000 is the original, and I updated the ROM to 1.01. —*Jerry L. Press, Greenville, TX*

A. The IBM PC–compatible hard disks are generally not compatible with the 1000s. They use different interrupts. The Tandy uses interrupt request line 2 for the hard-drive controller, and the IBM PC uses interrupt request line 5. The hard-drive controller must be customized for the 1000. Western Digital (2445 McCabe Way, Irvine, CA 92714, 714-863-0102) has a controller that works with the 1000 or the IBM PC.

CLEARING OUT THE STACK

Q. I have 640K in my 1000. I've been slowly typing in a program called Capitals, which

Send your questions or problems dealing with any area of Tandy/Radio Shack MS-DOS microcomputing to Feedback Loop, 80 Micro, 80 Elm St., Peterborough, NH 03458. Please include a self-addressed, stamped envelope and daytime phone number.

has four or five lines of information about each of four cities in each state, one of which is the capital.

I am slightly less than half through the program, and when I try to save more of the program, I get an "Out of memory" message. A Radio Shack computer expert told me I used all the space on the disk that is allocated by the machine for a program of this kind, about 60K. He said I need to use a compiled Basic like Microsoft's Quickbasic or the BIOS that deals with opening a channel so that only data would be stored on the disk.

I think this means that with an interpreted Basic, the entire program, with the data, is stored on disk. With a compiled Basic, only the data is stored.

How can I not have access to more than 60K of a 360K disk? Can you tell me what is going on? —*Eldred Bogart, Pekin, IL*

A. There seems to be some confusion with the words memory and disk. The error message indicates you are out of memory. Basic, in its present form, can only address 64K—regardless of how much memory you have. Of the 64K, approximately 4K is used by Basic itself, leaving about 60K available to the programmer.

Actually, an "Out of memory" error indicates that the stack is out of space. The stack is used to store data and addresses during subroutine calls and For. . .Next loops. If there isn't any free memory in Basic, you get an "Out of string space" error message.

Use the Clear statement at the beginning of your program to reserve more stack space. Look up the Clear statement in your manual. You need two commas after Clear and before the number of bytes to reserve for the stack, for example, CLEAR,,5000. The default stack space is 768 bytes or $^1/_8$ of the memory available, whichever is smaller.

The 360K on your disk is all available for storage. If you run out of disk space, you get a "Disk full" message.

AUTOMATIC CAPS

Q. How do I write an Autoexec or BAT file that will automatically set the caps and number-lock key status? On my Model 4 I used SYSGEN to set the configuration—no such thing on the 1000. —*Charles E. Leonard, Jefferson City, TN*

A. The Figure shows how to enter a program in Debug to set the caps and number-lock on. This program will not set the keyboard lights on, thereby putting them in opposite position. Insert the name of the program on a line in your Autoexec or batch file.

GET THE LEAD OUT

Q. I have an early model of the Tandy 1000 with ROM BIOS (basic input/output system) 1.0. The motherboard is not an A model and doesn't have a slot for the 8087 coprocessor.

The system speed is 4.77 megahertz (MHz), which in light of recent microprocessor development seems inordinately slow, especially when I try to run the newer desktop publishing programs. I want to use a turbo card to give the system a higher clock speed. I only have three slots. A Plus-memory expansion card, phone modem, and a hard-disk controller card occupy the slots. I need a turbo card that replaces a chip on the motherboard, instead of requiring a slot of its own.

Does anyone make such a product that's compatible with my Tandy 1000? Can I use a third-party hard disk, or must I buy one of the Radio Shack models?

Finally, is it necessary to update my system BIOS to operate the turbo card or hard disk? —*Jon Reynolds, San Antonio, TX*

```
debug

 - n setkey.com              ;name output file
 - a 100                     ;assemble at 100h
xxxx:0100 mov  ax,0
xxxx:0103 mov  ds,ax          ;set to segment 0
xxxx:0105 mov  ax,[417]       ;move contents of 417h into ax
xxxx:0108 or   ax,60          ;set bits 5 and 6
xxxx:010B mov  [417],ax       ;replace with bits set
xxxx:010E mov  ax,4c00        ;exit code with normal return
xxxx:0111 int  21             ;return to dos
xxxx:0113
-rcx                          ;display cx register
-cx 0000
:0013                         ;number of bytes to write
-w                            ;write file to disk
writing 0013 bytes
-q                            ; exit to dos
```

Figure. The procedure to enter a program in Debug to set the caps and number-lock key status automatically.

A. I suggest you look at the article "The Wonderful World of Tandy 1000 Add-Ons" (September 1986, p. 34). The article mentions Fast88, available for $129 from Microspeed (5307 Randall Place, Fremont, CA 94538, 415-490-1403). We've seen PC Sprint listed for $99 from Exec PC (P.O. Box 11268, Shorewood, WI 53211, 414-242-2173). Neither speedup board requires a slot.

Several third-party suppliers of hard disks for the Tandy 1000 advertise in *80 Micro*. The BIOS upgrade is a good idea, but it's unnecessary. We tested several hard drives with BIOS 1.0, and we didn't have any problems.

SAVE PICTURES TO DISK

Q. I have an early model Tandy 1000. I wrote a graphics program in Basic that does darn near anything, but I can't save a picture to disk. I lose all my pictures when I turn the machine off. How do I save a graphics image to disk? —*Mike Stewart, Austerlitz, NY*

A. The save routine is:

```
6000 DEF SEG = &HB800:BSAVE "file  name",0,n
```

where n is 32768 in screen mode 5
6384 in screen modes 1 and 2
4096 in screen mode 0

The load routine is:

```
6010 DEF SEG = &HB800:BLOAD "file  name",0
```

A SIDEWAYS SPREADSHEET SOLUTION

Q. I have a Tandy 1200 HD with a VM-3 monitor, 384K, and a monographics card, I use DWP 510 and DWP 430 printers with my 1200.

I would like to print more than 132 characters per line on my spreadsheet. How can I do this when Mode limits me to 132 characters? —*John D. Reavill, Wilkesboro, NC*

A. You could use Sideways, by Funk Software (222 Third St., Cambridge, MA 02141, 800-822-3865). This software turns ASCII text on its side to print. You can have the program skip perforations or not. The printout will be as wide as your spreadsheet is. ■

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by Ron White

The Education of IBM

We all know that as the twig is bent, so grows the tree. IBM knows it, too, and must have had a little twig-bending in mind when it included the Model 25 in its new line of PS/2 computers. The Model 25, at the low end of the PS/2 machines, is widely regarded as IBM's attempt to crash the educational computer market that has been dominated by Tandy and Apple.

IBM's thinking is that the students of today are the computer buyers of tomorrow. When they get into the business world and the time comes to purchase a personal computer, well, won't they just naturally pick the computer they used in their school days?

Even if you don't account for how the courting of schools today could pay off tomorrow, the education market is still big business. A survey conducted by COMTEC Market Analysis Services shows that schools are the largest single installed base of microcomputers.

The study, which was conducted last year, showed that nearly 33 percent of the personal computers in use were on school desks. This figure easily overshadows finance and manufacturing, industries more often associated with heavy PC use.

IBM's PCjr was also supposed to be a home/school computer, and we all know its ill fate. That's not stopping IBM from giving it another shot. But if IBM wants to fight for a hunk of the school market, Tandy claims it's not worried.

The school market is a significant, if not overwhelming, chunk of Tandy's computer business—somewhere between 10 and 15 percent, estimated Ed Juge, Tandy's director of market planning. Juge believes Tandy can hold on to its percentage despite IBM's best efforts.

"They're no threat," he said. "They came out with the Model 25 the day after we introduced our new products, and generally the trade press dumped on them. IBM was too late, and the features and pricing didn't make sense."

The Model 25 with a color display lists for $1,695, compared to the $1,199 price tag on a Tandy 1000 SX, the most popular Tandy computer in the schools. Asked to explain how it expects to compete in the education market with computers priced considerably higher than those of Tandy or Apple, IBM has taken two stances. One is the familiar if unspoken attitude: "We can do it and get away with it because we're IBM." The other is that IBM will offer heavy discounts to schools.

Schools are a significant chunk of Tandy's market.

"IBM acts like no one else ever thought about discounting," Juge reacted. "We've been discounting to schools longer than IBM has been making PCs."

After discounting, the real costs of the Tandy 1000 and the Model 25 are not that different, according to Rita Oates, supervisor of computer education and technology for the Dade County Public Schools in Miami, FL. Oates can buy Tandys with a color display for "a little under $1,000 each and Model 25s for a little over $1,000," she said.

That's a difference of about $100 between the machines, which doesn't sound like much. But it can add up if someone is buying, as Oates did recently, 233 computers for 30 high schools. At the time of the purchase, Model 25s were not yet on the list of computers approved for purchase by the school system. (They are now.)

But even if the IBMs had been approved, Oates said she still would have gone with the Tandy 1000 SX computers, but not only to save approximately $23,300. "That does add up," she said. "But if the machine you really need is only $100 more, it might be penny-wise and pound-foolish not to get it."

Still, she said, the reason Dade will likely continue to go with Tandy instead of IBM computers is—Apples.

Dade's recent purchase needed to run MS-DOS software to use a particular compensatory education program that was written for the MS-DOS format. Any MS-DOS machine could handle that, including a Model 25, but Oates prefers Tandy's because it accepts an expansion board called the Trackstar that allows it to run Apple software.

"IBM is not very cooperative about running Apple software," she said. The ability to use Apple software is important because in education, particularly the lower grade levels, there are substantially more Apple than MS-DOS programs, Oates said. Dade schools already have 3,500 Apple computers but until the recent purchase of the Tandys, they had only 78 MS-DOS machines.

"I've told the Tandy people what they need to do is court the educational software producers. Many of them don't get any cooperation from compatible manufacturers when it comes to developing software for the computers," Oates said.

The other factor that weighs in favor of Tandy over the Model 25 is that the 1000 SX uses the more common 5¼-inch floppies instead of the 3½-inch disks used by the new line of IBMs. For the compensatory education program alone, Dade has a license to make 250 copies. Those copies and routine backup and data disks make the higher cost of the smaller floppies a factor that stays with the machine for life.

The bottom line is that IBM again may be counting on its name to conquer disadvantages of price and performance. It didn't work with the PCjr, and it hasn't worked with IBM's laptop. It's not likely to work in the education market.

TANDYLAND

There must be a lot of smiles at Tandy headquarters these days. One of the first indications that Tandy's new line of MS-DOS computers has been a success is Tandy's announcement that it is building a $7 million, 250,000-square-foot plant in Fort Worth that will double its capacity to produce personal computers.

An additional 100 workers will be hired to assemble Tandy 1000s at the plant, which is expected to open this summer.

"After we saw our [1986] Christmas sales and how well the machines were received last year and growth as far as unit sales, we determined we needed more manufacturing facilities," Tandy President Robert McClure said.

The announcement of the plant came at about the same time Tandy was noting its

September sales last year were up 13 percent compared to the previous year.

Of course, no success story is complete without a hostile takeover attempt. No one has yet made a move on Tandy itself, but Tandy executives are riled up about the next best thing, an attempt by financier George Mann and Unicorp Canada Corp. to take control of Intertan Inc.

Intertan is a company that Tandy spun off about a year ago to handle international retail sales of Tandy products. Mann's attempt to get control of Intertan was stoutly denounced by Tandy, but it's like rebuffing an amorous pass. The woman may not want anything to do with the creep, but it's still flattering to be noticed.

Anyone who's been inside a Radio Shack outlet has noticed the price tags on bigger items such as computers that proclaim they can be bought with "low" monthly payments.

If you bought anything on credit at a Radio Shack in the past, you've really been sending your payments to a bank. Until recently, Radio Shack's credit program was actually handled through an outside financial institution.

That changed with the purchase of all of Radio Shack's customer accounts by Tandy Credit Corp., a subsidiary that will now handle all credit arrangements directly. The $175 million deal is being financed by Tandy itself making some "low" time payments.

By cutting out the middleman, Tandy should be able to keep some of the interest profits that had been going to the bank. The new arrangement won't mean the customer is more likely to get financing if his or her credit rating is bad, Tandy officials explained, but it will mean that a customer can get credit approved faster.

Tandy might soon offer for its Intel 80386 computers a three-chip coprocessor board from a little-known California company. The board is made by Weitek Corp. of Sunnyvale, which has a reputation among nearby engineering firms for producing coprocessor chips for workstations to speed up tasks that require a lot of mathematical manipulations.

Compaq Corp. has already decided to offer Weitek's board as a $1,999 option on its Deskpro 386-20 model, and a similar board is available for 386 machines from AT&T and Convergent Technologies.

The word around Silicon Valley is that Tandy is also thinking about offering the board. Tandy officials would only say that it's being discussed and that no decision has been made. But if you're one of those computer users with an insatiable lust for sheer speed, stay tuned.

MICRO TRENDS

It's no news what computer techies have done to the English language. Try reading many software manuals—worse yet, hardware documentation—and you'll realize why people are scared of computers.

But if you think computer gurus with their inventive jargon are bad, brace yourself for an onslaught that makes the most tongue-tied—oops, make that oral musculature organ-torusized—techie sound like Winston Churchill. The current computer-related attack on English comes from two fronts manned by some of the worst enemies of the language: Madison Avenue and, even worse, lawyers.

Advertising and marketing agencies led the attack by playing havoc with such basics as capitalization and the spaces between words. We can thank the men and women in gray flannel for such product names as CROSSTALK MK.4, SideKick, @Liberty, pfs:FILE, XyWrite III and ZyINDEX (a product of ZyLAB, naturally).

The rule of thumb for creating software names seems to be never use two words if you can cram them into one, and wherever possible capitalize letters unless, of course, they're supposed to be capitalized.

Someone back in the days when Dbase *(as we spell it—Eds.)* was in its infancy said, "Hey, let's screw around with capitalization in the product name and we'll have something that will be hard to forget!" Now, of course, everyone has the same idea.

As bad as this trend is, the language in the past has survived the H*U*L*A-H*O*O*P. (That's the official spelling; no kidding.) But now that Madison Avenue has weakened our sensibilities to language, the lawyers are moving in to enforce what the ad agencies began.

Exhibit No. 1 is a letter from Dayflo Software Corp. asking computer publications to make sure that the name of its product is always spelled "DayFlo TRACKER."

Not DayFlo Tracker.
Not Dayflo.
Not DayFlow.
Not Day Flo.
Not Day-Flo.

And not just TRACKER by itself. (Never mind that an accompanying flyer on the program uses TRACKER by itself a couple of times.) "You can appreciate the legal and business issues of this request," the letter closes.

The Dayflo letter is polite compared to what IBM's lawyers have been doing lately. IBM's legal strong-arms won a U.S. court ruling to prevent Club AT, a clone manufacturer, from using the letters "XT" and "AT" in the names of its IBM compatibles. "AT" and "XT," IBM's attorneys said, were trademarks.

It took IBM a while to react to the Club AT threat. But it wasted no time after the introduction of the PS/2 line of computers to tear into other companies that dared to use PS/2, PS, or even /2 in the names of any of their products.

Trademark infringement suits against AST Research Inc. and Orchid Technology Inc. quickly made both companies pull ads that suggested their products are designed for use with the PS/2 computers, which, in fact, they are. Tecmar Corp. dropped /2 from the name of one of its new boards before IBM had a chance to go on the offensive.

A certain amount of vigilance about trademarks is understandable, but does IBM remember that one reason for the original success of its PC was the third-party vendors who created add-ons that made it a better computer? By taking legal action that obscures the fact that other companies are similarly enriching the PS/2 computers, IBM's lawyers could be costing IBM more than just their retainer fees.

Who says seminars can't be fun? People who didn't attend a seminar sponsored last fall by computer industry pundit Stewart Alsop don't know the fun they missed. Scheduled as speakers, according to a report from Knight-Ridder newspapers, were Bill Gates, the wunderkind head of Microsoft, and Phillipe Kahn, the enfant terrible of Borland International.

When Gates learned that Kahn was also supposed to speak at the seminar, he almost backed out. Gates cannot forgive Kahn for selling software at prices so low that, Gates believes, they have forced price cuts on software throughout the industry. It took some fast persuading by Alsop to convince Gates to go ahead with his talk on Microsoft's forthcoming OS/2 operating system.

As soon as Gates sat down, Kahn gave his talk, a deadpan announcement that Borland would develop its own operating system. . .called BS/2. Gates sat with a polite stare for 15 minutes while Kahn lampooned Microsoft's software.

Later, however, Kahn may have had a change of heart. When Borland was asked for a copy of Kahn's speech, a public relations representative checked with Kahn and called back to say that Kahn had decided to lay off Gates.

If you missed the Alsop seminar, you also missed another fun session on 80386 computers. The person conducting the seminar reportedly asked the audience if anyone was buying 386 computers in large quantities. When one company's computer manager said he was, he was asked to tell the crowd why he bought the super-fast, super-expensive computers.

"To satisfy the egos of executives," he said, and he sat down. ■

The Amazing A-BUS

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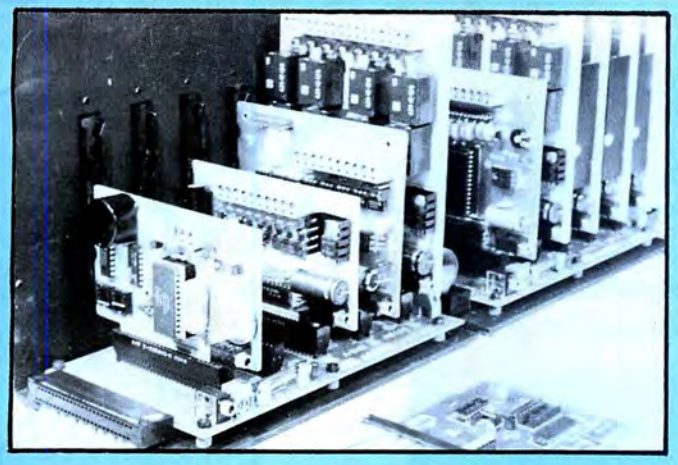

An A-BUS system with two Motherboards
A-BUS adapter (IBM) in foreground

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The A-BUS is backed by Alpha's continuing support (our 11th year, 50000 customers in over 60 countries).

The complete set of A-BUS User's Manuals is available for $10.

About the A-BUS:

- All the A-BUS cards are very easy to use with any language that can read or write to a Port or Memory. In BASIC, use INP and OUT (or PEEK and POKE with Apples and Tandy Color Computers)
- They are all compatible with each other. You can mix and match up to 25 cards to fit your application. Card addresses are easily set with jumpers.
- A-BUS cards are shipped with power supplies (except PD-123) and detailed manuals (including schematics and programming examples).

Relay Card — RE-140: $129

Includes eight industrial relays, (3 amp contacts, SPST) individually controlled and latched. 8 LED's show status. Easy to use (OUT or POKE in BASIC). Card address is jumper selectable.

Reed Relay Card — RE-156: $99

Same features as above, but uses 8 Reed Relays to switch low level signals (20mA max). Use as a channel selector, solid state relay driver, etc.

Analog Input Card — AD-142: $129

Eight analog inputs. 0 to +5V range can be expanded to 100V by adding a resistor. 8 bit resolution (20mV). Conversion time 120us. Perfect to measure voltage, temperature, light levels, pressure, etc. Very easy to use.

12 Bit A/D Converter — AN-146: $139

This analog to digital converter is accurate to .025%. Input range is −4V to +4V. Resolution: 1 millivolt. The on board amplifier boosts signals up to 50 times to read microvolts. Conversion time is 130ms. Ideal for thermocouple, strain gauge, etc. 1 channel. (Expand to 8 channels using the RE-156 card).

Digital Input Card — IN-141: $59

The eight inputs are optically isolated, so it's safe and easy to connect any "on/off" devices, such as switches, thermostats, alarm loops, etc. to your computer. To read the eight inputs, simply use BASIC INP (or PEEK).

24 Line TTL I/O — DG-148: $65

Connect 24 input or output signals (switches or any TTL device) to your computer. The card can be set for: input, latched output, strobed output, strobed input, and/or bidirectional strobed I/O. Uses the 8255A chip.

Clock with Alarm — CL-144: $89

Powerful clock/calendar with: battery backup for Time, Date and Alarm setting (time and date); built in alarm relay, led and buzzer; timing to 1/100 second. Easy to use decimal format. Lithium battery included.

Touch Tone® Decoder — PH-145: $79

Each tone is converted into a number which is stored on the board. Simply read the number with INP or POKE. Use for remote control projects, etc.

A-BUS Prototyping Card — PR-152: $15

3½ by 4½ in. with power and ground bus. Fits up to 10 I.C.s

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AD-142

Smart Stepper Controller — SC-149: $299

World's finest stepper controller. On board microprocessor controls 4 motors simultaneously. Incredibly, it accepts plain English commands like "Move arm 10.2 inches left". Many complex sequences can be defined as "macros" and stored in the on board memory. For each axis, you can control: coordinate (relative or absolute), ramping, speed, step type (half, full, wave), scale factor, units, holding power, etc. Many inputs: 8 limit & "wait until" switches, panic button, etc. On the fly reporting of position, speed, etc. On board drivers (350mA) for small steppers (MO-103). Send for SC-149 flyer.

Remote Control Keypad Option — RC-121: $49
To control the 4 motors directly, and "teach" sequences of motions.

Power Driver Board Option — PD-123: $89
Boost controller drive to 5 amps per phase. For two motors (eight drivers).

Breakout Board Option — BB-122: $19
For easy connection of 2 motors. 3 ft. cable ends with screw terminal board.

Stepper Motor Driver — ST-143: $79

Stepper motors are the ultimate in motion control. The special package (below) includes everything you need to get familiar with them. Each card drives two stepper motors (12V, bidirectional, 4 phase, 350mA per phase).

Special Package: 2 motors (MO-103) + ST-143: **PA-181: $99**

Stepper Motors — MO-103: $15 or 4 for $39

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TRS-80 Model 102, 200 Plugs into 40 pin "system bus".	AR-136...$69
Model 100. Uses 40 pin socket. (Socket is duplicated on adapter).	AR-135...$69
TRS-80 Mod 3,4,4D. Fits 50 pin bus. (With hard disk, use Y-cable).	AR-132...$49
TRS-80 Model 4P. Includes extra cable. (50 pin bus is recessed).	AR-137...$62
TRS-80 Model I. Plugs into 40 pin I/O bus on KB or E/I.	AR-131...$39
Color Computers (Tandy). Fits ROM slot, Multipak, or Y-cable.	AR-138...$49

A-BUS Cable (3 ft, 50 cond.) — CA-163: $24

Connects the A-BUS adapter to one A-BUS card or to first Motherboard.

Special cable for two A-BUS cards: CA-162: $34

A-BUS Motherboard — MB-120: $99

Each Motherboard holds five A-BUS cards. A sixth connector allows a second Motherboard to be added to the first (with connecting cable CA-161: $12). Up to five Motherboards can be joined this way to a single A-BUS adapter. Sturdy aluminum frame and card guides included.

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DOS Help

Helpmatedos provides references, formats, examples, hints, warnings, and comments on 88 MS-DOS commands and associated topics. The program requires 256K and is not memory resident.

Helpmate Software, Suite 135, 8660-D Miramar Road, San Diego, CA 92126, 619-693-5050. $39.95.

Circle 556 on Reader Service card.

More DOS Help

CSW DOS Assistant includes several utilities, a user-modifiable menu, and an on-line DOS manual that includes over 200 DOS and GW-Basic commands.

CSW Management Services Inc., P.O. Box 920683, Houston, TX 77292, 713-869-3296. $149.95.

Circle 557 on Reader Service card.

File Compression

The Cubit 2.0 memory-resident file-compression program lets you transfer files from one computer to another over data-communication lines. It can reduce a 1-2-3 worksheet file an average of 70 percent and program files an average of 25–35 percent.

Softlogic Solutions, One Perimeter Road, Manchester, NH 03103, 800-272-9900 (603-627-9900 in NH). $49.95.

Circle 558 on Reader Service card.

Connection Advice

The RS-232 Consultant, an AI expert system, gives you advice about the proper connections when you build your own RS-232 cables, even when you don't know all the answers. Once it's decided on the proper cable, it displays a connection diagram and instructions.

Alohmon Inc., 433 Wedgewood Drive, Lower Burrell, PA 15068, 412- 337-8188. $89.95.

Circle 559 on Reader Service card.

Backup/Restore Utility

The Smart Recall high-speed backup utility uses a unidirectional head movement to transfer 20MB of data between DOS-recognizable devices in less than 15 minutes. Files are automatically segmented, and Smart Recall can perform incremental backups and format media during backups.

IQ Technologies Inc., 11811 N.E. First St., Suite 201, Bellevue, WA 98005, 206-451-0232. $129.

Circle 560 on Reader Service card.

Linking Laptops and Desktops

Lap-Link connects an MS-DOS desktop and a laptop computer (like Tandy's new 1400 LT) and lets them share information. It's also an easy way to convert between 5 1/4- and 3 1/2-inch disk formats. Lap-Link comes with both 5 1/4- and 3 1/2-inch disks and a universal-mold serial cable with 25- and 9-pin connectors.

Traveling Software Inc., North Creek Corporate Center, 19310 North Creek Parkway, Bothell, WA 98011, 206-483-8088. $129.95.

Circle 561 on Reader Service card.

ENTERTAINMENT

In This Corner. . .

The one- or two-player Star Rank Boxing II lets you train your fighter and then work him up through the ranks to challenge the current champ.

Activision Inc., 2350 Bayshore Parkway, Mountain View, CA 94043, 415-960-0410. $39.95.

Circle 581 on Reader Service card.

Beyond Zork

Beyond Zork takes you back to Zorkian universe for a new approach to Infocom gaming. You can create your own character, choose a text-only screen or one with a map and window display, move via mouse, undo your last move, and program function keys for commonly used commands.

Infocom Inc., 125 CambridgePark Drive, Cambridge, MA 02140, 617-492-6000. $49.95.

Circle 582 on Reader Service card.

1932

Gee Bee Air Rally puts you in the pilot's seat of 1932's fastest racing aircraft, the Gee Bee. An action game with 16 race courses and 250 levels of difficulty.

Activision Inc., 2350 Bayshore Parkway, Mountain View, CA 94043, 415-960-0410. $39.95.

Circle 583 on Reader Service card.

Infocom takes a new approach with Beyond Zork.

INFO LINE

HARDWARE

Robokit

WAO, the electronic robot kit, has a microcomputer chip so it can store an operating system and a user program. WAO can perform programs and graphics and interact with a PC.

OWI Inc., 1160 Mahalo Place, Compton, CA 90220, 213-638-4732. $99.95

Circle 550 on Reader Service card.

The WAO electronic robot kit can interact with a PC.

Smooth Talkin'

The Speech Thing digital sound converter attaches to your computer's parallel printer port but doesn't interfere with printer operation.

The unit includes the Smooth Talker and a text-to-speech converter, and it features an audio amplifier with built-in speaker and headphone jack and software that comprises an English/Spanish talking calculator, a music sampler keyboard, a graphics-based sound editor, a special-effects control panel, several prerecorded vocabularies, and more.

Covox Inc., 675 Conger St., Eugene, OR 97402, 503-342-1271. $69.95.

Circle 552 on Reader Service card.

Voice Processor

The VP620E voice-processor board features adaptive differential pulse code modulation (ADPCM) to convert 20 Hz–7.0 kHz audio to digital in mono or stereo. You can record any waveform through an RCA jack for sampling at 8 or 16 kHz (software selectable).

Antex Electronics Corp., 16100 S. Figueroa St., Gardena, CA 90248, 213-532-3092 or 800-621-0849. $395.

Circle 551 on Reader Service card.

A Little Terminal

The Model 210 Mini Terminal adds 48 full-travel keys to any device capable of receiving standard RS-232 signals. The keyboard features an 8085 processor with 8K of RAM. It is available with or without a two-line by 40-character alphanumeric LCD and two peripheral device ports that support bar code readers, magnetic strip readers, printer ports, or another keyboard.

The manufacturer programs the ASCII character codes in ROM according to customer specifications. The terminal can include up to three shift keys, allowing up to 180 output codes.

Contact Touchstone Technology Inc., 955 Buffalo Road, P.O. Box 24954, Rochester, NY 14624, 716-235-8358. $385 (includes LCD and one auxiliary port).

Circle 555 on Reader Service card.

The Model 210 Mini Terminal can produce up to 180 output codes.

Communicating Fast

The PM2400SA 300/1,200/2,400-baud, Hayes-compatible, stand-alone modem features modifiable, non-volitile RAM that stores the configuration program and automatic adaptive equalization.

Practical Peripherals, 31245 La Baya Drive, Westlake Village, CA 91362, 800-641-0814 (in CA, 818-991-8200). $239 ($199 for the internal half-card version).

Circle 553 on Reader Service card.

VP620E voice processor digitizes audio signals for recording or random playback on computer disks.

Laser Printing

The Laserstar 6, a six-page-per-minute desktop laser printer, features 1.5MB buffer, 300 by 300 dot-per-inch resolution, 15 internal fonts, Diablo 630 and Hewlett-Packard Laserjet Plus emulation, and built-in Centronics parallel and serial RS-232 interfaces.

Olympia USA Inc., Box 22, Somerville, NJ 08876-0022, 201-722-7000. $2,399.

Circle 554 on Reader Service card.

FOR THE PROGRAMMER

Developing Turbo Pascal

The Turbo Development System (TDS), designed to work with Borland's Turbo Pascal Compiler 3.x, can find multiple errors in a single pass through source code. The program lets you develop source code incrementally and correct errors while TDS is running. The system provides the Shell, Delete, Rename, and Copy commands and

Circle 282 on Reader Service card.

lets you execute any other program, batch file, or DOS command from within the environment.

Microhelp Inc., 2220 Carlyle Drive, Marietta, GA 30062, 404-973-9272 or 800-922-3383. $39.

Circle 577 on Reader Service card.

Program Editor

The Out of the Blue Program Development System is a compact, full-function editor that includes features such as a simple word processor, text insertion and deletion, DOS format for files, and search and replace. It lets you compile a program without leaving the editor.

Paragon Software Corp., 600 Rugh St., Greensburg, PA 15601, 412-838-1166. $69.95.

Circle 578 on Reader Service card.

FOR THE HOME

The Record Collector

The Record Collector includes three versions of a data base to help you keep track of your recorded music. The different versions can handle the needs of a casual collector or of a radio station that needs to know when the record was last played and its position on the charts.

Homecraft, P.O. Box 974, Tualatin, OR 97062, 503-692-3732. $129.95.

Circle 579 on Reader Service card.

The Home Accountant

The Moneymate home-accounting package helps you organize your finances. It can handle up to 10 bank accounts and 25 credit cards; comes with a set of categories for allocating money flow; and can track bills, write checks, project cash flow, track assets and liabilities, sort information for tax-return preparation, and calculate loan repayments.

Realworld Corp., 282 Loudon Road, P.O. Box 2051, Concord, NH 03302-2051, 800-255-1115 or 603-224-2200. $169.95 (now in Radio Shack's Express Order Service, catalog no. 900-3242).

Circle 580 on Reader Service card.

ADD-ONS

For PFS:File

CWS:Aid brings a relational report writer to PFS:File, Professional File, and First Choice data files. It lets you design reports that use data from several related files.

Clay Watts Software, 68C North Loop, Cedar Hill, TX 75104, 214-291-1171. $39.

Circle 562 on Reader Service card.

Faster 1-2-3

Sprint attaches to Lotus's 1-2-3 and uses sparse-matrix technology to recalculate only those cells of a worksheet that you've changed since the last recalculation. In most cases, it increases recalculation speed by 50 percent.

Biologic Co., 11982 Coverstone Hill Circle, Suite 1622, Manassas, VA 22110, 703-368-2949. $59.

Circle 563 on Reader Service card.

WORD PROCESSING

Document Conversion

Word for Word 2.1 converts text files between 11 word processors and three communications formats, while the converted documents retain full function and format codes. It comes on a 3½- or 5¼-inch disk.

Mastersoft Inc., 4621 N. 16th St., Suite A-108, Phoenix, AZ 85016, 602-277-0900. $149.

Circle 565 on Reader Service card.

The Name Processor lets you create mailing lists and name tags.

And Again

R-Doc/X 4.1 translates files (and most print- and format-control codes) between 20 word-processing formats. It also supports extended character sets to handle international characters and mathematical symbols.

Advanced Computer Innovations, 1227 Goler House, Rochester, NY 14620, 716-454-3188. $149.

Circle 566 on Reader Service card.

International Word Processor

Duangjan 1.3 is a bilingual word processor that lets you write in the English alphabet or in a foreign alphabet of your choice. It offers standard editing features and includes a built-in reverse-Polish calculator.

You can choose from the following foreign languages: Armenian, Bengali, Cambodian (Khmer), French, German, Portugese, Spanish, Greek (classical and modern), Hindi, Lao, Punjabi, Russian, Tamil, Telugu, Thai, or Vietnamese.

Megachomp Co., 3524 Cottman Ave., Philadelphia, PA 19149-1606, 215-331-2748. $69.

Circle 567 on Reader Service card.

Spanish Lexical Adviser

Ibersoft has added a Spanish lexical adviser to their Spanish-language spelling checker, Escribién. The program includes an on-line verb conjugator and implements the latest grammatical and orthographic rules approved by Real Academia. You can expand the dictionary.

Ibersoft Inc., P.O. Box 3455, Trenton, NJ 08619, 609-890-1496. $129.95.

Circle 568 on Reader Service card.

Fill in the Blank

Blankety Blank works with your word processor to create questionnaires that can contain up to 1,000 questions each. The program automatically calculates math questions and merges standard information into the appropriate places or blanks in each form. You can edit and add questions and answers at any time.

Blankety Blank comes on a 3½- or 5¼-inch disk and is designed to help you complete such things as closing statements, financial documents, and payroll checks.

Softstream Technologies Inc., 2740 Hollywood Blvd., Hollywood, FL 33020, 800-888-9292 or 305-920-9292. $99.50.

Circle 569 on Reader Service card.

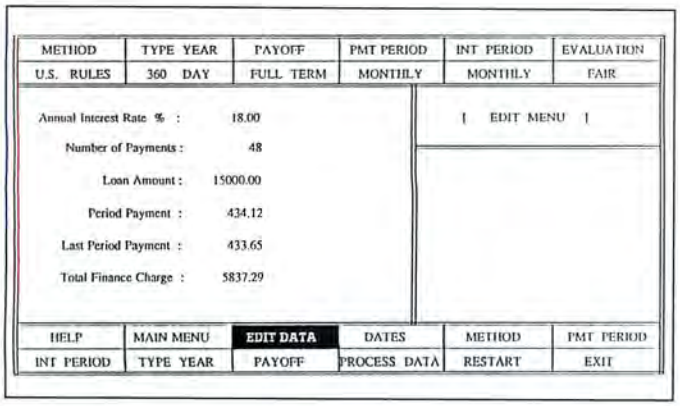
BUSINESS & PROFESSIONAL

Bulk Mail

The Name Processor manages data for creating mailing lists, name badges, and so on. The program includes form-feed name-badge cards, name-badge holders, and peel-off name badges.

ETS Center, P.O. Box 651, 35026-A S. Turtle Trail, Willoughby, OH 44094. $79.

Circle 573 on Reader Service card.



A sample menu of The Loan Ranger and lease amortization program.

I Owe Silver

The Loan Ranger loan and lease amortization package's primary purpose its to initiate a grassroots banking-reform movement by educating banking consumers. The program handles balloon, Rule of 78s, actuarial-method, and U.S. Rules-method loans; tracks loan payments; and explains the terms so you can see how they affect your payments.

Pride Software Development Inc., 8221 Glades Road, Suite 202, Boca Raton, FL 33434, 800-635-6366 or 305-731-4333. $99.95.

Circle 576 on Reader Service card.

Business Planner

Bottomline-V works with several popular spreadsheets to help you plan the growth of a small, medium, or large business. Seven financial modules help analyze a company's financial history, plan for budget and cash-flow, and project its financial future.

ILAR Systems Inc., 334 Baywood Drive, Newport Beach, CA 92660, 714-759-8987. $495.

Circle 570 on Reader Service card.

Point of Sale

Keyretailer includes a point-of-sale module; an inventory-control and purchase-order system; and accounting modules for general-ledger, accounts-receivable, accounts-payable, and system-report generation.

Softkey Software Products Inc., 630 Mello Lane, Santa Cruz, CA 95062, 408-462-5370. $1,995.

Circle 571 on Reader Service card.

Investograph

Investograph Plus charts securities, tracks your stock portfolio, analyzes trends in the market. It's available in three versions: Basic ($99), Advanced ($178), and Advanced with Trading Strategies ($277). Each version includes a data base to store portfolio price history.

Liberty Research Corp., 1701 Directors Blvd., Suite 550, Austin, TX 78744, 800-433-3310.

Circle 572 on Reader Service card.

Engineering Help

Triangle converts angles and triangles from degrees/minutes/seconds to decimal format; lists the 24 most common metric conversions; finds any root to 16 places; and gives the most used steel-beam, column, and weld-strength formulas.

William M. Ripple, 10 Dauterive Court, Kenner, LA 70065, 504-466-3097. $35.

Circle 574 on Reader Service card.

Loan Amortizer

Execamort 2.03 helps such professionals as bankers, accountants, and mortgage brokers produce loan amortization reports that include the annual percentage rate with points and fees. The program solves for unknowns; calculates yields, loan prices, and present/future values; and handles mixed cash flows, PMI fees, and escrow fees.

Electrosonics, 36380 Garfield, Suite 1, Fraser, MI 48026-1239, 313-791-0770 or 800-858-8448. $129.95.

Circle 575 on Reader Service card.

LITERATURE

Do-It-Yourself Desktop Publishing

The *Desktop Publishing Bible* (James Stockford, ed.) tells you what you need to know about desktop publishing from print production, typography, and high-end typesetters to copyright information, equipment, and software.

Howard Sams & Co., 4300 W. 62nd St., Indianapolis, IN 46268, 317-298-5400. $24.95.

Circle 564 on Reader Service card.

ON LINE

BBSes

The 24-hour PD-SIG offers thousands of public-domain and shareware programs; a contest club; special-interest groups, and an on-line store. There are four phone lines to the BBS: 619-749-2741 (300/1,200/2,400 baud, no 300 baud from 5–9 p.m.), 619-749-2589 (300/1,200 baud), 619-566-6329 (300/1,200 baud, members only), 619-727-0202 (300/1,200 baud).

PD-SIG the TBBS, 1291 E. Vista Way #150, Vista, CA 92084, 619-749-0322 (voice). Membership: $5/month, $45/year, $100/lifetime.

Circle 584 on Reader Service card.

DIRECTORIES

On-Line Database

The *On-Line Databases in the Medical and Life Sciences* ($29.95) and *On-Line Databases in the Securities and Financial Markets* ($39.95) provide information on data bases in the bioscience and securities-and-finance fields.

Cuadra/Elsevier, 52 Vanderbuilt Ave., New York, NY 10017, 212-370-5520.

Circle 586 on Reader Service card.

SOFTWARE

FYI

The Hayes-compatible FYI-MCD BBS software for professional users features e-mail, conferences, true data bases, and questionnaires. You can set up 16 free-form text data bases.

FYI Inc., P.O. Box 26481, Austin, TX 78755, 512-346-0133. $295.

Circle 585 on Reader Service card.

USER GROUPS

Columbia Baltimore User Group

P.O. Box 125, Columbia, MD 21045. Contact Ed Kidera, 301-997-9333.

Not Tandy specific. MS-DOS, information exchange. Dues: $15/year. 350 members. Club's age: 4 years. Newsletter and BBS (301-997-1918, 1,200/2,400 baud, 8-bit words, 1 stop bit, no parity).

Personal Computer Club of Battle Creek

844 N. Washington, Battle Creek, MI 49017. Contact Sidney Adams, 616-963-1440.

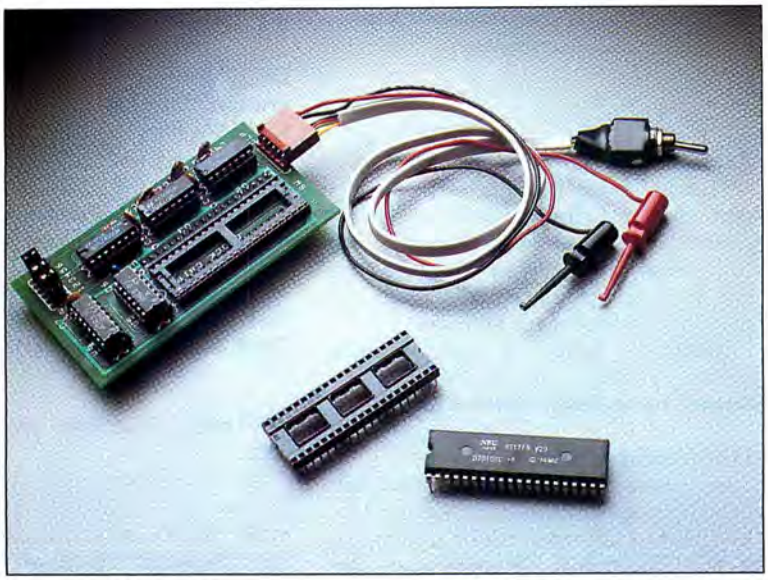
Not Tandy specific. All machines, TRSDOS, MS-DOS, and Color Computer. Dues: $15/year per family. 124 families. Club's age: 3 years. Newsletter and several BBSes (616-964-3545, 616-962-0400, and 616-962-2840).

Northwest Computer Society

P.O. Box 75061, Seattle, WA 98125. Contact Leo B. McCracken, 206-527-8279.

Tandy specific. Models I/III/4 and Tandy 1000. Dues: $12/year. 350 members. Club's age: 9 years. No newsletter, no BBS.

Speed Shifting



PC-Sprint 1000A 7.16/ 9.54-MHz slotless CPU speedup kit version A works with the Tandy 1000A. Exec-PC Inc., P.O. Box 11268, Shorewood, WI 53211, 414-242-2173. $99.

by John Wolfskill

The Tandy 1000 suffers from a hardware design that, in the past, has presented a problem for speedup-board designers: how to increase the CPU clock speed without throwing the rest of the computer into a tailspin. In particular, the Tandy 1000's balky direct memory access (DMA) circuitry has refused to operate correctly at high CPU clock speeds.

Now Exec-PC has solved the design puzzle by creating a CPU speedup board that makes your 1000 fly.

The Kit

Exec-PC provides a slightly different version of PC Sprint for each of three Tandy 1000 motherboards. The original 1000 motherboard has the number 25-1000 stamped on the rear of the case. The 1000A, a later revision, bears the number 25-1000A, and a third variation is stamped 25-1001-A.

The PC Sprint 1000A includes an NEC V-20 CPU chip, a small circuit board containing an empty 40-pin IC socket with five support chips, two microclip jumper wires, a wired toggle switch, a 40-pin adapter socket, a chip removal strip, and a few pieces of paper-backed tape.

The board replaces the 40-pin clock chip (U25) on your 1000A motherboard. Before installing PC Sprint, you insert the original clock chip into the board's empty socket. The NEC V-20 CPU replaces the Tandy 1000's original Intel 8088 CPU chip. The V-20 allows the computer to operate at the speedup circuitry's higher clock frequencies and adds a small performance boost of its own.

Installation

The PC Sprint isn't difficult to install, if you're familiar with the internals of your Tandy 1000. First remove the case cover, expansion boards, and anything else that might get in the way. Then replace the 8088 CPU with the NEC V-20 chip, reassemble the case, and test the machine with the new V-20 CPU onboard.

The next steps are also relatively simple. You locate the 40-pin clock chip on the motherboard, use the plastic chip-removal strip to remove it, place the clock chip in the 40-pin socket on the circuit board, and install the board in the now-vacant clock-chip socket.

The PC Sprint board is heavier than the original clock chip. Therefore, to make the board mechanically reliable, the support legs are slightly thicker than those of the original chip. The instructions warn that the thick support pins might stretch the connectors on the motherboard clock-chip socket and prevent you from restoring the system to its original design in the future.

To eliminate this problem, the kit includes a special adapter socket. The adapter plugs into the motherboard socket, and the circuit board plugs into the adapter. While this saves the motherboard socket pins from damage, it provides a tottering mechanical and electrical connection that could cause problems.

I initially opted to use the special adapter rather than risk stretching the motherboard connector pins. However, when I reassembled the computer, I discovered there was no clearance between the bottom of my internal hard drive (which mounts directly over the clock-chip socket) and the circuit board. With no recourse, I installed the PC Sprint directly onto the motherboard, crossed my fingers, and hoped it would work as advertised.

The board offers two modes of operation: DMA speed sensing or clock substitution. Some memory-board DMA chips (namely those marked 8237-5 and 9517) will not work reliably at clock speeds above 4.77 MHz.

If you select speed sensing, the computer slows down to normal clock speed each

time the DMA chip is addressed for disk I/O. This solves the finicky DMA problem but provides less than maximum performance. The clock-substitution method gives better results.

To select this option, connect a special microclip jumper wire between the PC Sprint board and the DMA chip's clock signal input pin, then place a small piece of tape over the bus connector pin that normally passes the clock signal to the memory/DMA card. Using this scheme, the speedup board substitutes a normal 4.77-MHz clock signal to run the DMA chip, while the rest of the computer runs at full speed.

Next, decide whether to set the board for hardware or software speed switching. Hardware switching consists of mounting a toggle switch through the CPU case. Then simply flip the switch to toggle between low and high speeds. Due to the thickness of the 1000's double-walled case, I found no convenient place to mount the switch. I decided instead to tape the switch to the inside wall and install the software speed-switching option.

Software switching requires a considerable amount of extra work, but it's worth the effort. Attach a second microclip connector between the PC Sprint board and the 40-pin keyboard-controller chip (U9) located underneath your floppy-disk drives. To attach the microclip, completely remove the drives and detach the power-supply harness.

Here is where the otherwise good instruction manual falters. It identifies the proper chip (U9) and pin number (37) but either assumes that you know how to determine which pin is number 37 or that you will discover a picture of a vaguely similar chip buried in the rear of the instruction manual.

The last step in the speed-switch installation requires you to write two small machine-language programs, Slow.COM and Fast.COM, using the DOS Debug utility. The programs toggle the CPU from low to high speed. You can make Fast.COM a part of your Autoexec.BAT file to make your 1000 automatically start up at 9.54 or 7.16 MHz. If you're not a programmer, creating the files is not as intimidating as it sounds. The programs are short, and the instructions are fairly good.

Next comes the fine tuning. You can select to run the board at 4.77 MHz and one of two higher speeds: either 7.16 MHz or 9.54 MHz. You also decide whether to insert a wait state in the timing circuit. Wait states are normally inserted to allow slow memory chips or I/O devices time to catch up to a CPU running at a higher clock speed.

Testing the Board

I found that (as the manual warns) running the board flat out (9.54 MHz and no wait states) crashed the system. I experimented with every available combination of speed and wait-state operation and settled on the 9.54 MHz speed with one wait state. You can also select a 7.16 MHz clock, either with or without a wait state.

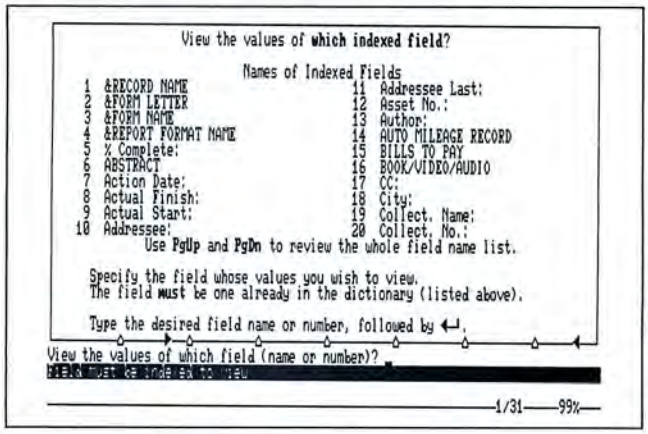
Although 9.54 MHz with one wait state sounds like it's quite a bit faster then 7.16 MHz with no wait state, the difference in performance is only slight. Benchmark tests using the Norton Utilities System Information (SI) test yielded a 2.7 rating with the board running at 9.54 MHz (one wait state). At 7.16 MHz (no wait state), the SI rating was only reduced to 2.4. My Tandy 1000A now runs well over 150 percent faster than its original speed.

Conclusion

For the most part, the installation instructions are clear and thoroughly detailed. However, if the thought of opening the case and yanking at ICs, expansion boards, and disk drives gives you pause, you might want to have a technician install the kit for you. Installing the board is not an easy task for a novice.

The PC Sprint has performed dependably at both 9.54 MHz and normal operating speed in two months of heavy use with all types of software. I heartily recommend it if you require more performance from your Tandy 1000A. At $99, it may be the best productivity bargain you'll ever find. ■

Keep on Tracking



Dayflo Tracker requires 384K, one floppy-disk drive, a hard disk, and MS-DOS 2.x. Dayflo Software Corp., 17701 Mitchell Ave. N., Irvine, CA 92714, 714-474-1364. $99.95.

by Harry Green

Every office needs a way to maintain and manage lists of information. For many, a data-base manager (DBM) is the answer, but DBMs can be expensive, difficult to learn, and time consuming to set up. Dayflo Tracker, a program that combines features of a data-base manager with those of a desktop manager, offers an excellent alternative. The price is reasonable, and the hard work of setting up the application is mostly done for you.

Free-Form Records

Tracker comes with input forms that accommodate many conventional office operations. It has forms for tracking payables, receivables, key-customer contacts, expenses and mileage, and most other office functions that call for record-keeping. The forms are easy to modify, or you can create your own.

Once you've created a form, you're ready to begin entering data. There are no fields to define, and you don't have to specify record type and length as with most DBMs. In fact, Tracker operates more like a word processor than a DBM. The screen shows the input form with highlighted fields—you simply fill it with data and save it to disk. You can retrieve data from disk by any of the field names.

Tracker's operation emulates that of desktop organizer software. Records can be in one of two places: on the desk (called the stack), or in file. With a simple command, you can retrieve records from file and place them in the stack, where you can edit, print, rearrange, sort, or handle them in any way you would handle a card file, only much faster. You can select by any of the indexed fields or by key words. When you're done with the record, press a key to return it to file.

To add records to the file, you call a blank form from the main menu and complete it. You can copy a record to file, leaving one copy of the form on the stack for editing. This feature saves typing when you want to create a record that shares several fields with another record.

Like other DBMs, Tracker supports record selection by specific match to any combination of values on file. You select the search argument from a menu—pressing the View key brings up a list of all the possibilities (see Photo). If, for example, you want to retrieve records for a particular

(continued on page 62)


The Tandy®
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Desktop Publishing System

Now you can create professional-looking documents with an affordable PC system

Here's a desktop publishing system with a unique advantage over other systems: it's truly affordable. Featuring the Tandy 4000 computer with a hard disk drive, PageMaker software, our new LP 1000 Laser Printer, EGM-1 Enhanced Graphics Monitor and a mouse, this system can automate capabilities previously handled manually or by expensive dedicated systems.

Desktop publishing begins with PageMaker

With PageMaker software, you can design, lay out and produce top-quality printed materials right at your desk. Combining sophisticated quality with incredible ease of use, PageMaker makes short work of page layout and design.

Simply create your text and graphics on the Tandy 4000, bring them into the PageMaker program and do your cutting and pasting electronically.

You'll be able to produce almost any printed piece imaginable, from newsletters and brochures to catalogs and annual reports. The finished product is so professional most people will think you had it typeset.

The power of 386 technology

The Tandy 4000 computer unleashes the awesome power of the 80386 microprocessor. It will allow you to run current PC and AT® software with blinding 16 MHz speed. And when new operating systems such as Microsoft® OS/2 become available, you'll be able to tap the full potential of the 80386 processor.

The Tandy 4000 also features 1 MB standard memory and a 1.4 MB 3½" floppy disk drive, giving you increased storage capacity and greater durability on pocket-sized 3½" diskettes.

Print quality that rivals professional typesetting

The Tandy LP 1000 Laser Printer delivers laser-sharp clarity with whisper-quiet printing at a fast six pages per minute. Its 1.5 MB memory enables it to produce up to 300 × 300 dots-per-inch resolution on a full 8½ × 11" page.

The LP 1000 offers three top printer emulations: Tandy, IBM® and HP LaserJet Plus®, ensuring compatibility with almost all MS-DOS software. And unlike many other laser printers, no special controller board is required. Just plug it into a standard parallel printer interface.

What you see is what you get!

The system is topped off by our EGM-1 Enhanced Graphics Monitor. With an EGA adapter card, the EGM-1 displays stunning colors with up to 640 × 350 resolution to give you a razor-sharp display of your page layout. With the "what you see is what you get" (WYSIWYG) display, you'll know what your work looks like *before* you print.

Join the revolution

The Tandy desktop publishing system can revolutionize the way your business communicates. And it's available now, along with our unequalled service and support. So step up to typeset-quality desktop publishing today. Visit your nearby Radio Shack Computer Center for a demonstration.

Send me a new 1988 computer catalog.

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03452

Special Delivery

Manage your mailing list with our first-class Maillist program.

by Bruce Tonkin

Most businesses and a surprising number of "just plain folks" need a program to manage names and addresses and print mailing labels. Several mailing-list manager programs can do this, but a good one can cost $100, and others cost a lot more.

In this article, I will discuss the requirements of a typical mailing-list manager. I'll also include the complete source code (in Quick Basic) for an easily altered and comprehensive mailing-list program called Maillist (see the Program Listing).

Program Requirements

A mailing-list manager program has several requirements to be efficient *and* effective: It should permit fast data entry and provide clear and intuitive screen format, easy screen-based corrections, quick retrieval on as many fields as possible (even with partial keys or non-key fields), changeable label formats, record selection and exclusion on multiple fields for mailing labels, and rapid sorting. This program fills or exceeds those requirements.

Sorting is never necessary; Maillist maintains all records in sorted order by last name, company name, and zip code. To do this, it uses a modified B-tree approach to manage the keys. Record selection and exclusion can include multiple-selection and multiple-exclusion criteria on every field in each record in the file. The only limits to the number of criteria for selection or exclusion are the number of characters permitted in a string variable and the amount of memory available—under the interpreter, that's 255 characters of selection and 255 characters of exclusion criteria per field. This is almost certainly more than you will ever require. If that's not enough, compiled versions under MS-DOS allow approximately 50,000 characters (total) of selection and exclusion criteria.

Finally, if the program doesn't match your needs closely enough, you can change it. Commercial programs rarely come with complete source code.

Maillist requires at least 256K of RAM, two disk drives, and DOS 2.1 or higher. It permits the storage of approximately 1,500 records per blank, non-system, double-sided 5¼-inch floppy disk. You can use multiple floppy disks for your data files, but you must exit the program before changing data disks.

Installing and Running Maillist

To install the program, boot the computer under MS-DOS. Insert the Maillist disk in your current drive. The data disk must be in drive B. (In the listing, DSPEC$ is set as drive B for data.) At the MS-DOS system prompt, enter the command MAILLIST. That's all there is to it.

The first thing you should see is a message that says "Initializing files." That message remains for two or three seconds as the various data and index files are created. Then, the opening menu appears on screen. This menu is straightforward: It asks you to add, edit, find, or delete records, print mailing labels, output to another file, or exit the program.

Adding Records

When you add records, a full screen appears, showing each of the 15 fields. Each field has a title. The number of characters

System Requirements: 256K RAM, DOS 2.1 or higher, two disk drives, printer, Quick Basic or compiled Basic. Available on The Disk Series.

Photograph by Larry Dunn

permitted for each field is indicated by underscore characters. At the bottom of the screen are the number of active, deleted, and total records in the main data file, the option you chose (add records, in this case), and the entry mode (insert or overtype).

You begin entering data at the first character of the first field. For each field, you can enter data or skip to other fields. The editing commands are styled after Wordstar, but with a few differences. The Table summarizes the commands.

In the insert mode, existing characters in the field are pushed to the right as you enter new ones. Characters that "fall off the end" of a field are gone forever. In the overtype mode, the character you type replaces the character at your current position. Once you fill the field, you automatically move to the next.

When you finish adding a record, the program writes it to disk. When you delete a record, its space is reclaimed automatically. The total number of records doesn't change, but the number of deleted records decreases.

After the record is added to the file, the screen clears, and you move to the start of the first field again. Everything except the city, state, zip code, and special code fields changes to blanks. Those fields stay as they were, because their data often remains constant (or nearly so), and leaving them intact makes for faster entry. You can change this or make additional fields remain on the screen easily—add or remove that field name in the ADDREC routine.

When you finish entering data, press the escape key, and you return to the main menu. You may press the escape key at any point in any field.

Editing Records

To edit records, press "E" at the main menu. The entry screen appears. Fill in the blanks with as much data as you remember about the record you want. You needn't fill in any of the key fields, but retrieving a record by one or more keys is faster. If all you remember is that the person's title is "Ms." and that the last name begins with the letter "N," that's all right. Then press the End key or ^C and press enter. Maillist shows you the first record it can find that matches all of your criteria. It then asks you if this is the correct record. If it isn't, press the N key, and the program will find the next match.

When no records match, you see an error message, and the program asks you to press any key to continue. When you do, the cursor moves to the start of the first field. The data you had entered remains. You can edit it and try again or press the escape key and return to the main menu. When you find the correct record, use the editing commands to alter as many fields as you like. After you've made all the changes, press End (or ^C) to move to the last field, and then press enter. The record is updated (including the keys, if necessary), and you return to the main menu.

Table. Field editing operations in Maillist.SB1.

Command	Result
^A	Move left a word
^S, left arrow	Move left a character
^D, right arrow	Move right a character
^F	Move right a word
^E, up arrow	Move to beginning of the previous field
^X, down arrow	Move to the beginning of the next field
^R, pg up, home	Move to the beginning of the first field
^C, pg down, end	Move to the beginning of the last field
^T	Delete to the end of the current field
^Y	Delete the current and following fields
^G	Delete the current character
^H, backspace, del	Destructive backspace
^, Insert	Switch modes (insert/overtype)
Enter, ^I, tab, ^M	Finished entry, move to the next field
ESC	Quit, return to the main menu immediately

Finding and Deleting Records

Finding a record is similar to editing one. Everything works the same, except that you cannot edit data in the record. Also, after you look up a record, you cannot return to the menu unless you press escape. This lets you look up as many records as you like without going through the main menu. Use the shift-print command to dump the screen display of the record to your printer.

Deleting records is also similar to editing records. As before, you first find the record you want to eliminate. The program asks if this is the record you want to delete.

If you just finished editing a record and asked to delete one, then the record you last edited will be displayed on the screen. That is the program's best guess for the record you want to get rid of. You can edit any of the fields or clear all of the fields using control-Y and then enter data matching the kind of record you want to delete. As before, the program will look for records matching your criteria. When it finds the one you want to delete, you can tell it to delete that record.

Printing Labels

Printing labels is more complex, partly because more options are involved. You can choose the fields that will appear on your labels and on which lines, the size of the labels, the number of lines to skip between each label, and which records to include and exclude (and how to determine inclusion and exclusion). Most of these options should be easy to understand. The most complex are the formatting and selection/exclusion options.

To format a label, the program shows you each field title and its field number. It then asks you which field numbers you wish to have displayed on each line of the label. Enter as many fields as you like and separate the numbers with commas.

For example, to print the title, first name, last name, and suffix on line 1, you would tell the program that line 1 should include fields 1, 2, 4, and 5. Field 3 is the middle initial. Blank lines won't appear when the label is printed. If you tell the program to include both the first and second lines of the address on each label, labels without a second address won't have a blank line. Adjacent fields on each line will be separated by a blank.

You select records to print in four ways. First, you can enter a minimum value for each field. This minimum value is interpreted alphabetically in ASCII order. Thus,

your selection by zip code or postal code is not limited to United States formats. You need not enter a minimum value.

Second, you can enter a maximum value for each field. As before, this is interpreted alphabetically, so you needn't enter a maximum value.

Third, you can enter selection criteria for each field. If any record contains the selection characters, it is printed (with one exception, as I will explain). You can enter as many selection criteria as you like for each field, separating each with commas. Suppose you want to print labels and select records containing the letter "A" and the character string "New" in the special code field. For that field, you would enter the selection criteria as A,NEW.

Fourth, you can specify exclusion criteria. Enter this in the same way as the selection criteria. If any record contains the character(s) or character string(s) you specified, it is rejected. You can exclude records containing the letter "B" and the words "Newer" and "Newest" by entering B,NEWER,NEWEST.

The selection process checks minimum values first, then maximum, then selection, and finally, exclusion. When a record fails to meet the minimum or maximum criteria, it isn't selected. When it meets the minimum and maximum criteria but fails to match at least one of the selection criteria, it isn't included. When it meets all other criteria but contains one of the exclusion criteria, it isn't selected.

Once you decide on the label format and the records you want to print, you can print a test pattern to check the format. You might need to shift the labels a few times in your printer to get everything exactly right. This is one of the other options in the Print Labels menu. Labels are printed in zip code order. You can change this if it's not what you want.

Output to Another File

This option lets you use the data in the Maillist file with a word processor or other program. Maillist asks for the name of the desired output file. It then outputs all active records to that file, one field per line, and places quotation marks around any field containing a comma.

You should always exit the program through the main menu. If you don't, your files might be damaged. To guard against that, be sure to keep backups of all your data and key files.

The Inner Workings

Maillist is essentially a standard data-base program, but it is more sophisticated than many others, especially in its key file management.

Maillist has one main data file (Maillist.DAT), three key files (Maillist.LN for last name, Maillist.CN for company name, and Maillist.ZIP for zip code), and one deleted record file (Maillist.DEL).

Each of the key files uses records of length 250; this length is kept in the variable BLK% and can be changed. As supplied, each key file record can contain up to 125 record pointers. The pointers are maintained in order by the indicated key. When a key record becomes filled, it is split. Subsequent records are moved to make room for the newly divided record. This is an implementation of a modified B-tree file structure.

To find a record, Maillist performs a standard binary search through the key file to look up the pointer. Inserting a new record

For each field, you can enter data or skip to other fields.

is handled similarly. The keys to a record are deleted differently; for that, Maillist uses a sequential search. The reason for this—which you might not expect—is that sequential search is faster.

To see why, let's suppose there are 64 records in the file. To find the correct pointer to delete with a binary search, a maximum of six accesses to the key file would be necessary. Each of those would also require an access to the main data file to check the key values. Repeat this for the three keys: that's 36 file accesses. Half are to the key file and the other half to the data file. With a sequential search, only one access is necessary for each key file. Everything else is handled in memory.

With some B-tree methods, the key files are more complex. To avoid moving the blocks when records are inserted, they contain forward and backward pointers. New blocks are always added at the end, and the whole key file is organized in a structure called a doubly linked list. I find that unnecessary, since a block size of 1,024 or 2,048 can be used for the key files. Then, only a few records need be moved for any reasonable data file.

With Quick Basic or Turbo Basic, Maillist can handle block sizes of as many as 8,192 bytes for each of the key files and efficiently manage data files of as many as 32,000 records. Most files on floppy-disk systems contain fewer than several thousand records, so the 250-byte block size should be quite speedy. Deleted records are marked in the data file as records filled with ASCII 250 in each field.

Customizing Maillist

You can alter Maillist in a number of ways. First, you can easily change the lengths of any of the fields. Be sure to change the length of the data file record if you do this; change all occurrences of "228." With more effort, you can even add fields. Adding key fields takes more work, possibly several hours.

The screen format is easy to alter. You can also alter the field titles and the position each field occupies on the screen in the display routine. Changing the titles requires changing a Data statement (it occurs before line 50 in the source code). Changing the screen position requires a change to the field display routine for that particular field. If you changed the field length, the number of underline characters changes automatically.

If you want the entry of any character field to be uppercase, you can insert a single line in the Getfield field input routine. The line should call the uppercase conversion routine and pass the variable to be converted as X$. Be sure to check the value of F% to make sure you're in the correct field to convert. This would be best used for field 3, the customer's middle initial.

To change the editing commands, change or insert the relevant lines in Getloop or Functionkey. The variable A$ contains the ASCII value of the key pressed. To make the entry for each field pass a validation test, you could add such a routine and call it before writing a new or edited record to disk. This would be easiest to do by inserting a new first line in the Smallmenu routine.

I could have added more features to Maillist, but I thought it more important to make the program easy for you to change. Don't be afraid to experiment.

Conclusion

I wrote Maillist to serve as an easily altered but sophisticated mailing-list manager. The techniques should be useful in other programs as well, particularly those that require immediate access to data in sorted order. The large number of fields makes the program useful as a personal name, address, and telephone number data file. Since the program can export data in plain ASCII format, most word processors also can use the information in the file.■

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Program Listing. Maillist. See page 80 for information on using checksums.

```
        'Mailing list program by Bruce W. Tonkin
        'Fields include:
        '1: Customer title (Mr., Mrs., Ms, Miss, Dr., etc.): 4 characters
        '2: Customer first name: 12 characters
        '3: Customer middle initial: 1 character
        '4: Customer last name: 18 characters
        '5: Customer suffix: (MD, Jr., Esq., etc.) 4 characters
        '6: Company name: 30 characters
        '7: Address, first line: 30 characters
        '8: Address, second line: 30 characters
        '9: City: 25 characters
        '10: State: 2 characters
        '11: Zip code, postal code, or similar: 10 characters
        '12: Country: 18 characters
        '13: Special selection codes: 16 characters
        '14: Home phone number: 12 characters
        '15: Work phone number: 16 char (area code + number + 3 digit extension)
        'Total record length: 228 characters
        'Key fields: 4, 6, 11 (last name, company name, zip)
 674    DEFINT A-Z
        'Dimension array holding the field lengths and read the lengths.
 503    DIM F(15)
2244    DATA 4,12,1,18,4,30,30,30,25,2,10,18,16,12,16
1855    FOR I=1 TO 15:READ F(I):NEXT I
2512    DIM P(1,15):DIM F$(15):DIM S$(15,4):DIM L$(15)
2420    L$(1)=CHR$(1)+CHR$(2)+CHR$(3)+CHR$(4)+CHR$(5)
2210    L$(2)=CHR$(6):L$(3)=CHR$(7):L$(4)=CHR$(8)
2572    L$(5)=CHR$(9)+CHR$(10)+CHR$(11):N.PL=5:N.TP=6
        'Dimension array holding field titles
 553    DIM T$(15)
6547    DATA Title,First name,Initial,Last name,Suffix,Company,Address1,Address2
5778    DATA City,State,Zip,Country,Special codes,Home phone,Work phone
1905    FOR I=1 TO 15:READ T$(I):NEXT I
 484    KEY OFF
 995    B$=STRING$(30,32)   'Blank string used to wipe out field data.
 475    TRUE=-1             'Boolean true/false variable.
 656    DSPEC$="B:"         'Drive specification for data and key files.
1034    DFN$="MAILLIST."    'Main part of data file name.
 781    INSRT=TRUE  'Default starting value for insert/overtype.
 429    BLK=250     'Key file block size (see article).
        'File names, purposes, and sizes:
1819    OPEN"R",1,DSPEC$+DFN$+"DAT",228   'Main data file
3730    IF LOF(1)<228 THEN CLS:PRINT"Initializing files."
1818    OPEN"R",2,DSPEC$+DFN$+"LN",BLK    'Last name key file
1810    OPEN"R",3,DSPEC$+DFN$+"CN",BLK    'Company name key file
1909    OPEN"R",4,DSPEC$+DFN$+"ZIP",BLK   'Zip code key file
1713    OPEN"R",5,DSPEC$+DFN$+"DEL",2     'Deleted records file
1246    R.MAIN=(LOF(1)+1)/228!    'Number of records in main file
1136    R.LN=(LOF(2)+1)/BLK       'Number of records in last name key
1128    R.CN=(LOF(3)+1)/BLK       'Number of records in company key
1074    R.Z=(LOF(4)+1)/BLK      'Number of records in zip code key
1114    FIELD #5,2 AS DEL$$
 402    GET 5,1
1041    R.DEL=CVI(DEL$$)          'Number of deleted records
        'Fielding the various files
3440    FIELD #1,4 AS TITLE$,12 AS F$,1 AS MI$,18 AS L$,4 AS SUFFIX$
2702    FIELD #1,39 AS D$,30 AS CMP$,30 AS AD1$,30 AS AD2$
3863    FIELD #1,129 AS D$,25 AS CITY$,2 AS STATE$,10 AS Z$,18 AS COUNTRY$
3002    FIELD #1,184 AS D$,16 AS SPECIAL$,12 AS HP$,16 AS WP$
3299    FIELD #1,4 AS F$(1),12 AS F$(2),1 AS F$(3),18 AS F$(4),4 AS F$(5)
2731    FIELD #1,39 AS D$,30 AS F$(6),30 AS F$(7),30 AS F$(8)
3466    FIELD #1,129 AS D$,25 AS F$(9),2 AS F$(10),10 AS F$(11),18 AS F$(12)
2926    FIELD #1,184 AS D$,16 AS F$(13),12 AS F$(14),16 AS F$(15)
1339    FIELD #2,BLK AS LAST1$
1256    FIELD #3,BLK AS CMP1$
1123    FIELD #4,BLK AS Z1$
        'check to see if we should initialize
2080    IF R.MAIN<>0 THEN GOTO MAINMENU
4622      IF R.LN+R.CN+R.Z>0 THEN PRINT"Damaged index/data files.":END
1142      T$=STRING$(BLK,0)
2632      LSET LAST1$=T$:LSET CMP1$=T$:LSET Z1$=T$
1455      PUT 2,1:PUT 3,1:PUT 4,1
1676      LSET DEL$$=MKI$(0):PUT 5,1
 660    MAINMENU:
 290      CLS
3357      LOCATE 1,25:PRINT"MAILING LIST SYSTEM: MAIN MENU"
2572      LOCATE 5,10:PRINT"PRESS";TAB(20);"TO DO"
3360      LOCATE 6,12:PRINT"A";TAB(20);"Add new records."
3128      LOCATE 7,12:PRINT"E";TAB(20);"Edit records."
3333      LOCATE 8,12:PRINT"D";TAB(20);"Delete records."
3140      LOCATE 9,12:PRINT"F";TAB(20);"Find a record."
3954      LOCATE 10,12:PRINT"L";TAB(20);"Print mailing labels."
4940      LOCATE 11,12:PRINT"O";TAB(20);"Output records to another file."
3536      LOCATE 12,12:PRINT"X";TAB(20);"Exit the program.
 778    MAINCHOICE:
2783      LOCATE 20,12:PRINT"Your choice is: ";
3920      X$="":WHILE INSTR(" AaEeDdFfL1OoXx",X$)<2:X$=INKEY$:WEND
4074      GOSUB TOUPPER:CH$=X$:PRINT CH$:CHOICE=INSTR(" AEDFLOX",CH$)-1
4649      ON CHOICE GOTO ADDREC,EDITREC,DELREC,FINDREC,P.LABELS,OUT.DIFF,QUIT
 381    QUIT:
4519      LOCATE 21,12:PRINT"Are you sure you want to quit (Y/N)? ";
 368      CH$=""
2855      WHILE INSTR(" YyNn",CH$)<2:CH$=INKEY$:WEND
2296      IF CH$="Y" OR CH$="y" THEN CLOSE:END
2163      LOCATE 21,12:PRINT STRING$(37,32);
1129      GOTO MAINCHOICE
 477    ADDREC:
4162      LSET TITLE$=B$:LSET F$=B$:LSET MI$=B$:LSET L$=B$:LSET SUFFIX$=B$
3919      LSET CMP$=B$:LSET AD1$=B$:LSET AD2$=B$:LSET HP$=B$:LSET WP$=B$
2235      GOSUB DISPLAY:F=1:GOTO GETFIELD
 570    EDITREC:
3863      PASS=0:GOSUB OLDASSIGN:GOSUB DISPLAY:F=1:GOTO GETFIELD
 489    DELREC:
3385      GOSUB OLDASSIGN:GOSUB DISPLAY:F=1:GOTO GETFIELD
 565    FINDREC:
3385      GOSUB OLDASSIGN:GOSUB DISPLAY:F=1:GOTO GETFIELD
 619    P.LABELS:
 290      CLS
3062      PRINT TAB(26);"PRINT MAILING LABELS: SUBMENU"
3384      LOCATE 3,16:PRINT"Press";TAB(35);"To Perform:"
4588      LOCATE 5,16:PRINT"S";TAB(35);"Select records for printing"
3879      LOCATE 6,16:PRINT"P";TAB(35);"Print mailing labels"
3532      LOCATE 7,16:PRINT"F";TAB(35);"Format selection"
3029      LOCATE 8,16:PRINT"T";TAB(35);"Trial print"
3528      LOCATE 9,16:PRINT"X";TAB(35);"Exit to main menu"
2787      LOCATE 11,16:PRINT"Your choice is: ";
 706      CHOICE2$=""
2126      WHILE INSTR(" SPFTX",CHOICE2$)<2
3378        X$=INKEY$:IF X$<>"" THEN GOSUB TOUPPER:CHOICE2$=X$
1425      WEND:PRINT CHOICE2$;
4815    ON INSTR("SPFTX",CHOICE2$) GOTO P.SELECT,P.PRINT,P.FMT,P.TRIAL,MAINMENU
 632    P.SELECT:
 290      CLS
3615      PRINT"FIELD TITLE";TAB(25);"MINIMUM";TAB(35);"MAXIMUM";
2575      PRINT TAB(45);"SELECT";TAB(60);"EXCLUDE"
 839      FOR I=1 TO 15
2453        LOCATE I+1,1:PRINT I;":";T$(I);TAB(25);
3361        PRINT LEFT$(S$(I,1),9);TAB(35);LEFT$(S$(I,2),9);TAB(45);
2937        PRINT LEFT$(S$(I,3),14);TAB(60);LEFT$(S$(I,4),19)
 488      NEXT I
 988    P.FIELDSELECT:
 729      LOCATE 22,1
5443      PRINT"Which field selection (1-15) to update (enter 0 to quit): ";
 948      LINE INPUT X$
2113      IF VAL(X$)<=0 THEN GOTO P.LABELS
2121      IF VAL(X$)>15 THEN GOTO P.SELECT
1369      X=VAL(X$):LOCATE 23,1
3119      PRINT"Smallest value to include: ";
4255      LINE INPUT S$(X,1):LOCATE X+1,25:PRINT STRING$(9,32);:LOCATE X+1,25
4230      PRINT LEFT$(S$(X,1),9);:LOCATE 23,1:PRINT STRING$(79,32):LOCATE 23,1
3004      PRINT"Largest value to include: ";
4258      LINE INPUT S$(X,2):LOCATE X+1,35:PRINT STRING$(9,32);:LOCATE X+1,35
4231      PRINT LEFT$(S$(X,2),9);:LOCATE 23,1:PRINT STRING$(79,32):LOCATE 23,1
5272      PRINT"Include records containing (use commas if needed): ";
4305      LINE INPUT S$(X,3):LOCATE X+1,45:PRINT STRING$(14,32);:LOCATE X+1,45
4276      PRINT LEFT$(S$(X,3),14);:LOCATE 23,1:PRINT STRING$(79,32):LOCATE 23,1
5278      PRINT"Exclude records containing (use commas if needed): ";
4305      LINE INPUT S$(X,4):LOCATE X+1,60:PRINT STRING$(19,32);:LOCATE X+1,60
1502      PRINT LEFT$(S$(X,4),19);
4117      LOCATE 22,1:PRINT STRING$(79,32):LOCATE 23,1:PRINT STRING$(79,32)
1339      GOTO P.FIELDSELECT
 581    P.PRINT:
1437      R.Z=CSNG(LOF(4)+1)/BLK
3683      FOR I=1 TO R.Z:GET 4,I:P1=1:REC=CVI(MID$(Z1$,P1,2)):X=TRUE
1490        WHILE REC>0:GET 1,REC
 968          FOR J=1 TO 15
2053            IF S$(J,1)="" THEN GOTO P.MAX:
3455            IF F$(J)<S$(J,1) THEN X=NOT TRUE:J=15:GOTO QSELECT
 414    P.MAX:
1994            IF S$(J,2)="" THEN GOTO P.SEL
3458            IF F$(J)>S$(J,2) THEN X=NOT TRUE:J=15:GOTO QSELECT
 412    P.SEL:
1991            IF S$(J,3)="" THEN GOTO P.EXC
 806            T$=S$(J,3)
 462    P.SEL2:
1158            T=INSTR(T$,",")
3632      IF T=0 THEN X$=T$:T$="":ELSE X$=LEFT$(T$,T-1):T$=MID$(T$,T+1)
2403            IF INSTR(F$(J),X$) THEN GOTO P.EXC
3016            IF T$="" THEN X=NOT TRUE:J=15:GOTO QSELECT
1005            GOTO P.SEL2
 408    P.EXC:
2171            IF S$(J,4)="" THEN GOTO QSELECT
 807            T$=S$(J,4)
 458    P.EXC2:
1158            T=INSTR(T$,",")
3632      IF T=0 THEN X$=T$:T$="":ELSE X$=LEFT$(T$,T-1):T$=MID$(T$,T+1)
3677            IF INSTR(F$(J),X$) THEN X=NOT TRUE:J=15:GOTO QSELECT
1853            IF T$<>"" THEN GOTO P.EXC2
 587    QSELECT:
 617          NEXT J
2358          IF X=NOT TRUE THEN GOTO NEXTREC
 478          XY=0
1453          FOR J=1 TO N.PL:T$=""
1502            FOR K=1 TO LEN(L$(J))
2592              X$=F$(ASC(MID$(L$(J),K,1))):GOSUB TRIM
 931              T$=T$+X$+" "
 682            NEXT K
3501      IF T$<>STRING$(LEN(T$),32) THEN LPRINT T$:ELSE XY=XY+1
 617          NEXT J
2057          FOR J=1 TO XY:LPRINT:NEXT J
2493          FOR J=1 TO N.TP-N.PL:LPRINT:NEXT J
 595    NEXTREC:
1961        P1=P1+2:REC=CVI(MID$(Z1$,P1,2))
 430        WEND
 488      NEXT I
 970      GOTO P.LABELS
 415    P.FMT:
3359      CLS:PRINT TAB(30);"MAILING LABEL FORMAT":LOCATE 3,1
5247      PRINT"Number of printable lines per label (1-15, default=5): ";
1779      LINE INPUT X$:N.PL=VAL(X$)
3271      IF N.PL<1 OR N.PL>15 THEN N.PL=5:PRINT"Set to 5."
 682      LOCATE 5,1
5169      PRINT"Number of lines from top to top of next label (";N.PL;
1810      PRINT"-99, default=6): ";
1787      LINE INPUT X$:N.TP=VAL(X$)
4018      IF N.TP<N.PL OR N.TP>99 OR X$="" THEN N.TP=6:PRINT"Set to 6."
 684      LOCATE 7,1
2205      FOR I=1 TO 15 STEP 2:LOCATE 7+I\2,1
3701        PRINT I;":";T$(I);TAB(40);:IF I<15 THEN PRINT I+1;":";T$(I+1)
 488      NEXT I
1017      FOR I=1 TO N.PL
 796        LOCATE 16,1
5707        PRINT"Which field numbers do you want on line";I;" of the label?"
5973        PRINT"Enter field numbers all on one line in the order they will"
4470        PRINT"appear.  Separate field numbers by commas."
2002        PRINT B$;B$:LOCATE 19,1:L$(I)=""
1012        LINE INPUT X$
 709        X=VAL(X$)
2501        WHILE X>0 OR (INSTR(X$,",")>0 AND X$<>"")
2574          IF X>0 AND X<256 THEN L$(I)=L$(I)+CHR$(X)
3828          IF INSTR(X$,",") THEN X$=MID$(X$,INSTR(X$,",")+1):X=VAL(X$):_
109             ELSE X=0:X$=""
 430        WEND
 488      NEXT I
 970      GOTO P.LABELS
 564    P.TRIAL:
2500      CLS:PRINT"Test label format."
```

Listing continued

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The Clone comes complete, ready to run, with most every option you would want as standard equipment (except the Basic and Starter Clone). We build the Clone ourselves, right here in Dallas, and we're proud of it. Your computer is subjected to an extensive burn-in and complete functional test before shipping. We include MoneyMaster, a personal financial manager, which lets you keep track of where your money comes from and where it goes: Includes detailed tax-time reports, check writing, property management, portfolio management and much more. Also, a powerful multi-function memory resident utility is included so you can start using your Clone when you receive it. You get an alarm, clock, calculator, notepad, phone dialer, typewriter and access to DOS level commands. The Clone also comes equipped with QModem, the famous modem program which enables you access the world of telecommunications. PC-Write, probably the most famous shareware word processor available, is also furnished. With this array of software, we provide FINDEX, a different and better database. Simple yet powerful, you won't believe it is shareware. We even include utilities for hard drive low-level format, head parking software and timer software for the clock/calendar. Your Clone comes ready to work for you.

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10 mHz, 0 Wait State, 1024

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286

K RAM, 42.8MB Hard Drive

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All sizes are after formatting

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720K 3.5″ 80tk TEAC bare drive ..... 109†
720K 3.5″ TEAC but in 5.25″ bracket .... 129†
1.44M 3.5″ 80tk 2-speed TEAC bare... 139†‡*
Dual 5.25″ drive case/power supply 59
Dual 3.5″ drive case/power supply 89
External drive cable for use with 37-pin external floppy controller port 39
External drive cable for use with 2- drive controller. Plugs into drive "B" connector inside computer case 39
* Requires an AT type controller
† Requires DOS 3.2 or later
‡ Requires a compatible BIOS
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Uses existing floppy controller. Multiple tape capability allows use of any size hard drive. Automatic backup with included software.
Irwin 20MB internal specify XT/AT ..... $299†
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Data cartridge, specify 20 or 40MB 22
Adapter cable to use external tape in place of internal floppy drive "B" 39
† *Takes the place of floppy drive "B".*
‡ *For XT/AT with external 37 pin floppy controller port.*

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Herc type graphics card with printer ..... $ 49
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EGA,CGA,HERC, autoswitch with software.. 139
2-drive floppy disk controller with int cable ... 19
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XT I/O as above except no FDC 59
AT I/O Par/2-Ser/Game ports 49
2MB EMS XT Memory Board L-I-M 0K RAM .99
2MB EMS AT Memory Board L-I-M 0K RAM . 119

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300/1200 Baud internal with software .... $ 89
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IBM AT type layout. 84 keys ..... $ 30*
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NX-15 Wide carriage version NX-10 .....319*
ND-10 180/45cps NLQ, 12.6K Buffer 299*
ND-15 Wide carriage version ND-10 .....399*
NR-15 240/60cps NLQ, 12.6K buffer 499*
NB-15 300/100cps NLQ, 16K Buffer 799*
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4-pos Centronics input/output connectors 49
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10′ Standard IBM printer cable 12
10″ DB-25 specify M/M or M/F.....20
10′ Tandy 1000 printer cable(26-1401) 9
6′ coiled keyboard extender cable 9
6′ DB9 M/F video extender cable 9
6′ Special IBM hooded power/IEC cable 9
Centronics M/M gender changer 9
DB25 gender changer specify M/M or F/F.....9
Cables are fully shielded with molded connectors and thumb screws (exc. Tandy)

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Disk Storage Box w/Key Lock & Dividers holds 100 disks ... $ 9
With 100 DSDD disks $49

Tilt/Swivel Stand for 12″ monitors $ 9
for 14″ monitors 12

CPU Floor Stand Heavy Duty Metal Adjustable $24

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Listing continued

```
4066    PRINT"Set printer.  Press any key when ready."
2473    X$=INKEY$:WHILE X$<>"":X$=INKEY$:WEND
2412    X$=INKEY$:WHILE X$="":X$=INKEY$:WEND
1328    FOR I=1 TO N.PL:X$=""
1372      FOR J=1 TO LEN(L$(I))
2734        X$=X$+STRING$(F(ASC(MID$(L$(I),J,1))),"X")+" "
 553      NEXT J
 757      LPRINT X$
 488    NEXT I
 970    GOTO P.LABELS
 633  OUT.DIFF:
 290    CLS
6189    PRINT"Enter the name of the file to which the data should be output."
 948    LINE INPUT X$
1806    IF X$="" THEN GOTO MAINMENU
 783    OPEN"O",6,X$
1158    FOR I=1 TO R.MAIN
 550      GET 1,I
2215      IF L$>CHR$(249) THEN GOTO SKIPREC
 904      FOR J=1 TO 15
3608        IF INSTR(F$(J),",") THEN PRINT #6,CHR$(34);F$(J);CHR$(34);_
1408          ELSE PRINT #6,F$(J)
 553      NEXT J
 587  SKIPREC:
 488    NEXT I
 524    CLOSE 6
1011    GOTO MAINMENU
       'Utility routines:
 592  DISPLAY:
 226  CLS
4379  GOSUB FLD1:GOSUB FLD2:GOSUB FLD3:GOSUB FLD4:GOSUB FLD5:GOSUB FLD6
4532  GOSUB FLD7:GOSUB FLD8:GOSUB FLD9:GOSUB FLD10:GOSUB FLD11:GOSUB FLD12
2309  GOSUB FLD13:GOSUB FLD14:GOSUB FLD15
 664  LOCATE 21,1
3498  IF CH$="A" THEN PRINT"Adding records to file."
2920  IF CH$="E" THEN PRINT"Editing records."
3023  IF CH$="D" THEN PRINT"Deleting records."
2916  IF CH$="F" THEN PRINT"Finding records."
4796  LOCATE 21,65:IF INSRT THEN PRINT"INSERT MODE":ELSE PRINT"OVERTYPE MODE"
4069  LOCATE 22,1:PRINT"Number of records in file:";R.MAIN
4054  LOCATE 23,1:PRINT"Number of deleted records:";R.DEL
4521  LOCATE 24,1:PRINT"Number of active records: ";R.MAIN-R.DEL;
 480  RETURN
 321  FLD1:
5197  LOCATE 1,1:F=1:PRINT"Customer's title (Mr., Mrs., Dr.): ";:GOSUB FLDSHOW
3380    X$=TITLE$:GOSUB TRIM:LOCATE 1,X:PRINT X$;:RETURN
 322  FLD2:
3568    LOCATE 2,1:F=2:PRINT"First name: ";:GOSUB FLDSHOW
3065    X$=F$:GOSUB TRIM:LOCATE 2,X:PRINT X$;:RETURN
 323  FLD3:
3364    LOCATE 2,30:F=3:PRINT"Initial: ";:GOSUB FLDSHOW
3145    X$=MI$:GOSUB TRIM:LOCATE 2,X:PRINT X$;:RETURN
 324  FLD4:
3057    LOCATE 2,50:F=4:PRINT"Last: ";:GOSUB FLDSHOW
3071    X$=L$:GOSUB TRIM:LOCATE 2,X:PRINT X$;:RETURN
 325  FLD5:
4900  LOCATE 3,1:F=5:PRINT"Suffix to name (MD, PhD, etc.): ";:GOSUB FLDSHOW
3465    X$=SUFFIX$:GOSUB TRIM:LOCATE 3,X:PRINT X$;:RETURN
 326  FLD6:
3781    LOCATE 4,1:F=6:PRINT"Company name: ";:GOSUB FLDSHOW
3221    X$=CMP$:GOSUB TRIM:LOCATE 4,X:PRINT X$;:RETURN
 327  FLD7:
3854    LOCATE 5,1:F=7:PRINT"Address line 1: ";:GOSUB FLDSHOW
3180    X$=AD1$:GOSUB TRIM:LOCATE 5,X:PRINT X$;:RETURN
 328  FLD8:
3857    LOCATE 6,1:F=8:PRINT"Address line 2: ";:GOSUB FLDSHOW
3182    X$=AD2$:GOSUB TRIM:LOCATE 6,X:PRINT X$;:RETURN
 329  FLD9:
3020    LOCATE 7,1:F=9:PRINT"City: ";:GOSUB FLDSHOW
3313    X$=CITY$:GOSUB TRIM:LOCATE 7,X:PRINT X$;:RETURN
 369  FLD10:
3215    LOCATE 7,40:F=10:PRINT"State: ";:GOSUB FLDSHOW
3385    X$=STATE$:GOSUB TRIM:LOCATE 7,X:PRINT X$;:RETURN
 370  FLD11:
3012    LOCATE 7,60:F=11:PRINT"Zip: ";:GOSUB FLDSHOW
3090    X$=Z$:GOSUB TRIM:LOCATE 7,X:PRINT X$;:RETURN
 371  FLD12:
3410    LOCATE 8,1:F=12:PRINT"Country: ";:GOSUB FLDSHOW
3565    X$=COUNTRY$:GOSUB TRIM:LOCATE 8,X:PRINT X$;:RETURN
 372  FLD13:
3361    LOCATE 9,1:F=13:PRINT"Special: ";:GOSUB FLDSHOW
3515    X$=SPECIAL$:GOSUB TRIM:LOCATE 9,X:PRINT X$;:RETURN
 373  FLD14:
3628    LOCATE 10,1:F=14:PRINT"Home Phone: ";:GOSUB FLDSHOW
3194    X$=HP$:GOSUB TRIM:LOCATE 10,X:PRINT X$;:RETURN
 374  FLD15:
3656    LOCATE 11,1:F=15:PRINT"Work Phone: ";:GOSUB FLDSHOW
3210    X$=WP$:GOSUB TRIM:LOCATE 11,X:PRINT X$;:RETURN
       'Put dashes in the field for entry and mark the starting position.
 593  FLDSHOW:
2412    PRINT STRING$(F(F)," ");:X=POS(0)-F(F)
2412    IF P(0,F)=0 THEN P(0,F)=CSRLIN:P(1,F)=X
 544    RETURN
       'Trim trailing blanks
 374  TRIM:
2064    IX=LEN(X$):IF IX<1 THEN RETURN
2893    WHILE MID$(X$,IX,1)<=" " AND IX>1:IX=IX-1:WEND
2185    IF IX<LEN(X$) THEN X$=LEFT$(X$,IX)
1204    IF X$<=" " THEN X$=""
 544    RETURN
       'Convert to upper case
 617  TOUPPER:
1339    IF X$="" THEN RETURN
1253    FOR IX=1 TO LEN(X$)
1135      AX$=MID$(X$,IX,1)
3709      IF AX$>="a" AND AX$<="z" THEN MID$(X$,IX,1)=CHR$(ASC(AX$)-32)
 576    NEXT IX
 544    RETURN
       'Assign old field values
 734  OLDASSIGN:
2251    X$=TITLE$:GOSUB TRIM:O.TITLE$=X$
1619    X$=F$:GOSUB TRIM:O.F$=X$
1779    X$=MI$:GOSUB TRIM:O.MI$=X$
1631    X$=L$:GOSUB TRIM:O.L$=X$
2417    X$=SUFFIX$:GOSUB TRIM:O.SUFFIX$=X$
1927    X$=CMP$:GOSUB TRIM:O.CMP$=X$
1843    X$=AD1$:GOSUB TRIM:O.AD1$=X$
1845    X$=AD2$:GOSUB TRIM:O.AD2$=X$
2105    X$=CITY$:GOSUB TRIM:O.CITY$=X$
2249    X$=STATE$:GOSUB TRIM:O.STATE$=X$
1659    X$=Z$:GOSUB TRIM:O.Z$=X$
2607    X$=COUNTRY$:GOSUB TRIM:O.COUNTRY$=X$
2505    X$=SPECIAL$:GOSUB TRIM:O.SPECIAL$=X$
1783    X$=HP$:GOSUB TRIM:O.HP$=X$
1813    X$=WP$:GOSUB TRIM:O.WP$=X$
 480  RETURN
       'Assign new field values
 745  NEWASSIGN:
3198    LSET TITLE$=O.TITLE$:LSET F$=O.F$:LSET MI$=O.MI$
3524    LSET L$=O.L$:LSET SUFFIX$=O.SUFFIX$:LSET CMP$=O.CMP$
2056    LSET AD1$=O.AD1$:LSET AD2$=O.AD2$
3562    LSET CITY$=O.CITY$:LSET STATE$=O.STATE$:LSET Z$=O.Z$
3480    LSET COUNTRY$=O.COUNTRY$:LSET SPECIAL$=O.SPECIAL$
1964    LSET HP$=O.HP$:LSET WP$=O.WP$
 480  RETURN
       'FIND: Looks in key files for a match to the record on as many fields as
       '   have been filled in.  Partial matches are accepted.
 638  GETFIELD:
       ' Gets entry to a field and allows arrow key movement, field skipping,
       ' insert/delete, and other easy ways of input validation and edit.
1807  IF F>15 THEN GOTO SMALLMENU
1232  X$=F$(F):GOSUB TRIM
 831  MAX=F(F):CT=1
 596  GETLOOP:
3169    IF CT>MAX THEN LSET F$(F)=X$:F=F+1:GOTO GETFIELD
1127    IF CT<1 THEN CT=1
2676    T=-1:A$="":T$=CHR$(SCREEN(P(0,F),P(1,F)+CT-1))
 703    WHILE A$=""
1579      LOCATE P(0,F),P(1,F)+CT-1
1270      A$=INKEY$:T=NOT T
2305      IF T THEN PRINT T$;:ELSE PRINT" ";
1579      LOCATE P(0,F),P(1,F)+CT-1
 366    WEND
 672    PRINT T$;
1515    LOCATE P(0,F),P(1,F)+CT-1
1732    IF A$>=" " THEN GOTO NORMAL
2385    IF LEN(A$)=2 THEN GOSUB FUNCTIONKEY
4108    IF A$=CHR$(9) OR A$=CHR$(13) THEN LSET F$(F)=X$:F=F+1:GOTO GETFIELD
4298    IF A$=CHR$(27) THEN FOR I=1 TO 15:LSET F$(I)=B$:NEXT I:GOTO MAINMENU
2371    IF A$=CHR$(20) THEN X$=LEFT$(X$,CT-1):
2870      PRINT STRING$(MAX-CT+1," ");:GOTO GETLOOP
3738    IF A$=CHR$(25) THEN FOR I=F TO 15:LSET F$(I)=B$:NEXT I:T=F:_
2334      GOSUB DISPLAY:F=T:GOTO GETFIELD
4097    IF A$=CHR$(1) THEN WHILE MID$(X$,CT,1)<=" " AND CT>1:CT=CT-1:WEND:
3799      WHILE MID$(X$,CT,1)>" " AND CT>1:CT=CT-1:WEND:GOTO GETLOOP
2610    IF A$=CHR$(19) THEN CT=CT-1:GOTO GETLOOP
1766    IF A$=CHR$(4) THEN CT=CT+1:
2498      IF CT<=LEN(X$)+1 THEN GOTO GETLOOP:
2464      ELSE X$=X$+" ":PRINT" ";:GOTO GETLOOP
3281    IF A$=CHR$(5) THEN LSET F$(F)=X$:F=F-1:GOTO GETFIELD
3328    IF A$=CHR$(24) THEN LSET F$(F)=X$:F=F+1:GOTO GETFIELD
3218    IF A$=CHR$(18) THEN LSET F$(F)=X$:F=1:GOTO GETFIELD
3217    IF A$=CHR$(3) THEN LSET F$(F)=X$:F=15:GOTO GETFIELD
3144    IF A$=CHR$(6) THEN WHILE MID$(X$,CT,1)>" ":CT=CT+1:_
2993      WEND:WHILE CT<=LEN(X$) AND MID$(X$,CT,1)<=" ":_
1884      CT=CT+1:WEND:GOTO GETLOOP
3273    IF A$=CHR$(22) THEN INSRT=NOT INSRT:LOCATE 21,65:
3546      IF INSRT THEN PRINT"INSERT MODE  ";:GOTO GETLOOP:_
2885      ELSE PRINT"OVERTYPE MODE";:GOTO GETLOOP
2498    IF A$=CHR$(7) THEN IF CT<=LEN(X$) THEN _
2084      X$=LEFT$(X$,CT-1)+MID$(X$,CT+1):
2433      PRINT MID$(X$,CT);" ";:GOTO GETLOOP
2106    IF A$<>CHR$(8) THEN GOTO GETLOOP
1750    IF CT=1 THEN GOTO GETLOOP
1776    X$=LEFT$(X$,CT-2)+MID$(X$,CT)
2030    CT=CT-1:LOCATE P(0,F),P(1,F)+CT-1
2369    PRINT MID$(X$,CT);"_";:GOTO GETLOOP
 905  FUNCTIONKEY:
1109    A=ASC(MID$(A$,2,1))
1898    IF A=71 OR A=73 THEN A$=CHR$(18)    'Home or pg up
1390    IF A=72 THEN A$=CHR$(5)             'Up
1446    IF A=75 THEN A$=CHR$(19)            'Left arrow
1394    IF A=77 THEN A$=CHR$(4)             'Right arrow
1851    IF A=79 OR A=81 THEN A$=CHR$(3)     'End, or pg dn
1438    IF A=80 THEN A$=CHR$(24)            'Down arrow, to next field
1438    IF A=82 THEN A$=CHR$(22)            'Insert mode toggle
1395    IF A=83 THEN A$=CHR$(8)             'Delete, destructive backspace
1432    IF A=115 THEN A$=CHR$(1)            'Ctrl-left arrow, left a word
1438    IF A=116 THEN A$=CHR$(6)            'Ctrl-right arrow, right a word
 544    RETURN
 515  NORMAL:
2262    IF NOT INSRT THEN GOTO OVERTYPE
3161    IF CT<=LEN(X$) THEN X$=LEFT$(X$,CT-1)+A$+MID$(X$,CT)
1700    IF CT>LEN(X$) THEN X$=X$+A$
2325    IF LEN(X$)>MAX THEN X$=LEFT$(X$,MAX)
4169    PRINT MID$(X$,CT);:LOCATE P(0,F),P(1,F)+CT-1:CT=CT+1:GOTO GETLOOP
 696  OVERTYPE:
2215    IF CT<=LEN(X$) THEN MID$(X$,CT,1)=A$
1791    IF CT=LEN(X$)+1 THEN X$=X$+A$
2107    PRINT A$;:CT=CT+1:GOTO GETLOOP
 744  SMALLMENU:
1823    IF CH$<>"A" THEN GOTO NOTADD
3984    GOSUB ADDKEY:GOSUB NEWASSIGN:GOSUB WRITEREC:GOTO ADDREC
 500  NOTADD:
2138    IF CH$<>"E" THEN GOTO NOTEDITREC
1676    IF PASS=1 THEN GOTO DOIT
2656    GOSUB OLDASSIGN:NG=TRUE:GOSUB SEARCH
3790    IF NG THEN GOSUB UNFOUND:GOSUB NEWASSIGN:GOTO EDITREC
2856    PASS=1:GOSUB OLDASSIGN:F=1:GOTO GETFIELD
 362  DOIT:
4228    GOSUB DELKEY:GOSUB ADDKEY:CD=0:GOSUB WRITEREC:GOTO MAINMENU
 811  NOTEDITREC:
1916    IF CH$<>"F" THEN GOTO NOTFIND
1744    GOSUB OLDASSIGN:NG=TRUE
3787    GOSUB SEARCH:IF NG THEN GOSUB NEWASSIGN:GOSUB UNFOUND
 916    GOTO FINDREC
 588  NOTFIND:
1986    IF CH$<>"D" THEN GOTO MAINMENU
1744    GOSUB OLDASSIGN:NG=TRUE
4621    GOSUB SEARCH:IF NG THEN GOSUB NEWASSIGN:GOSUB UNFOUND:GOTO DELREC
```

Listing continued

Listing continued

```
1477    LOCATE 20,1:PRINT B$;B$
3449    LOCATE 20,1:PRINT"Now deleting record #";REC
 926    GOSUB DELKEY
2931    FOR I=1 TO 15:LSET F$(I)=STRING$(30,255):NEXT I
 656    PUT 1,REC
1687    GET 5,1:T=CVI(DELS$):T=T+1
1712    LSET DELS$=MKI$(T):PUT 5,1
1973    LSET DELS$=MKI$(REC):PUT 5,T+1
1477    LOCATE 20,1:PRINT B$;B$
5462    LOCATE 20,1:PRINT"Edit existing data for next record to delete."
1733    R.DEL=R.DEL+1:GOTO DELREC
 496  SEARCH:
1616    IF R.MAIN=0 THEN RETURN
1468    TP=R.LN:BM=1:REC.LN=1
1664    FIL=2:X$=O.L$:GOSUB TRIM
2608    IF X$="" THEN X$=O.CMP$:FIL=3:GOSUB TRIM
2475    IF X$="" THEN X$=O.Z$:FIL=4:GOSUB TRIM
2731    IF X$="" THEN FIL=0:REC=0:GOTO SEARCHREST
 898    T=F(1)+F(2)+F(3)
1659    IF FIL=3 THEN T=T+F(4)+F(5)
2456    IF FIL=4 THEN T=T+F(6)+F(7)+F(8)+F(9)+F(10)
1353    FIELD #FIL,BLK AS X2$
1868    FIELD #1,T AS D$,LEN(X$) AS TT$
 525    P=TRUE
1739    WHILE P=TRUE AND NG=TRUE
1272      REC.LN=(TP+BM+1)\2
1065      GET FIL,REC.LN
1500      TEST=CVI(LEFT$(X2$,2))
 797      GET 1,TEST
1832      IF TP<=BM THEN P=NOT TRUE
4218      IF TT$>X$ THEN TP=REC.LN-1:ELSE IF TT$<X$ THEN BM=REC.LN:ELSE _
2376        TP=REC.LN:BM=REC.LN:NG=NOT TRUE
 366    WEND
3231      IF NOT NG THEN P1=REC.LN:P2=1:GOTO SEARCHFIRST
2685      REC.LN=BM:BM=1:TP=1:T=INSTR(X2$,MKI$(0))
1659      WHILE T MOD 2<>1 AND T<>0
1646        T=INSTR(T+1,X2$,MKI$(0))
 430      WEND
2433      TP=T\2:P=TRUE:IF TP<BM THEN TP=BM
1803      WHILE P=TRUE AND NG=TRUE
1048        P2=(TP+BM+1)\2
1811        GET 1,CVI(MID$(X2$,2*P2-1,2))
1836        IF TP=BM THEN P=NOT TRUE
3706        IF TT$>X$ THEN TP=P2-1:ELSE IF TT$<X$ THEN BM=P2:ELSE _
1864          BM=P2:TP=P2:NG=NOT TRUE
 430      WEND
1707      IF NG THEN GOTO UNFOUND
      'Find the first match on the key or partial key entered.
 888    SEARCHFIRST:
3559      P3=2*P2-1:P=TRUE:P1=REC.LN:P2=P3:REC=CVI(MID$(X2$,P3,2))
1598      WHILE TT$=X$ AND P=TRUE
 546        P3=P3-2
4119        IF P3<1 THEN REC.LN=REC.LN-1:IF REC.LN>0 THEN GET FIL,REC.LN:_
3168          T=INSTR(X2$,MKI$(0)):WHILE T MOD 2<>1 AND T<>0:
3617          T=INSTR(T+1,X2$,MKI$(0)):WEND:P3=T-2:ELSE P=0:GOTO SF2
1562        GET 1,CVI(MID$(X2$,P3,2))
3469        IF TT$=X$ THEN P1=REC.LN:P2=P3:REC=CVI(MID$(X2$,P3,2))
 261    SF2:
 366      WEND
      'At end, P1 is the key record number and P2 is the key position which
      'first matches the key value entered. REC is data file record number.
 814    SEARCHREST:
1951      MATCH=NOT TRUE:GU=NOT TRUE
2577      WHILE MATCH=NOT TRUE AND GU=NOT TRUE
1587        IF FIL=0 THEN REC=REC+1
 695        GET 1,REC
4123        IF O.TITLE$<>"" THEN IF INSTR(TITLE$,O.TITLE$)<>1 THEN GOTO QS
3175        IF O.F$<>"" THEN IF INSTR(F$,O.F$)<>1 THEN GOTO QS
3415        IF O.MI$<>"" THEN IF INSTR(MI$,O.MI$)<>1 THEN GOTO QS
3193        IF O.LS<>"" THEN IF INSTR(LS,O.LS)<>1 THEN GOTO QS
4372        IF O.SUFFIX$<>"" THEN IF INSTR(SUFFIX$,O.SUFFIX$)<>1 THEN GOTO QS
3637        IF O.CMP$<>"" THEN IF INSTR(CMP$,O.CMP$)<>1 THEN GOTO QS
3511        IF O.AD1$<>"" THEN IF INSTR(AD1$,O.AD1$)<>1 THEN GOTO QS
3514        IF O.AD2$<>"" THEN IF INSTR(AD2$,O.AD2$)<>1 THEN GOTO QS
3904        IF O.CITY$<>"" THEN IF INSTR(CITY$,O.CITY$)<>1 THEN GOTO QS
4120        IF O.STATE$<>"" THEN IF INSTR(STATE$,O.STATE$)<>1 THEN GOTO QS
3235        IF O.Z$<>"" THEN IF INSTR(Z$,O.Z$)<>1 THEN GOTO QS
4657        IF O.COUNTRY$<>"" THEN IF INSTR(COUNTRY$,O.COUNTRY$)<>1 THEN GOTO QS
4504        IF O.SPECIAL$<>"" THEN IF INSTR(SPECIAL$,O.SPECIAL$)<>1 THEN GOTO QS
3421        IF O.HP$<>"" THEN IF INSTR(HP$,O.HP$)<>1 THEN GOTO QS
3466        IF O.WP$<>"" THEN IF INSTR(WP$,O.WP$)<>1 THEN GOTO QS
1814        MATCH=TRUE:GOTO SUCCESS
 222    QS:
3124        IF FIL=2 THEN IF INSTR(LS,O.LS)<>1 THEN GU=TRUE
3421        IF FIL=3 THEN IF INSTR(CMP$,O.CMP$)<>1 THEN GU=TRUE
3154        IF FIL=4 THEN IF INSTR(Z$,O.Z$)<>1 THEN GU=TRUE
3932        IF FIL=0 THEN IF REC>=R.MAIN THEN GU=TRUE:GOTO SUCCESS:_
1435          ELSE GOTO SUCCESS
1708        IF GU THEN GOTO SUCCESS
2966        P2=P2+2:IF P2>BLK THEN P2=1:P1=P1+1:GET FIL,P1
1491        REC=CVI(MID$(X2$,P2,2))
2412        IF REC=0 THEN P2=1:P1=P1+1:GET FIL,P1
2863        IF P1>LOF(FIL) THEN GU=TRUE:GOTO SUCCESS
3399        IF REC<0 OR REC>R.MAIN THEN GU=TRUE:GOTO SUCCESS
 695        GET 1,REC
 595    SUCCESS:
 366      WEND
 645    SUCCESS2:
3155      IF GU OR (MATCH=NOT TRUE) THEN NG=TRUE:RETURN
3315      GOSUB DISPLAY:LOCATE 20,1:PRINT B$;B$;:LOCATE 20,30
2662      PRINT"Is this the record (Y/N)?";
3866      X$="":WHILE INSTR(" YN",X$)<2:X$=INKEY$:GOSUB TOUPPER:WEND
2289      IF X$="Y" THEN NG=NOT TRUE:RETURN
2035      IF FIL=0 THEN GOTO SEARCHREST
2902      P2=P2+2:IF P2>BLK THEN P2=1:P1=P1+1:GET FIL,P1
1427      REC=CVI(MID$(X2$,P2,2))
2348      IF REC=0 THEN P2=1:P1=P1+1:GET FIL,P1
3574      IF P1>(LOF(FIL)/CSNG(BLK)) THEN GU=TRUE:GOTO SUCCESS2
3446      IF REC<=0 OR REC>R.MAIN THEN GU=TRUE:GOTO SUCCESS2
1165      GOTO SEARCHREST
 492  ADDKEY:
1978      IF CH$<>"E" THEN GOTO NOTEDIT:
3322      X$=L$:GOSUB TRIM:IF CD AND 1=0 THEN GOTO ADDCMPKEY
      'We changed the last name key field
3881      FIL=2:GOSUB OLDASSIGN:GOSUB INSERTKEY:GOSUB NEWASSIGN
 716  ADDCMPKEY:
3337      X$=CMP$:GOSUB TRIM:IF CD AND 2=0 THEN GOTO ADDZKEY
      'We changed the company key field.
3882      FIL=3:GOSUB OLDASSIGN:GOSUB INSERTKEY:GOSUB NEWASSIGN
 582  ADDZKEY:
2816      X$=Z$:GOSUB TRIM:IF CD AND 4=0 THEN RETURN
      'We changed the zip code key field.
4421      FIL=4:GOSUB OLDASSIGN:GOSUB INSERTKEY:GOSUB NEWASSIGN:RETURN
 760  INSERTKEY:
      'Insert a new key pointer for the key indicated by FIL.
      'X$ is the field value.
2449      TP=CSNG(LOF(FIL)+1)/BLK:BM=1:NG=TRUE
 898      T=F(1)+F(2)+F(3)
1659      IF FIL=3 THEN T=T+F(4)+F(5)
2456      IF FIL=4 THEN T=T+F(6)+F(7)+F(8)+F(9)+F(10)
1353      FIELD #FIL,BLK AS X2$
1868      FIELD #1,T AS D$,LEN(X$) AS TT$
 525      P=TRUE
1739      WHILE P=TRUE AND NG=TRUE
1272        REC.LN=(TP+BM+1)\2
1065        GET FIL,REC.LN
4046        TEST=CVI(LEFT$(X2$,2)):IF TEST=0 THEN P=NOT TRUE:GOTO BLOOP
 797        GET 1,TEST
1772        IF TP=BM THEN P=NOT TRUE
2279        IF TT$>X$ THEN TP=REC.LN-1:ELSE _
2226          IF TT$<X$ THEN BM=REC.LN:ELSE _
2440            TP=REC.LN:BM=REC.LN:NG=NOT TRUE
 438  BLOOP:
 430      WEND
2784      IF NOT NG THEN P1=REC.LN:P2=1:GOTO ADDPTR
1329      REC.LN=BM:BM=1:TP=1
2293      GET FIL,REC.LN:T=INSTR(X2$,MKI$(0))
1595      WHILE T MOD 2<>1 AND T<>0
1582        T=INSTR(T+1,X2$,MKI$(0))
 366      WEND
2369      TP=T\2:P=TRUE:IF TP<BM THEN TP=BM
1739      WHILE P=TRUE AND NG=TRUE
2504        P2=(TP+BM+1)\2:P3=CVI(MID$(X2$,2*P2-1,2))
3411        IF P3<=0 THEN BM=P2:TP=P2:NG=NOT TRUE:GOTO BLOOP2
2310        GET 1,P3:IF TP=BM THEN P=NOT TRUE
3313        IF TT$>X$ THEN TP=P2-1:ELSE IF TT$<X$ THEN BM=P2:_
2129          ELSE BM=P2:TP=P2:NG=NOT TRUE
 488  BLOOP2:
1449      WEND:IF NG THEN BM=P2
 505  ADDPTR:
      'Add a key pointer to the correct pointer file
 419      T$=X2$
3091      IF TP<BM OR (P3=0 AND P2=1) THEN T$=MKI$(REC)+T$:
3886    ELSE IF TT$<X$ THEN T$=LEFT$(T$,2*P2)+MKI$(REC)+MID$(T$,2*P2+1):_
2964      ELSE T$=LEFT$(T$,2*P2-2)+MKI$(REC)+MID$(T$,2*P2-1)
3544      IF RIGHT$(T$,2)<>MKI$(0) THEN GOSUB SPLITBLOCK:RETURN
2321      LSET X2$=T$:PUT FIL,REC.LN:RETURN
 817  SPLITBLOCK:
      'Split a key block which has overfilled.
1550      TP=CSNG(LOF(FIL)+1)/BLK
1836      FOR I=TP TO REC.LN+1 STEP -1
1487        GET FIL,I:PUT FIL,I+1
2489      NEXT I:P=BLK\2:IF P MOD 2=1 THEN P=P-1
3388      LSET X2$=LEFT$(T$,P)+STRING$(BLK-P,0):PUT FIL,REC.LN
3585      LSET X2$=MID$(T$,P+1)+STRING$(BLK-P-1,0):PUT FIL,REC.LN+1
 544      RETURN
 593  NOTEDIT:
      'Adding a record.
2937      GOSUB WHEREPUT:REC=N.REC:GOSUB OLDASSIGN
2840      X$=O.L$:GOSUB TRIM:FIL=2:GOSUB INSERTKEY
2989      X$=O.CMP$:GOSUB TRIM:FIL=3:GOSUB INSERTKEY
2856      X$=O.Z$:GOSUB TRIM:FIL=4:GOSUB INSERTKEY
 544      RETURN
 686  WHEREPUT:
3452      N.REC=0:IF R.DEL>0 THEN GET 5,R.DEL+1:N.REC=CVI(DELS$)
3532      IF N.REC<=0 THEN R.MAIN=R.MAIN+1:N.REC=R.MAIN:RETURN
 901      R.DEL=R.DEL-1
1969      LSET DELS$=MKI$(R.DEL):PUT 5,1
 544      RETURN
 504  DELKEY:
2257      CD=0:GOSUB OLDASSIGN:T$=MKI$(REC)
 936      FOR FIL=2 TO 4
3667        IF FIL=2 THEN X$=O.L$:IF X$=L$ THEN GOTO AVOID:ELSE CD=1
3485        IF FIL=3 THEN X$=O.CMP$:IF X$=CMP$ THEN GOTO AVOID:_
 945          ELSE CD=CD+2
3878        IF FIL=4 THEN X$=O.Z$:IF X$=Z$ THEN GOTO AVOID:ELSE CD=CD+4
2101        TP=CSNG(LOF(FIL)+1)/BLK:I=0:P=0
1417        FIELD #FIL,BLK AS X2$
1298        WHILE I<TP AND P=0
2159          I=I+1:GET FIL,I:P=INSTR(X2$,T$)
3309          WHILE P MOD 2<>1 AND P<>0:P=INSTR(P+1,X2$,T$):WEND
 430        WEND
3410        IF P=0 THEN PRINT"Index file corrupt.":END
2323        X$=LEFT$(X2$,P-1)+MID$(X2$,P+2)+MKI$(0)
1506        LSET X2$=X$:PUT FIL,I
 429  AVOID:
1172      NEXT FIL:RETURN
 671  WRITEREC:
 656      PUT 1,REC
 544      RETURN
 601  UNFOUND:
1477      LOCATE 20,1:PRINT B$;B$
5290      LOCATE 20,1:PRINT"No matching record was found. Press any key."
 348      BEEP
2461      T$=INKEY$:WHILE T$<>"":T$=INKEY$:WEND
2400      T$=INKEY$:WHILE T$="":T$=INKEY$:WEND
1477      LOCATE 20,1:PRINT B$;B$
 544      RETURN
```

End

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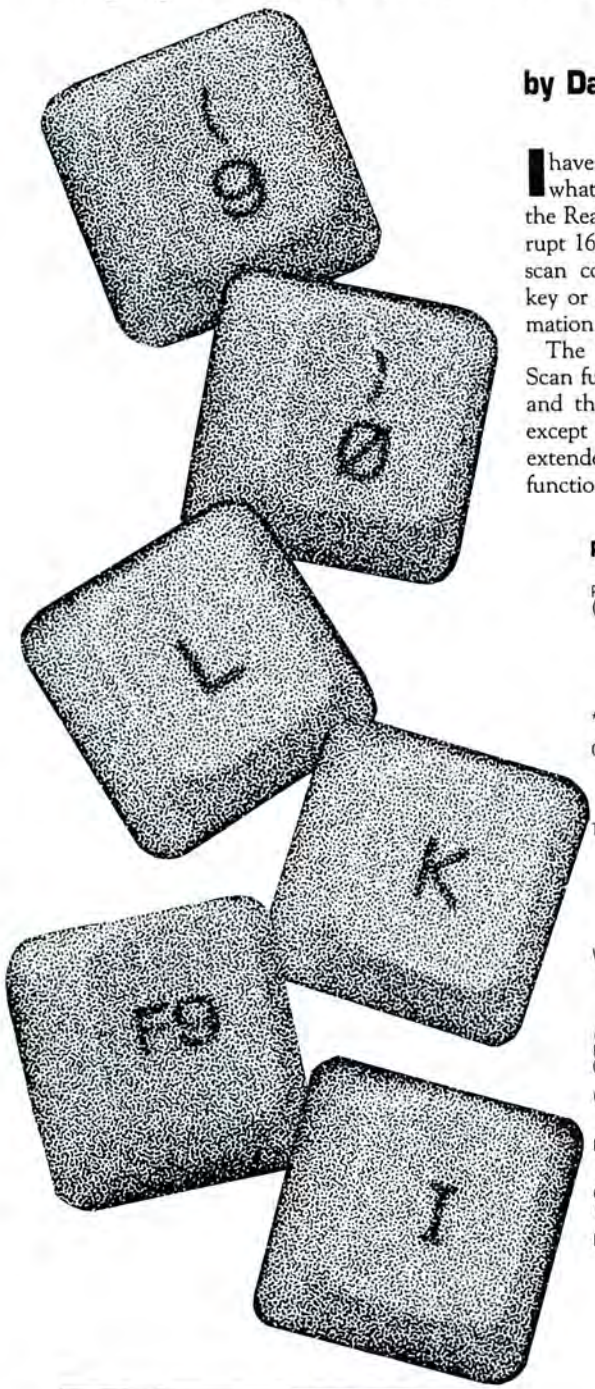

by Dale Rogerson

I have noticed a slight difference between what most reference manuals say about the Read and Scan functions of DOS interrupt 16H and what I have discovered about scan codes. A scan code indicates which key or key combination was pressed, information sometimes needed in programming.

The manuals state that the Read and Scan functions return the scan code in AH and the ASCII code in AL. This is true, except when the key pressed returns an extended ASCII code. This happens with function keys and keys on the numeric keypad. Extended ASCII codes are preceded by a zero. The Read and Scan functions return the ASCII code in AH and a zero in AL for extended ASCII codes. Keytest, a Turbo Pascal program (see the Program Listing), demonstrates the Read function call.

Keytest displays the ASCII code and scan code for any key you press. You stop the program by pressing the enter key. The codes are displayed in hexadecimal. ■

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

System Requirements: Turbo Pascal. Keytest is available on The Disk Series.

Program Listing. Keytest displays the scan code and ASCII values of any pressed key.

```
PROGRAM KeyTest(input,ouput);
(*                              Scan Code Reporter

                                  Dale Rogerson
                                    30 Jun 87

   This program displays the scan code and ASCII values of any key pressed.
   Press <Enter> to end the program.
*)

CONST
     Enter  = $0D;
     KeyIO = $16;  (* Keyboard Interrupt *)
     Read   = 0;    (* Function Number    *)

TYPE
    RegPack = record case Integer of
                    1: (AX, BX, CX, DX, BP, SI, DI, DS,ES, Flags : Integer);
                    2: (AL, AH, BL, BH, CL, CH, DL, DH           : Byte);
              end;

    Str    = String[10];

VAR
   Regs      : RegPack;
   Scan,
   AscCode   : Str;

(*---------------------------------------------------------------------------*)
FUNCTION Hex(Dec : Byte) : Str;  (* Convert integer to Hexadecimal string *)
CONST
     Digits : Array [0..15] OF Char = '0123456789ABCDEF';
VAR
   offset : integer;

Begin
     offset := Dec DIV 16;
     Hex    := Digits[offset]+Digits[Dec - offset*16];
end; (* Hex *)
(*---------------------------------------------------------------------------*)

BEGIN
     WriteLn('Press any key to get ASCII value and Scan code');
     WriteLn('Press ENTER to end program.');
     With Regs Do begin

          REPEAT

               AH := Read;            (* We want to read the keyboard buffer *)
               Intr(KeyIO,Regs);  (* Read the Buffer *)
               Writeln('Scan Code (AH) -->',Hex(AH),
                       'H    ASCII (AL) -->',Hex(AL),'H');

          UNTIL AL = Enter;         (* End when Enter is pressed *)
     end; (* With *)
END.
```

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the holiday spirit...

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(Continued from previous page)
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Same Old Routines

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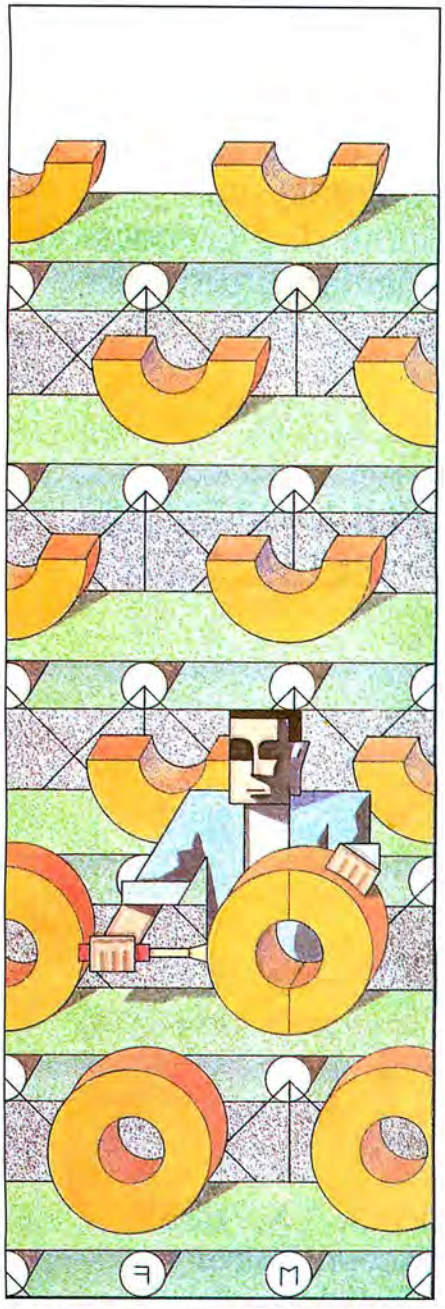

by George King

If you enjoy programming and write a considerable number of programs each year, you soon find that you are continually writing the same code. Years ago, I began to collect the routines I used most often into a set of "standard" subroutines. These routines are not examples of textbook programming technique but are a collection of common, serviceable routines that I find useful from one application to the next.

I wrote the routines presented here in GW-Basic for the Tandy 1000 and compiled them using Microsoft's Quick Basic compiler without a problem, except for the machine-language string space stripper. Many of you will make improvements to these routines or customize them to suit your own needs.

The 10 subroutines and their locations in the Program Listing are:

- 302: Press any key to continue
- 305: Yes/no decision
- 310: Menu selection input
- 316: Input routine
- 348: Format output to the printer
- 364: Format screen display
- 384: Clear to the bottom of the screen
- 424: Strip trailing spaces from strings
- 452: Generic error handling
- 902: Printer ready

When I develop a new program, I first load the standard subroutines into memory as a base for building my new application. I might not need every subroutine in every application, so I delete the unnecessary ones if memory space is tight. I place the subroutines at the beginning of my program, as line numbers 300–999, so they execute more quickly. I reserve lines 1–299 for opening program statements such as DIM, On Error Goto, DEF, and the opening menu. My function modules begin at line 1000.

Testing the Subroutines

Included with the subroutines is a program, beginning on line 1000, that demonstrates their use (see the Listing). It lets you select one of the 10 subroutines for testing. The coding also demonstrates the calling sequence for each subroutine and serves as an example of the procedure for using each one.

Press Any Key to Continue

The first subroutine, a simple, time-saving routine, begins at line 302. It displays a message on the bottom line of the screen—"Press any key to continue. . ."—and waits for a keystroke.

With the Inkey$ instruction, you don't need to press enter following the initial keystroke. You can use coding such as:

```
302 X$ = INKEY$:IF X$ = " " THEN 302
```

This coding must be on a line by itself to function properly. The loop in line 302 of the subroutine uses the Boolean characteristic of GW-Basic. In GW-Basic, a true result produces a signal of −1. The variable V is used as the loop counter and in the test V = (INKEY$ = " "). The expression (INKEY$ = " ") is true when no key has been pressed. Since a true condition produces a −1, V (which is also the loop counter) is set to −1 each time through the loop when no key has been pressed. The Next V command adds 1 to V before testing it; if no key has been pressed, V

System Requirements: Basic, printer (optional). Available on The Disk Series.

Illustration by Mark Fischer

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Program Listing. The 10 subroutines with a demonstration program. See page 80 for information on using checksums.

```
      10 ' ****************************************
      20 ' *****     STANDARD SUBROUTINES     *****
      30 ' *****     Copyright, July 1986     *****
      40 ' *****      George L H King Jr      *****
      50 ' *****        Big G Software        *****
      60 ' *****         Rt 2 Box 111         *****
      70 ' *****      Alleyton, Tx 78935      *****
      80 ' ****************************************
 621  90 KEY OFF
1290 100 ON ERROR GOTO 450
6184 130 K79$=STRING$(79,32):K80$=STRING$(80,32):K3$=STRING$(240,32):K255$=ST
         RING$(255,32):K160$=STRING$(160,32)
9235 140 FOR I! = 65401! TO 65435!:READ X:POKE I!,X:NEXT:DATA 138,22,255,255,
         182,0,139,54,253,255,1,214,78,138,4,60,32,117,8,78,74,136,208,60,1,1
         17,242,190,255,255,136,20,203,7,0,0,0
1069 150 DEF USR0=65401!
3761 190 CLS:LOCATE 2,1:PRINT"Do you want to ....................."
3737 191 LOCATE 7,10:PRINT"1 - Test Any Key to Continue"
3070 192 PRINT TAB(10)"2 - Test Yes-No Decision"
3058 193 PRINT TAB(10)"3 - Test Menu Selection"
2991 194 PRINT TAB(10)"4 - Test Input Routine"
3854 195 PRINT TAB(10)"5 - Test Printer Format Routine"
3842 196 PRINT TAB(10)"6 - Test Display Format Routine"
3955 197 PRINT TAB(10)"7 - Test Clear to Bottom Of Screen"
3640 198 PRINT TAB(10)"8 - Test Strip Spaces Routine"
3832 199 PRINT TAB(10)"9 - Test Error Handling Routine"
3720 200 PRINT TAB(10)"0 - Test Printer Ready Routine"
8511 206 LOCATE 24,1:PRINT"Enter Selection ..................... ";:XM$="12345
         67890":GOSUB 310:ON X GOTO 1000,1500,2000,2500,3000,3500,4000,4500,5
         000,5500
     300 ' ***** SYSTEM SUBROUTINES -- LINES 300 - 999 *****
     301 ' ***** ANY KEY TO CONTINUE *****
8454 302 LOCATE 25,1:PRINT"Press any key to continue .......................
         ..... ";:FOR V = 0 TO 0:V = (INKEY$ = ""):NEXT V:RETURN
     303 ' ***** YES - NO DECISION *****
     304 ' ***** X$ CONTAINS INPUT *****
6110 305 FOR V = 0 TO 0:X$ = INKEY$:V = (X$ = ""):NEXT V:X = INSTR("YyNn",X$)
         :IF X = 0 THEN 305 ELSE RETURN
     307 ' ***** MENU SELECTION INPUT *****
     308 ' ***** XM$ IS INPUT CHECK STRING *****
     309 ' ***** X CONTAINS MENU SELECTION *****
5837 310 FOR V = 0 TO 0:X$ = INKEY$:V = (X$ = ""):NEXT V:X = INSTR(XM$,X$):IF
          X = 0 THEN 310 ELSE RETURN
     311 ' ***** INKEY$ INPUT ROUTINE *****
     312 ' ***** ZF=LENGTH OF STRING TO BE INPUT ****
     313 ' ***** ZA=LINE NUMBER FOR DISPLAY *****
     314 ' ***** ZB=COLUMN NUMBER FOR DISPLAY *****
     315 ' ***** Z1$=INPUT STRING -- INITIALIZE TO NULL OR A VALUE *****
10741 316 LOCATE ZA,ZB,1:COLOR 0,7:Z9=LEN(Z1$):Z8=1:WHILE Z8<=Z9:PRINT MID$(Z1
         $,Z8,1);:Z8=Z8+1:WEND:Z8=Z9+1:WHILE Z8<=ZF:PRINT" ";:Z8=Z8+1:WEND:LO
         CATE ZA,ZB:Z1=Z9+1:Z2=1:Z3=0
6568 317 Z2$=INKEY$:IF Z2$="" THEN 317 ELSE Z5=ASC(Z2$):ZZ=1:IF LEN(Z2$)=2 TH
         EN Z2$=RIGHT$(Z2$,1):ZZ=2:Z5=ASC(Z2$)
1173 318 IF ZZ=2 THEN 323
2214 319 IF Z5=9 OR Z5=27 OR Z5=13 THEN 339
12823 320 IF Z5=8 AND Z2<Z1 AND Z2>1 THEN PRINT CHR$(29);:Z1=Z1-1:Z2=Z2-1:Z1$=
         LEFT$(Z1$,Z2-1)+RIGHT$(Z1$,Z1-Z2):Z7=Z2:WHILE Z7<Z1:PRINT MID$(Z1$,Z
         7,1);:Z7=Z7+1:WEND:Z6=Z2:PRINT " ";:GOSUB 335:LOCATE AZ,BZ:GOTO 317
7666 321 IF Z5=8 THEN IF Z1>1 AND Z1=Z2 THEN PRINT CHR$(29);:PRINT " ";:PRINT
          CHR$(29);:Z1$=LEFT$(Z1$,Z1-2):Z1=Z1-1:Z2=Z2-1:GOTO 317
1705 322 IF Z5<27 THEN 317 ELSE 327
10961 323 IF Z5=83 AND Z2<Z1 THEN Z1$=LEFT$(Z1$,Z2-1)+RIGHT$(Z1$,Z1-Z2-1):Z1=Z
         1-1:Z7=Z2:WHILE Z7<Z1:PRINT MID$(Z1$,Z7,1);:Z7=Z7+1:WEND:PRINT " ";:
         Z6=Z2:GOSUB 335:LOCATE AZ,BZ:GOTO 317
6663 324 IF Z5=72 THEN 336 ELSE IF Z5=75 THEN 331 ELSE IF Z5=77 THEN 332 ELSE
          IF Z5=80 THEN 337 ELSE IF Z5=15 THEN 339
10573 325 IF Z5=82 THEN Z10=CSRLIN:Z11=POS(0):LOCATE 25,77:IF Z3=0 THEN Z3=1:P
         RINT" I ";:LOCATE Z10,Z11:GOTO 317 ELSE Z3=0:COLOR 7,0:PRINT"   ";:C
         OLOR 0,7:LOCATE Z10,Z11:GOTO 317
 687 326 GOTO 317
1952 327 IF Z1=ZF+1 AND Z1=Z2 THEN 317
1135 328 IF Z3=1 THEN 333
3866 329 IF Z2<Z1 THEN MID$(Z1$,Z2,1)=Z2$:PRINT Z2$;:Z2=Z2+1:GOTO 317
3072 330 Z1$=Z1$+Z2$:PRINT Z2$;::Z1=Z1+1:Z2=Z2+1:GOTO 317
3476 331 IF Z2>1 THEN PRINT CHR$(29);::Z2=Z2-1:GOTO 317 ELSE 317
3562 332 IF Z2<Z1 THEN PRINT CHR$(28);::Z2=Z2+1:GOTO 317 ELSE 317
1334 333 IF Z1=ZF+1 THEN 317
9558 334 Z1$=LEFT$(Z1$,Z2-1)+Z2$+RIGHT$(Z1$,Z1-Z2):Z1=Z1+1:Z2=Z2+1:Z7=Z2-1:WH
         ILE Z7<Z1:PRINT MID$(Z1$,Z7,1);:Z7=Z7+1:WEND:Z6=Z2:GOSUB 335:LOCATE
         AZ,BZ:GOTO 317
5556 335 AZ=(ZB+Z6-1)\80+ZA:BZ=(ZB+Z6-1)MOD 80:IF BZ=0 THEN AZ=AZ-1:BZ=80:RET
         URN ELSE RETURN
6599 336 GOSUB 338:Z15=Z14-80:IF Z15<Z12 THEN LOCATE ZA,ZB:Z2=1:GOTO 317 ELSE
          LOCATE Z10-1,Z11:Z2=Z2-80:GOTO 317
6825 337 GOSUB 338:Z15=Z14+80:IF Z15>Z13 THEN LOCATE ZAE,ZBE:Z2=Z1:GOTO 317 E
         LSE LOCATE Z10+1,Z11:Z2=Z2+80:GOTO 317
8602 338 Z10=CSRLIN:Z11=POS(0):Z14=Z10*80+Z11:Z12=ZA*80+ZB:Z13=Z12+Z1-1:ZAE=Z
         13\80:ZBE=Z13 MOD 80:IF ZBE=0 THEN ZAE=ZAE-1:RETURN ELSE RETURN
11718 339 LOCATE ZA,ZB:COLOR 7,0:XV=1:WHILE XV<Z1:PRINT MID$(Z1$,XV,1);:XV=XV+
         1:WEND:XV=Z1:WHILE XV<ZF+1:PRINT" ";:XV=XV+1:WEND:IF Z1=1 THEN Z1$="
         ":RETURN ELSE Z1$=LEFT$(Z1$,Z1-1):RETURN
     344 ' ***** LPRINT FORMAT ROUTINE *****
     345 ' ***** Z9 = LENGTH OF LINE TO PRINT *****
     346 ' ***** Z8 = TAB FOR BEGINNING OF LINE *****
     347 ' ***** ZX$ = STRING TO BE PRINTED *****
6866 348 IF LEN(ZX$) <= Z9 THEN LPRINT TAB(Z8) ZX$;:NL=NL+1:IF LEN(ZX$) + Z8
         <= 80 THEN LPRINT:RETURN ELSE RETURN
 550 349 V = Z9
3251 350 IF MID$(ZX$,V,1) <> " " THEN V = V - 1:IF V > 0 THEN 350
3112 351 Z1$ = LEFT$(ZX$,V):ZX$ = RIGHT$(ZX$,LEN(ZX$) - V)
4012 352 LPRINT TAB(Z8) Z1$;:NL=NL+1:IF LEN(Z1$) + Z8 <= 80 THEN LPRINT
6862 353 IF LEN(ZX$) <= Z9 THEN LPRINT TAB(Z8) ZX$;:NL=NL+1:IF LEN(ZX$) + Z8
         <= 80 THEN LPRINT:RETURN ELSE RETURN
 692 354 GOTO 348
     360 ' ***** PRINT FORMAT ROUTINE *****
     361 ' ***** Z9 = LENGTH OF LINE TO DISPLAY *****
     362 ' ***** Z8 = TAB FOR BEGINNING OF LINE *****
     363 ' ***** ZX$ = STRING TO BE PRINTED *****
6132 364 IF LEN(ZX$) <= Z9 THEN PRINT TAB(Z8) ZX$;:IF LEN(ZX$) + Z8 < 80 THEN
          PRINT:RETURN ELSE RETURN
 548 365 V = Z9
3265 366 IF MID$(ZX$,V,1) <> " " THEN V = V - 1:IF V > 0 THEN 366
3119 367 Z1$ = LEFT$(ZX$,V):ZX$ = RIGHT$(ZX$,LEN(ZX$) - V)
3287 368 PRINT TAB(Z8) Z1$;:IF LEN(Z1$) + Z8 < 80 THEN PRINT
6137 369 IF LEN(ZX$) <= Z9 THEN PRINT TAB(Z8) ZX$;:IF LEN(ZX$) + Z8 < 80 THEN
          PRINT:RETURN ELSE RETURN
 688 370 GOTO 364
     380 ' ***** CLEAR TO BOTTOM OF SCREEN *****
     382 ' ***** ZK IS LINE TO START WITH *****
6690 384 FOR KZ = ZK TO 23:LOCATE KZ,1:PRINT K80$;:NEXT:LOCATE 24,1:PRINT K79
         $;:LOCATE 25,1:PRINT K79$;:RETURN
     420 ' ***** STRIP UNNECESSARY SPACES *****
     422 ' ***** XX$ IS STRING TO BE STRIPPED, V1 IS LENGTH OF NEW STRING ***
6604 424 GX!=VARPTR(XX$):XG=PEEK(GX!):POKE 65535!,XG:XG=PEEK(GX!+1):POKE 6553
         3!,XG:XG=PEEK(GX!+2):POKE 65534!,XG
 716 426 X=USR(0)
2733 428 V1=PEEK(65535!):XX$=LEFT$(XX$,V1):RETURN
     450 ' ***** ERROR HANDLING ROUTINE *****
12542 452 IF ERR<50 THEN CLS:LOCATE 12,1:PRINT"A BASIC ERROR has occurred.":PR
         INT:PRINT:PRINT"The error code is: "ERR "     The line number in err
         or is: "ERL:GOSUB 302:RESUME 5010
11553 454 CLS:LOCATE 12,1:PRINT"A DISK ERROR has occurred.":PRINT:PRINT:PRINT"
         The error code is: "ERR "     The line number in error is: "ERL:GOSU
         B 302:RESUME 5010
     900 ' ***** PRINTER READY? *****
1301 902 ON ERROR GOTO 910
 853 904 LPRINT " ";
1842 906 ON ERROR GOTO 450:RETURN
7779 910 LOCATE 23,1:PRINT"Your printer is not ready. Please correct the prob
         lem.":GOSUB 302:RESUME 902
    1000 ' ***** TEST ANY KEY TO CONTINUE ROUTINE *****
7190 1010 CLS:LOCATE 12,1:PRINT"This is a test of the 'Press Any Key to Conti
         nue Routine' ........ "
 792 1020 GOSUB 302
3005 1030 CLS:LOCATE 12,1:PRINT TAB(35)"It Worked!"
5416 1040 LOCATE 24,1:PRINT"Would you like to test it again (Y,N)? ";:GOSUB 3
         05
1680 1050 IF X<3 THEN 1010 ELSE 190
    1500 ' ***** TEST YES-NO DECISION SUBROUTINE *****
6513 1510 CLS:LOCATE 12,1:PRINT"This is a test of the 'Yes-No Decision Routin
         e' ............ ";
5690 1520 LOCATE 24,1:PRINT"Would you like to return to the Main Menu (Y,N)?
         ";
2315 1530 GOSUB 305:IF X>2 THEN 1510 ELSE 190
    2000 ' ***** TEST MENU SELECTION ROUTINE *****
5427 2010 CLS:LOCATE 2,1:PRINT"Which selection would you like ..............
         ..."
3524 2020 LOCATE 10,10:PRINT"1 - Selection Number One"
3207 2030 PRINT TAB(10)"2 - Selection Number Two"
3399 2040 PRINT TAB(10)"3 - Selection Number Three"
3309 2050 PRINT TAB(10)"4 - Selection Number Four"
3293 2060 PRINT TAB(10)"5 - Selection Number Five"
4425 2070 LOCATE 24,1:PRINT"Type your selection (1 - 5) ..............  ";
1441 2080 XM$="12345":GOSUB 310
3724 2090 CLS:LOCATE 12,1:PRINT"You selected number";X
5685 2100 LOCATE 24,1:PRINT"Would you like to return to the Main Menu (Y,N)?
         ";
2306 2110 GOSUB 305:IF X>2 THEN 2010 ELSE 190
    2500 ' ***** TEST INPUT ROUTINE *****
15855 2510 CLS:LOCATE 8,1:PRINT"This routine allows you to specify the number
         of characters to be entered, and  the location on the screen at whi
         ch they will be displayed during entry."
5290 2540 LOCATE 12,1:INPUT"How long will your input string be (1-255) ";ZF
3689 2550 IF ZF>255 OR ZF<1 THEN LOCATE 12,1:PRINT K79$;:GOTO 2540
6668 2560 LOCATE 14,1:INPUT"On which line will your input string be displayed
          (1-24) ";ZA
3663 2570 IF ZA <1 OR ZA>24 THEN LOCATE 14,1:PRINT K79$;:GOTO 2560
7299 2580 LOCATE 16,1:INPUT"Enter character position (column) for your input
         string (1-80) ";ZB
1801 2590 IF ZB<1 OR ZB>80 THEN 2580
5686 2600 CLS:Z1$="":GOSUB 316:CLS:LOCATE 10,1:PRINT"Your input string was ..
         ..........."
2453 2610 PRINT:ZX$=Z1$:Z9=80:Z8=1:GOSUB 364
5278 2620 LOCATE 24,1:PRINT"Would you like to try another input (Y,N)? ";
2317 2630 GOSUB 305:IF X<3 THEN 2510 ELSE 190
    3000 ' ***** TEST PRINTER FORMAT ROUTINE *****
22241 3010 CLS:ZX$="This routine allows you to specify the line length to be p
         rinted on the printer, and the starting tab position for the beginn
         ing of the line. The routine then formats the printout so that word
         s are not broken at the end of a line."
17626 3020 PRINT ZX$:LOCATE 8,1:PRINT"To see the string above printed with var
         ious line lengths and starting tab      positions, be sure your pri
         nter is ready and then enter the required informationbelow."
4846 3030 LOCATE 16,1:INPUT"Enter the desired line length (10 - 80) ";Z9
3653 3040 IF Z9<10 OR Z9>80 THEN LOCATE 16,1:PRINT K79$;:GOTO 3030
7673 3050 LOCATE 18,1:INPUT"Enter the desired tab position for the beginning
         of the line (1 - 70) ";Z8
3608 3060 IF Z8<1 OR Z8>70 THEN LOCATE 18,1:PRINT K79$;:GOTO 3050
9698 3070 IF Z8+Z9>80 THEN CLS:LOCATE 12,1:PRINT"Your line length (";Z9;"), p
         lus your tab ("Z8;"), exceed 80 characters.":GOSUB 302:GOTO 3010
1439 3080 GOSUB 902:GOSUB 348
8007 3090 CLS:LOCATE 12,1:PRINT"Would you like to print another string (Y,N)?
          ";:GOSUB 305:IF X>2 THEN 190 ELSE 3010
    3500 ' ***** TEST DISPLAY FORMAT ROUTINE *****
22172 3510 CLS:ZX$="This routine allows you to specify the line length to be d
         isplayed on the screen, and the starting tab position for the begin
         ning of the line. The routine then formats the display so that word
         s are not broken at the end of a line."
14172 3520 PRINT ZX$:LOCATE 8,1:PRINT"To see the string above displayed with v
         arious line lengths and starting tab    positions, enter the requir
         ed information below."
4851 3530 LOCATE 16,1:INPUT"Enter the desired line length (10 - 80) ";Z9
3663 3540 IF Z9<10 OR Z9>80 THEN LOCATE 16,1:PRINT K79$;:GOTO 3530
7678 3550 LOCATE 18,1:INPUT"Enter the desired tab position for the beginning
         of the line (1 - 70) ";Z8
```

Listing continued

Listing continued

```
3618 | 3560 IF Z8<1 OR Z8>70 THEN LOCATE 18,1:PRINT K79$;:GOTO 3550
9708 | 3570 IF Z8+Z9>80 THEN CLS:LOCATE 12,1:PRINT"Your line length (";Z9;"), p
       lus your tab ("Z8;"), exceed 80 characters.":GOSUB 302:GOTO 3510
1097 | 3580 CLS:GOSUB 364
7667 | 3590 PRINT:PRINT"Would you like to display another string (Y,N)? ";:GOSU
       B 305:IF X>2 THEN 190 ELSE 3510
     | 4000 ' ***** TEST CLEAR TO BOTTOM OF SCREEN ROUTINE *****
13930 | 4010 CLS:PRINT"This routine allows you to specify the line with which to
        begin clearing the    screen.  It clears from that line to the bot
       tom of the screen."
19659 | 4020 LOCATE 8,1:PRINT"You will be prompted to enter the line with which
        to begin clearing.  The screenwill be cleared and each line will be
        numbered.  The subroutine will then be    used to clear to the bot
       tom of the screen."
6086 | 4030 LOCATE 14,1:INPUT"Enter the line with which to begin clearing (1 -
       23) ";ZK
3579 | 4040 IF ZK<1 OR ZK>23 THEN LOCATE 14,1:PRINT K79$:GOTO 4030
4250 | 4050 CLS:FOR I = 1 TO 25:LOCATE I,20:PRINT"This is line"I;:NEXT
 809 | 4060 GOSUB 384
6215 | 4070 LOCATE 25,1:PRINT"Return to the main menu (Y,N)? ";:GOSUB 305:IF X<
       3 THEN 190 ELSE 4010
     | 4500 ' ***** TEST STRIP SPACES ROUTINE *****
22042 | 4510 CLS:PRINT"This routine strips spaces from the end of strings which
        have been recalled fromrandom disk files.  It uses a machine langua
       ge subroutine, so you must use the  /M:65400,4096 switch when loadi
       ng BASIC to reserve space for the routine."
17924 | 4520 PRINT:PRINT:PRINT"You will be prompted to enter a string of up to 8
       0 characters from the keyboard.The program will append spaces to yo
       ur string to bring the total string length  to 255 characters
12220 | 4530 PRINT:PRINT"The machine language routine will be used to strip the
        spaces from the string,  and the following will be printed:":PRINT
14445 | 4540 PRINT TAB(10)"1) The length of the original string":PRINT TAB(10)"2
       ) The original string":PRINT TAB(10)"3) The length of the modified
       string":PRINT TAB(10)"4) The modified string"
 803 | 4550 GOSUB 302
5086 | 4560 CLS:LOCATE 10,1:PRINT"Enter your string now .....
       ..... "
4561 | 4570 ZA=14:ZB=1:ZF=80:GOSUB 316:CX=LEN(Z1$):A$=LEFT$(K255$,255-CX):Z1$=Z
       1$+A$
```

```
1317 | 4580 XX$=Z1$:GOSUB 424
5838 | 4590 CLS:LOCATE 4,1:PRINT"Your original string was 255 characters long:"
1293 | 4600 PRINT:PRINT Z1$
5634 | 4610 PRINT:PRINT:PRINT"Your modified string is"V1"characters long:"
1332 | 4620 PRINT:PRINT XX$
6149 | 4630 LOCATE 25,1:PRINT"Modify another string (Y,N)? ";:GOSUB 305:IF X<3
       THEN 4560 ELSE 190
     | 5000 ' ***** TEST ERROR HANDLING ROUTINE *****
19934 | 5010 CLS:PRINT"This routine traps errors and displays a message indicati
       ng whether the error  was a disk error or a BASIC error.  The GW B
       ASIC error code number and the line number on which the error occur
       red are displayed."
13787 | 5020 PRINT:PRINT:PRINT"To test the error trapping routine make a selecti
       on from the menu below and    follow the instructions which appear
        on the screen."
3715 | 5030 LOCATE 12,10:PRINT"1 - Division by Zero Error"
2970 | 5040 PRINT TAB(10)"2 - Disk File Not Found"
3264 | 5050 PRINT TAB(10)"3 - Illegal Function Call"
3653 | 5060 PRINT TAB(10)"4 - Input Past End of Disk File"
2818 | 5070 PRINT TAB(10)"5 - Next Without For"
3047 | 5080 PRINT TAB(10)"6 - Return to Main Menu"
5888 | 5090 LOCATE 24,1:PRINT"Enter your selection (1 - 6) ..... ";:X
       M$="123456":GOSUB 310
2267 | 5100 ON X GOTO 5110,5160,5210,5260,5310,190
 569 | 5110 A = 5/0
1618 | 5160 OPEN"I",1,"NOFILE.SPL"
1001 | 5210 LOCATE 34,123
2612 | 5260 OPEN"O",1,"TEST.TST":PRINT #1,5:CLOSE
2987 | 5270 OPEN"I",1,"TEST.TST":INPUT #1, A,B,C,D:CLOSE
 658 | 5310 NEXT J
     | 5500 ' ***** TEST PRINTER READY ROUTINE *****
6043 | 5510 CLS:LOCATE 12,1:PRINT"Enable or disable the printer for a test ....
       ..... "
1430 | 5520 GOSUB 302:GOSUB 902
5112 | 5530 CLS:LOCATE 12,1:PRINT"Your printer is ready .....
       ..... "
5815 | 5540 LOCATE 25,1:PRINT"Test printer again (Y,N)? ";:GOSUB 305:IF X>2 THE
       N 190 ELSE 5510
```

End

becomes zero and the routine repeats the loop.

When you press any key, Inkey$ no longer is null, and the expression (INKEY$ = " ") is false. A false condition results in a zero. The Next V command adds 1 to zero and the result is 1—and the loop ends.

This technique can be useful in a number of situations. You can include this type of loop in the middle of any line of coding. To call this routine, use Gosub 302. You don't need to pass any parameters.

Yes/No Decision

The yes/no subroutine reads the keyboard and rejects all keystrokes other than Y, y, N, or n. It returns to the calling program with a value in variable X of 1 or 2 if you pressed the Y key or a value of 3 or 4 if you pressed the N key.

This subroutine uses the Inkey$ instruction in a loop similar to the one in the above routine. The only difference is that the variable X$ retains the identity of the pressed key.

The routine uses the INSTR instruction to determine which key you pressed. INSTR searches a target string for a match with a second string. In this application, the routine matches the input string, X$, with the target string "YyNn." If a match isn't found, the routine returns a zero for X. If a match is found, X is the position of the character in the target string for which the match occurred. For example, if you press "Y," X is 1. If you press "n," X is 4.

After executing the subroutine, the calling program tests the value of X to determine which key was pressed. See line numbers 1040–1050 for an example.

To call this subroutine, use Gosub 305 and test X after the subroutine has executed to determine which key you pressed.

Menu Selection

The menu selection subroutine is a slightly different application of the same basic routine used for the yes/no decision. It tests the input string against a target string (XM$) supplied by the calling program. The value of X indicates which key was pressed. For example, if your menu choices are 1, 2, 3, 4, 5, and 6, your target string, XM$, would be "123456." An X value of 1 means the 1 key was pressed, a value of 6 means the 6 key was pressed, and so on.

If your menu choices are A, B, C, and D, then XM$ would be "ABCD" if you allow only uppercase inputs, or "AaBbCcDd" if you allow both upper- and lowercase inputs. In the latter case, an X value of 3 or 4 means a B (or b) was pressed.

Before calling this subroutine, you must set the variable XM$ to the target string. For example, if your menu selections are (P)rint, (Q)uit, and (R)eturn, then the calling program would set XM$ = "PQR" and then use Gosub 310.

Input Routine

The input subroutine gives you these features:

- You can limit input to any number of characters between 1 and 255.
- You can enter any typeable characters, including commas, semicolons, colons, and quotation marks.
- The insert, delete, backspace, and all four arrow keys are active during input.
- An input prompt displays spaces in inverse video on the screen, indicating the length of string you can enter.
- You can locate the input prompt at any position on the screen.
- Following input, you can display the input string on screen with the trailing prompting characters erased.
- By pressing the escape key, you can abort the input.

This routine works well for input strings of all lengths. It is slow when inserting or deleting characters from the beginning of long strings. The ability to edit inputs is worth the inconvenience of waiting for the insert and delete functions. This routine operates much faster when compiled using Microsoft's Quickbasic compiler. Table 1 lists the individual variable names and functions.

Before calling the subroutine, you must set ZF to the input string length, ZA to the input display line number, and ZB to the input string column number. You must also initialize Z1$ either to a null string (" ") or to a value. If Z1$ is not null, the subroutine displays the existing string and places the cursor at the beginning of the string for editing.

A typical calling sequence to input a 145-character string at row 12, column 1, is:

```
1200 ZA = 12:ZB = 1:ZF = 145:Z1$ = " ":GOSUB 316
```

Printer Format Routine

The printer format subroutine prints a string on the printer using a line length and beginning tab position that you specify. If the string is too long to fit in the specified line length, the subroutine breaks it into sections that fit on the line—without splitting words at the end of the line. It also contains a line counter to keep track of the number of lines printed. See Table 2 for the variable names and functions.

Before calling the subroutine, you must assign the string to be printed to ZX$, the line length to Z9, and the starting tab position to Z8. A Gosub 348 calls the subroutine. A typical calling sequence to print the string A$, with a 65-character line length and a starting tab position of 5, is:

```
1345 ZX$ = A$:Z9 = 65:Z8 = 5:GOSUB 348
```

Display Format Routine

The display format subroutine functions exactly the same as the printer format subroutine above, except that it sends the output to the screen rather than the printer. The coding is the same except that Print instructions replace the LPrint instructions, and it doesn't have a line counter. The calling sequence includes Gosub 364.

Clear to Bottom of Screen

This routine clears the screen from a specified row number to the bottom of the screen (through row 25). This function is useful if you want to preserve some text at the top of the screen. This "generic" clear routine works on all computers I've tried; other methods sometimes have compatibility problems. It is slow, however, and somewhat aggravating to use for this reason.

The subroutine consists of a loop that clears through row 23 and then clears rows 24 and 25 separately to prevent carriage returns from producing unwanted scrolling.

Before calling the subroutine, you must assign the starting row number to the variable ZK. A typical calling sequence to clear from row 13 down is:

```
2450 ZK = 13:GOSUB 384
```

Strip Trailing Spaces

I designed this machine-language routine specifically to strip trailing spaces from strings that were retrieved from random disk files.

The LSet instruction is used to place strings into a random disk file buffer in preparation for writing them to the disk. Random files require a fixed field length for each string; LSet left-justifies strings shorter than the field length and adds spaces to the end of the string to fill the field. For example, if you place a string of 35 characters in a field formatted for 100 characters, 65 spaces are added to the end of the string. When you retrieve the string from the disk, the 65 spaces are still there. Printing all those trailing spaces can cause havoc with your output formatting.

Before I wrote this machine-language version, I tried a Basic routine to strip spaces, but it was painfully slow. The machine-language subroutine is contained in a Data statement in line 140 of the test program. It is poked into high memory when you run the test program. To keep Basic from overwriting the routine, you must use the /M:65400,4096 switch when loading Basic. For example, to load Basic and run a program named Subs, you must do the following:

```
BASIC SUBS /M:65400,4096
```

This loading sequence preserves memory locations 65401–65535 for use by the subroutine.

Before using the machine-language subroutine in a Basic program, you must give Basic its starting address by using the DEF USR instruction as follows:

```
150 DEF USR0 = 65401
```

The Basic subroutine in lines 424–428 serves as an interface between your program and the machine-language subroutine. To call the machine-language subroutine, it uses the statement X = USR0. I decided not to have the USR call pass information to and from the subroutine. I used Poke and Peek statements instead. The routine assigns the string to be stripped to the variable XX$. After returning from the subroutine, XX$ contains no trailing spaces.

To call the subroutine, assign the string to be modified to the variable XX$, and

Table 1. Variable names and functions for the input routine.

Variable	Function
Z1$	Contains the input string
Z2$	Current input character
ZA	Row number for beginning of input display
ZB	Column number for beginning of input display
ZAE	Row number for end of input display
ZBE	Column number for end of input display
AZ	Row number for current cursor position
BZ	Column number for current cursor position
ZF	Maximum length of input string
Z1	Length of input display + 1
Z2	Position of cursor from beginning of input string + 1
Z3	Insert flag: zero = insert off; 1 = insert on
Z5	ASCII code of current input character
Z6	Temporary variable
Z7	Temporary variable
Z10	Row number of actual cursor position
Z11	Column number for actual cursor position
Z12	Beginning of input display represented as the number of characters from the first screen position (upper left corner of screen)
Z13	End of input display position represented as the number of characters from the first screen position
Z14	Current cursor position represented as the number of characters from the first screen position
Z15	New cursor position after pressing the up- or down-arrow key represented as the number of characters from the first screen position

Table 2. Variable names and functions for the printer format routine.

Variable	Function
Z9	Line length to print
Z8	Beginning tab position
ZX$	String to be printed
NL	Line counter
V	Position at which to split the string

use Gosub 424. When control is returned to your program, XX$ is ready to use—with no trailing spaces. A typical calling sequence to strip spaces from S$ is:

```
5640 XX$ = S$:GOSUB 424
```

Generic Error Handling

The "generic" error-handling routine beginning at line 452 traps errors and displays a message on the screen indicating whether a Basic error or a disk error has occurred and giving the error number along with the line number on which the error occurred. It transfers control to some predetermined point in the program following acknowledgment of the error.

This demonstration program transfers control to line 5010, which is the menu for the error-trapping demonstration program. When I write programs, I usually transfer control to the main menu of the program.

I use the generic error-trapping routine to trap errors that arise from unexpected causes. An On Error Goto 450 statement at the beginning of the program activates the error-trapping routine. I also use local error trapping in my programs to trap specific errors and handle them differently. An example is in the error trapping in the printer ready subroutine in line 902.

Printer Ready

The printer ready subroutine beginning in line 902 sets the error-trapping address to line 910 and sends a space to the printer. If the printer is ready, no error occurs, the error-trapping address is reset to the generic error-trapping routine, and control is transferred to the calling program.

If an error occurs, a message informs you that you need to correct the problem, and the printer is checked again. When you correct the error, control is transferred back to the calling program.

To call the routine, you need only insert Gosub 902. ■

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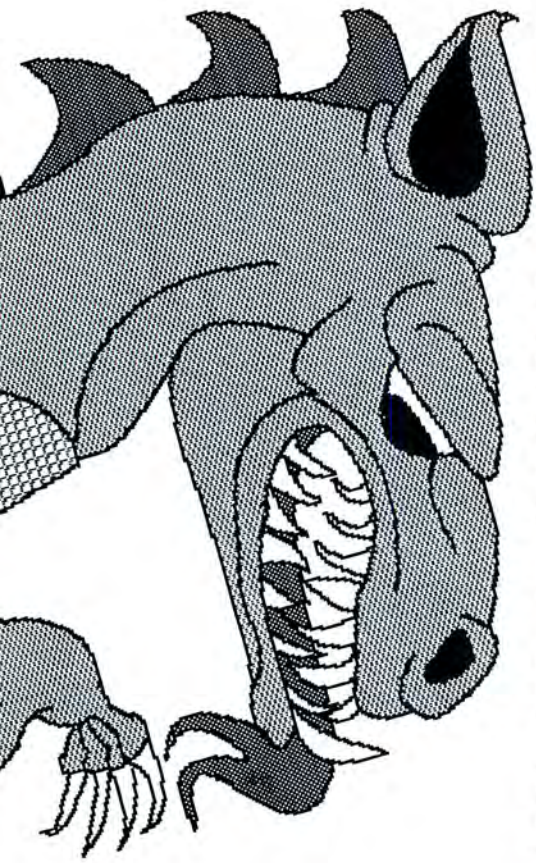


by Joel S. Avren

With a little inspiration and a dot-matrix printer, you can make your Microillustrator "masterpieces" spring to life in beautiful black and white. True, the Print utility of Tandy's Microillustrator is designed for use with a color ink-jet printer. But if you have only a dot-matrix printer, you can still get black-and-white hard copies of your Microillustrator creations by following these four simple steps:

1. Create the picture with Microillustrator.
2. Save the picture in bit-image format.
3. Recover the picture in Basic.
4. Dump the picture to the printer.

Creating the Picture

To create a picture, you must first consider how a dot-matrix printer interprets the colors. When you look at the colors in Microillustrator's main menu, you can see 16 solid colors. The printer, however, sees only four repeated shades of gray, left to right, as listed in the Table.

The textures, or patterns, reflect these shades on a pixel-for-pixel basis. This means that if you are creating pictures for output to the dot-matrix printer you may not be able to use the screen colors of artistic choice. You should concentrate instead on the shades of gray you want to see in your printed output, using the colors needed to produce them, and ignore the strange color combination you see on screen. Note that you can use any of four whites, four light grays, and so on. You do not have to remain within the same "set" of four shades.

Start by making a sampler that will take you through all the steps involved in outputting your creations on the dot-matrix printer.

If you don't have a hard drive, make a system disk containing Basic.EXE, Graphics.COM, and Microillustrator. Hard-drive users can copy these files into the directory or Microillustrator subdirectory.

Start Microillustrator and select the small cursor (second from left), Mirror, 4-way, and Frame options. Go to the picture screen and make a small rectangle in the upper left corner. Select Copy. Copy the rectangle next to the first one you made in the upper left quadrant of the screen, then two more, right below the first two. Don't worry about neatness. You now have 16 empty rectangles on the screen.

Select Fill. Going across the row of solid colors on the main menu, select each of them in turn and fill each rectangle, left to right, with one of the colors. This is your sampler.

Select Store, and then Save. In response to the prompt, name your sampler Test. Do *not* press enter, but continue to the next step.

Saving to Basic

Ordinarily, you press enter at this point and the picture is saved in Microillustrator format, not in Basic. However, if, immediately after you press enter, you press shift-greater than (>), Microillustrator emulates the BSave (bit-image save) function of Ba-

System Requirements: 128K RAM, MS-DOS, Microillustrator, GW-Basic (Tandy version), mouse, dot-matrix printer.

Table. The printer interprets Microillustrator's 16 colors as four shades of gray.

Microillustator Color	Printer's Interpretation
Black	*White (no print)*
Dark blue	*Gray*
Green	*Dark gray*
Cyan medium	*Black*
Red	*White (no print)*
Magenta	*Gray*
Brown	*Dark gray*
Light gray	*Black*
Dark gray	*White (no print)*
Blue	*Gray*
Light green	*Dark gray*
Cyan light	*Black*
Orange	*White (no print)*
Light magenta	*Gray*
Yellow	*Dark gray*
White	*Black*

sic; that is, it creates a file in the same format as a BSave statement in Basic. The Microillustrator format picture is saved also, which comes in handy if you want to edit (change) a picture in the future.

Press enter and immediately perform the shift-> combination; then exit to MS-DOS. If you call up the directory, you will notice two new files, Test.PIC and Picture. (The period after Picture is part of the file name.)

Test.PIC, the regular Microillustrator file, takes up little disk space. But Picture. eats up 32,776 bytes. Each time you use this feature, it names the file Picture. and eats up 32,776 bytes. It always names the file Picture., thereby replacing any previous Picture., so copy the file to a different disk or rename it.

Recovering the Picture in Basic

Microillustrator's BSave emulation saves an image that is recoverable in graphics screen 5 of GW-Basic, Tandy version. Use the Program Listing to recover the picture in Basic.

```
    | 10 'Image
 919 | 20 CLEAR,,,32776!
1458 | 30 KEYOFF:SCREEN 5:CLS
3141 | 40 LINE INPUT "Name of file to print? ";A$
 620 | 50 BLOAD A$
 581 | 60 GOTO 60
```

Program Listing. A utility to recover pictures.

Go into Basic, enter the program, and save it as Image. Now run the program. In response to the prompt, type TEST. (with the period), and press enter. Your sampler should appear on the screen and stay there. Press control-break and return to MS-DOS by typing SYSTEM and pressing enter.

Dumping the Picture to the Printer

With the printer turned off, make sure that your printer's DIP switches are set for graphics, in accordance with your printer's instructions. The printer will not accept new DIP switch settings while it is on.

Turn on the printer, and activate the screen dump utility of your system with shift-print. If it is working properly, the printer will print whatever text is on the screen (the drive prompt, if nothing else) and all blank lines.

Activate the graphics printing capability by entering the Graphics command (type GRAPHICS and press enter). The drive will spin and return you to the drive prompt. Once the printer is set up for graphics, it remains in that mode until you turn it off. In fact, if you know you are going to be printing pictures during a given session, you might prefer to activate the graphics printing capability before going into Microillustrator.

Next, type BASIC IMAGE and press enter. The computer will load Basic, load the program Image, and run it. Image will ask you for your file. Type TEST., and press enter. Your sampler will appear on the screen.

Dump the screen to the printer with shift-print. Your output should be similar to Figure 1.

Figure 1. A screen dump of Test.

Making Masterpieces

You now have the procedure for outputting images created in Microillustrator to a dot-matrix printer. Drawing accurately, using perspective, and sizing drawings to height come next.

Microillustrator uses the equivalent of Basic screen 5. Basic screen 5 is a 16-color, medium-resolution screen, 320 pixels wide, 200 pixels high, with default screen coordinates of (0,0) to (319,199). Unlike Basic, Microillustrator has no way to specify points mathematically on the screen. However, you can create a screen utility, such as Grid, to divide the screen into 640 squares with each border drawn point by point. You, thus, have total control of the screen locations.

To create Grid, go into Microillustrator, and select the small cursor and P-Set. Select orange, which is invisible to the printer. Select black, which is also invisible to the printer. Make every other block of the P-Set square black. Select any one of the patterns to replace with your new pattern and then select Frame. Using your new pattern, make a frame that is at the limits of the screen. Select Mirror, 4-way, and Zoom.

For the rest of the picture, work only in the upper left quadrant. Since you are in 4-way mirror, the other three quadrants will take care of themselves. Be sure you are in Zoom. Make the rectangle for the whole quadrant, placing the cursor at the upper left corner and then stretching the frame toward the center of the screen until the images meet perfectly but do not overlap, since you want a double line where they meet to mark off each quadrant.

While you are in Frame, 4-way mirror, and Zoom, start from the top center of the screen, count off by 10s, and drop overlapping frames vertically in the upper left quadrant only; the action is duplicated automatically in the other three. Starting from center left, do the same thing horizontally in the upper left quadrant.

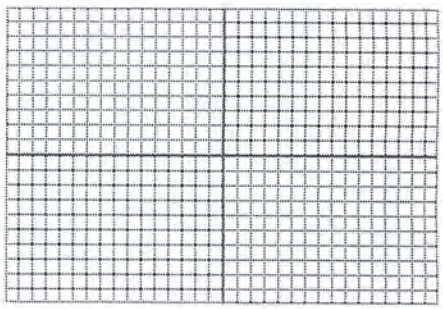


Figure 2. Grid for accurate drawing.

Your screen should resemble Figure 2. Perform a regular Microillustrator save using the name Grid, pressing enter after naming the picture. (It would do no good to do a BSave with enter and shift->, since you have deliberately made the utility Grid invisible to the printer. Use it only as a Microillustrator utility for accurate drawing.)

If accuracy is essential, call up Grid at the beginning of your session. Grid, combined with Zoom when convenient or necessary, gives you point-by-point control of the screen. Just be sure that when you are ready to save your creation you do not name it Grid.

A Session with Microillustrator

To see how Microillustrator works, start with one of the easiest things to draw—a fish. Call up Grid. For the basic shape, select the small cursor, Mirror, Vertical, and Curve. Go to the picture screen. Put one end of the curve low on the left side of the screen. Put the other end of the curve exactly on the horizontal center line at some point on the far upper right. When you have the hump of the fish's back as you want it, snap the curve. Your fish should resemble Figure 3.

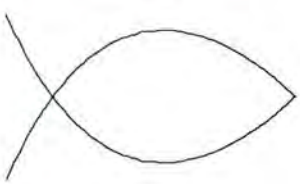


Figure 3. First step for drawing a fish.

If you are pleased with the shape of your fish, save it as Fish with a regular save so that, no matter what happens, you can always recall this image.

You are through with the grid at this point. To get rid of it, go to Fill. Select orange and fill all the spaces with orange. Some black dots remain, "trapped" by the orange. Select black and fill all the orange

areas. You need to eliminate the grid, because although it is invisible to the printer, it is not invisible to Microillustrator. As a result, the grid will block out or break up any area that has to be filled with a color or texture.

Return to white and to Curve to complete the fin shapes, the division of the head, and the small of the back. Note that the vertical mirror is doing half of your drawing for you. Go to one of the grays, and draw the segments of the fins, gill, and tail. That should give you the equivalent of Figure 4.

When you are satisfied with your fish, save it as Fish. The program will ask if you want to override your previous fish. Press "Y" (for yes).

For more details, select black and Point. Go to Zoom. Sever the unwanted portions of the original curves by placing a black point at the upper ends of the "X" shape where they join the back curve. Since you are in Mirror, the lower points will be placed automatically. Go to Fill and fill the "X" shape, thereby making it disappear. Turn off the mirror. Select white and Circle. Position the cursor where you want the eye. Zoom using the Z key. Draw the eye using two circles. Turn off Zoom. Select Curve. Draw the mouth using one or two curves. Select one of the gray colors and draw the line on the side of the fish with two connecting curves. You now have what could be termed a coloring book picture of the fish, similar to Figure 5.

Again, when you've got what you want, save the drawing as Fish.

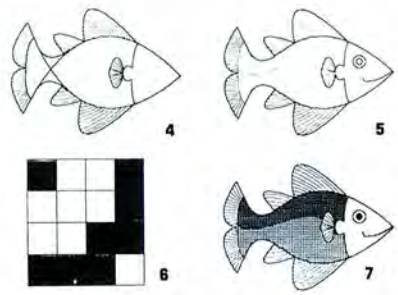
To finish the drawing, go into Zoom and go around the perimeters of any area you are going to fill with texture, checking for "leaks." Textures are difficult to erase, so a leak is a minor disaster.

Fill the eye with dark gray. Fill the head with a light gray texture, such as the first one on the left of the existing textures.

Go to P-Set. See Figure 6, the pattern for a fish scale, using Clear and a color. Make a darker scale for the top and use that pattern to replace an existing pattern in the main menu. Make a lighter scale for the bottom and do the same. Fill the top and bottom of the body with dark and light scales, respectively. Your fish should generally resemble Figure 7.

Save the drawing as Fish. Again, the program will caution you that you are overriding the existing Fish. This time, press "Y" and immediately perform shift->, the BSave emulation of Microillustrator. Return to MS-DOS.

To put the image on the screen in Basic, type BASIC IMAGE and press enter. In response to the prompt, type FISH. and press enter.



Figures 4–7. The fish with details added. Figure 6 shows the pattern for a fish scale.

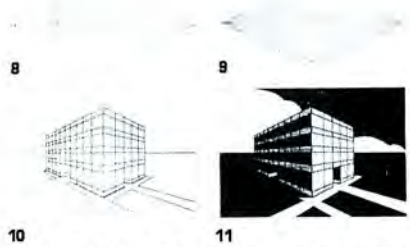
Press shift-print and enjoy the show.

Press control-break, type SYSTEM, and you are ready for whatever you want to do next.

Perspective Drawing

Figures 8, 9, 10, and 11 show how to draw a building in two-point perspective, using Grid. Select Line, using the diagonal section method of proportion. Use one of the grays and the smallest cursor.

Eliminate the diagonal construction lines and divide the building into ground floor and three upper floors. Put in the landscaping, walkways, and entrances. Eliminate the perspective lines and remove the grid. Be sure to use Zoom for this in all but the largest areas.



Figures 8–11. A building in two-point perspective.

To finish the drawing, use Fill, by itself or in conjunction with Spray. To create the cloud, use one of the "invisible" (to the printer) colors and Curve.

Drawing Pictures of Any Height

By screen-dumping successive images, slightly adjusting the paper in between, you can draw pictures of any length on the dot-matrix printer. The textures and lines drawn in Microillustrator are in perfect register.

Each segment of the dragon (Figure 12) is drawn so that the bottom of each successive screen lines up perfectly with the one above it. One way to do this is to call up the previous screen, which you have saved, and extend straight lines from the bottom to the top of it. Then eliminate as much of the "old" picture as you want, repeating the process as often as required. Be sure to call each segment by a different name (e.g., Dragon1, Dragon2, and so on).

My printer requires reversing the paper by hand exactly five "clicks" before dumping the next screen to achieve perfect image continuity. Yours may be different.

Conclusion

The use of Microillustrator with a color ink-jet printer, its designated method of hard-copy output, produces entertaining, but limited results.

The dot-matrix images produced with Microillustrator not only have a certain charm and character all their own, but can also be integrated with other applications not possible on an ink-jet printer. Creating images on paper with Microillustrator and a dot-matrix printer is not just a demonstration of minor technical cleverness, but a way of producing quality artwork having both entertainment and practical applications. ■

Joel S. Avren, a former Radio Shack instructor, is presently a management consultant. You can reach him at 1127 Blueberry Court, Edison, NJ 08817.

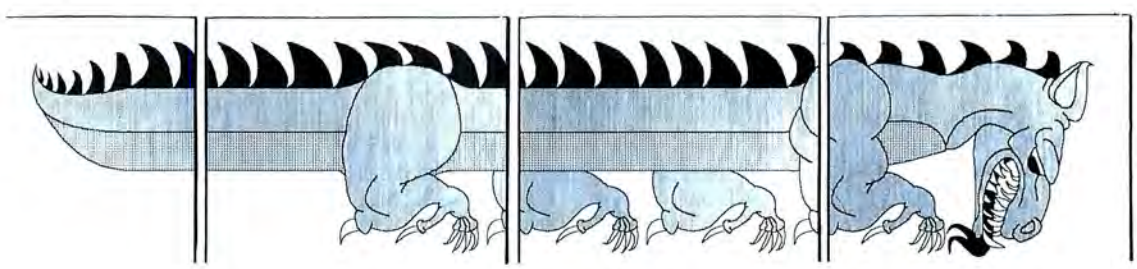


Figure 12. A dragon on multiple pages.

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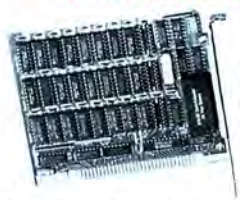

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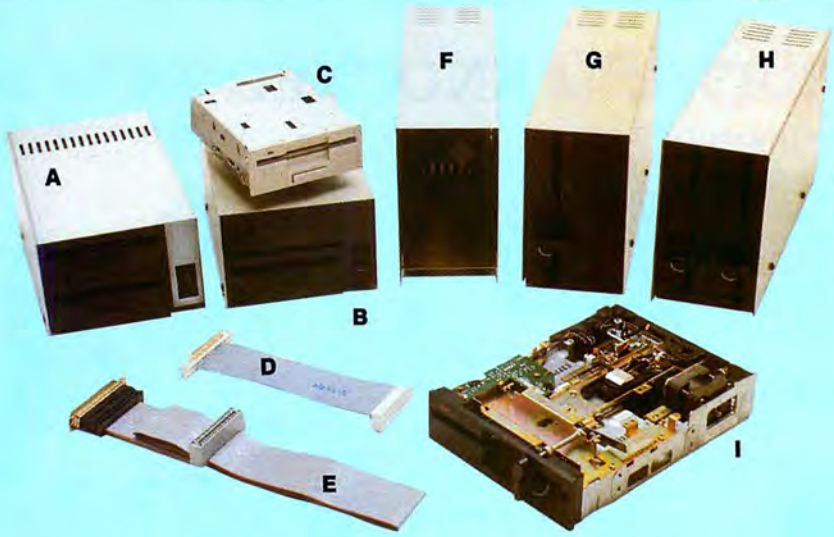

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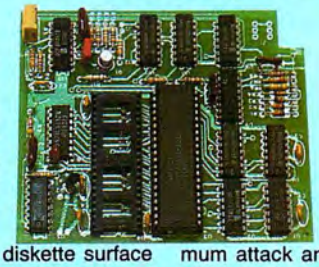

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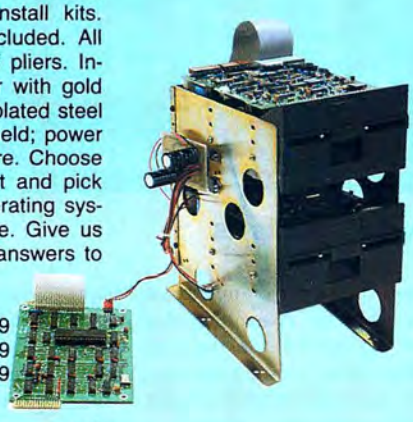

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(continued from page 25)

company but can't remember its exact name, you can press the View key to see a list of companies in alphabetical order. Each name is assigned a number; you can enter either the company name or the number.

You can use a special field for key words to create a file. These are any combination of characters that you store for later access. For example, a computer consulting firm might store the type of computer that each client has; later, it could list all clients by computer-brand ownership.

Four Pre-Fab Applications

Tracker includes an Application Pack that contains four ready-made applications: Contact Manager, Abstractor, Project Tracker, and DOS File Tracker. Each application has speed keys that permit you to bypass the menus and execute commands quickly.

The Contact Manager provides spaces for filing pertinent information about your customers. The contact form is meant to be used while you are on the telephone with a customer. Press the update key, and the program enters the current date and advances the cursor to a field where you can enter a synopsis of the contact.

You often follow up such contacts with a letter—by pressing a function key, you can send Tracker into the letter-writing mode. The name, salutation, and address are copied from the file. The date is automatically entered, and Tracker opens a space for entering the body text. Tracker has some word-processing features such as word wrap, cut and paste, and search and replace. It isn't meant for power typing, but it is fine for the purpose. A few keystrokes put you in the print mode, which prints the letter.

The Contact Manager includes a mail-merge feature. To use it, you create a form letter, file it, call addressees from the file to the stack, select the form letter from the menu, and call the print command. The process is as simple as could be; however, it lacks a way of inserting variable information into the text.

The Abstractor is a handy place to file information from your library of books, articles, and papers. The input form provides space for title, author, subject, key words, and other such data that can help you locate information quickly.

The Project Tracker is not a substitute for a full-blown project-management program. It lacks several important functions, including ones to draw project network diagrams, show schedules in bar-chart form, and allocate resources to a project. It can, however, keep track of many details, such as summaries of tasks, and project start and complete dates. Its report-generating ability is superior to that of a word processor, so for occasional projects it is an effective tool.

The DOS File Tracker is intended to help you keep track of disk files. It provides space for entering the subject matter as well as the usual data that the DIR command displays. All of these applications are useful, but they require someone to keep them current. It is particularly hard to discipline yourself to keep track of DOS files, because they change so often.

Et Alia

Tracker includes an interesting feature called Magic Key for accessing other programs without exiting the data base. The Magic Key command line displays commands for exiting to DOS or starting word-processing, communications, spreadsheet, or other programs. Before you run another program, you tell Tracker in which directory it's located and issue the command to start it. Tracker saves this information in a configuration file, after which it automates the process.

Tracker has a few quirks that are annoying, but not fatal. For example, if you are filling in a form in the insert mode and press enter at the end of a line, the program opens an unwanted line. The line-delete feature deletes it but offsets the next label; I was unable to find any way out except by deleting the record and starting over.

The Dayflo Tracker package contains printer drivers for several of the most popular printers, but it leaves many gaps. The procedure for writing your own driver is dauntingly complex. Strangely enough, a driver is not included for a plain teletypewriter, to which most printers will respond. If all fails, the instruction manual suggests using an alternate printer driver, but my copy of Tracker didn't include such a program.

For the most part, Tracker is easy to learn and use. Separate manuals cover the master program and the Applications Pack; they are clearly written and include short tutorials to get you started on the main functions.

Last Words

Tracker is not the solution for every data-base application. Large and complex data bases are still handled more efficiently by a full-scale DBM such as Dbase III or Rbase System V. Tracker has some computational capabilities, but it lacks the mathematical functions that would be needed to support an inventory or accounts-receivable file. Its best use is for the many lists and files that exist in every office. For this purpose, Tracker is as effective as any program on the market and is easier to use than most, particularly if your application fits one that is already programmed in the Application Pack.

Eds. note: A floppy-disk version of Tracker, Tracker 720, is now available on 5¼- or 3½-inch disks. It also sells for $99.95 but doesn't include the Applications Pack. ■

MASM 5.0

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by David A. Williams

Version 5.0, a major update of Microsoft's Macro Assembler, has something for everybody: for the pro, better performance, and, for the neophyte, greatly improved documentation and ease of use.

Both will appreciate Codeview, a debugger extraordinaire. A revelation the first time you use it, especially if you have a mouse, Codeview puts the source code, the register contents, selected variables, and memory locations all in front of you at one time. Move the cursor to a line of code, click right, and the program will execute up to that point. Debugging has

never been easier, and the novice assembly-language programmer can quickly get an education, watching things happen, as he or she steps through a program.

MASM is faster and easier to use, and it now supports the 80386. Other enhancements include simplified segment directives, the ability to use all available memory, improved error messages, and several new command-line options.

My compliments to the manual writers. Over 1,000 pages of text in three volumes, this is one of the best software manuals I've seen, especially for a language product. The *Programmer's Guide* gives a full description of the assembler and shows you how to use it with many examples. The coverage given structures and records is a good example of the improvement I'm talking about. It even has a clear explanation of phase errors, a mystery to many for years.

Beginning assembly-language programmers should have no trouble learning what has been, in the past, an arcane subject. Don't expect to learn programming techniques, though. This is a tutorial on the use of the assembler, not on assembly-language programming.

The second volume covers the Codeview debugger and the other utilities. The third volume, covering mixed-language programming, tells everything you need to know about interfacing Basic, C, Fortran, Pascal, and assembly modules. A 148-page, wire-bound reference guide gives a command summary for all the programs, a brief description of the assembler directives, a description of all the processor instructions (including the coprocessors), and several useful tables.

MASM

MASM's increased assembly speed is probably the most noticeable improvement. Version 5.0 is almost three times faster than version 3.0, and Microsoft claims it's 25–40 percent faster than version 4.0. I assembled a 70K source file in 9.8 seconds on an IBM PC AT compared with 26.2 seconds required by version 3.0. The resulting object files link somewhat faster also.

Simplified segment directives make it easier to set up source-code files for EXE-type programs. The following is all you need to set up a program that has separate data and code segments:

```
DOSSEG
.MODEL SMALL
.STACK 256
.DATA
Enter data statements here.
.CODE
Enter program code here.
```

Assume, group, and end segment directives are not required. The model directive tells the assembler what kind of segment organization to expect. The available size parameters are small, medium, compact, large, and huge. The stack directive establishes a 256-byte stack and initializes the SS and SP registers. Besides being more convenient, the DOSSEG directive generates a segment structure that is consistent with that used by Microsoft high-order languages.

MASM 5.0's more stringent type checking might lead to warning errors on files that assembled without problems with earlier versions. You can ignore these or inhibit the warning messages with a new command-line option that lets you change the level of errors that MASM displays. You can redirect error messages to a file or the printer, and the error-message descriptions have been slightly expanded.

MASM now defaults to IEEE-format, floating-point numbers, but the MSfloat directive will switch to the Microsoft format for compatibility with Basic.

Codeview

Codeview is a windows-oriented, source-level debugger capable of working with assembly-language code and compiled programs. To realize its full capability, you must have generated your program with MASM 5.0 or a recent version of a Microsoft compiler and linked it with version 3.6 of the Microsoft linker. Even if this is

not the case, Codeview offers several significant improvements over Debug and Symdeb, the debuggers supplied with earlier versions of MASM.

Although Codeview has a sequential mode of operation similar to these older products, the windows mode is more powerful. The Codeview screen, shown in the Photo, has three windows topped by a menu bar. The large display window shows source code, assembly code, or a mix of the two. The register window, which you can toggle on and off with the F2 key, displays the contents of registers, the status of the flags, and when required, data pointed to by operand registers.

In the 80386 mode, the register window expands to show 32-bit registers. The dialog window displays commands and command outputs. A fourth, the watch window, appears under the menu bar when you want to display selected variables or memory locations.

To use Codeview, you must have the properly prepared executable file and all appropriate source files in the current directory. Only EXE files will contain the necessary line number and symbol information required for source-level debugging. If your end product must be a COM file, set it up as an EXE file until you finish debugging. You will need to reassemble it anyway, since files assembled or compiled for Codeview are swollen with data needed only for debugging.

Let me emphasize that you can use Codeview with any executable file, but only in the assembly mode. Source-level debugging requires specially prepared EXE files.

When loaded with an executable file, Codeview automatically loads the source file and displays it with line numbers added. If your program consists of a mix of various compiled languages and assembly languages, Codeview will load and display the appropriate source file as you step through the program. You can toggle the display window between source code, assembly code, or an interleaved mix of the two. If you're working in a high-order language, the latter arrangement shows the assembly code produced by the compiler for each program statement. You can page through the displayed code, if the cursor is in the display window.

You have three ways to enter commands and control the operation of Codeview and the target program: the keyboard and a

series of pull-down menus, a mouse, and a command-line mode called dialog commands. The latter is the most powerful, having many commands unavailable in the other modes. The pull-down menus, reached by pressing the alternate key and the first letter of the title, give access to most of Codeview's functions. You'll also find many of the most frequently needed commands assigned to the function keys. A mouse will let you operate the pull-down menus more quickly.

You can also use your mouse to scroll either window, set breakpoints, and execute the target program. Clicking left on Trace or Go in the menu bar has the same effect as pressing the associated function key. Click right on Trace to start Program Step, which executes through subroutines and loops without stopping. Want to toggle a flag? Click on it. Put the cursor on a line of code and click left to set or reset a breakpoint. Click right and the program will execute up to that point. This is a fast way to move through a program without setting innumerable breakpoints.

Keyboard entries appear in the dialog window, and commands execute, even if the cursor is in the display window. The commands are similar to Debug commands but are generally simpler to use, yet more powerful. Unfortunately, the backspace key is the only command-editing facility provided. A command buffer retains several screens of previously issued commands and their output. This is convenient for reviewing memory dumps that have scrolled out of the window. You can easily expand and shrink the size of the dialog window to suit the task at hand.

In source mode, commands can reference addresses, line numbers, or symbolic names. Typing DA followed by the string variable displays an ASCII dump of the string variable. BP .85 sets a breakpoint at source line 85. You can control the format in which numeric variables are displayed by appending a code to the command.

Codeview has built-in high-level language interpreters that allow you to use source-code expressions in commands. For example, ++count uses the C increment operator to increment the variable count. You can switch between C, Basic, and Fortran, but you can only use one at a time. Future versions of Codeview will support Pascal.

You cannot do source-level debugging of include files or macros, although the unassembled code will be displayed in the assembly mode. Nor does Codeview support the debugging of memory-resident programs. You can debug overlay programs and library modules.

Other Utilities

This version of MASM comes with the usual collection of utilities to enhance your program-development efforts. First among these is Link. A necessary step in the development process, Link converts object files into an executable format. This version of the linker, besides supporting Codeview, is also slightly faster than previous versions.

Lib is a library manager you can use to create libraries of subroutines, or add to or delete modules from existing libraries. Make, a program maintenance utility, automates much of the activity required to update existing programs. Cref, a cross-reference utility, generates a listing of symbols.

The package includes other utilities to pack existing EXE files, modify file headers, enlarge the DOS environment, and redirect error outputs to a file.

The Bottom Line

I found a couple of minor commands that didn't work as advertised, but overall I am impressed with this package. Codeview alone is worth the price, especially if you are updating from an earlier version. If you are a novice debating whether to attempt assembly language, go for it! It's never been easier. ■

Soft as Silk

by Alan L. Zeichick

Silk 1.0 requires 512K and MS-DOS 2.x. Daybreak Technologies Inc., 2271 205th St., Torrance, CA 90501, 213-212-3030. $298.

Mention spreadsheets, and most MS-DOS users automatically think of Lotus's 1-2-3. Despite vigorous competition from the likes of Supercalc, Open Access II, and VP Planner, 1-2-3 has a stranglehold on today's spreadsheet market.

Daybreak Technologies is the latest company to tackle that market, and it does so by attacking Lotus Development Corp. head-on. Daybreak's ads depict an innocent youth face-to-face with a hulking bully. But, in this instance, the youngster is the aggressor—and doesn't stand much of a chance against the firmly entrenched giant.

First Impressions

Silk comes on five 5¼-inch disks. The 292-page manual is complete and concise, with a full table of contents, index, and over 100 pages of well-written tutorial. My manual's pages didn't fit into the binder: One of the looseleaf holes is drilled off-center. This lack of quality control slips into Silk at several points.

Installing the non-copy protected program is easy. Copy the five program disks into a Silk hard-disk subdirectory. (Be careful when following the manual; extraneous commas in the instructions can frustrate users who take the directions literally.) When installed, the program and demonstration spreadsheets occupy about 1.2 megabytes (MB) of disk space. Silk also works on floppy-only systems.

Setting Silk to use the appropriate monitor and printer is handled with a straightforward installation program. Silk supports monochrome, color-graphics-adapter (CGA), and enhanced-graphics-adapter (EGA) monitors; printer choices are limited to Epsons and compatibles. Graphics output is possible on Epson dot-matrix printers and Hewlett-Packard HP-7470A and HP-7475A plotters.

The program automatically adjusts to take advantage of installed Intel 8087 and 80287 math coprocessors. And Silk can access Lotus/Intel/Microsoft Expanded Memory Specification (EMS) and Enhanced Expanded Memory Specification (EEMS) memory to a maximum of 8 MB.

You can run Silk from the MS-DOS prompt or by invoking Access, roughly analogous to 1-2-3's Lotus System Manager. From Access, you can run the spreadsheet, the installation program, a print-graph utility, and a spreadsheet-translation program (to and from 1-2-3's WKS format, as well as the standard Data Interchange Format, DIF).

Another Access option is to log all keystrokes to disk, presumably in case of power disruption or severe human-caused damage to a spreadsheet.

Clever Copy

Designed to compete with 1-2-3, Silk offers the same functions in the same ways. The similar-looking spreadsheet measures 256 columns by 2,048 cells. Pressing the slash key calls up the commands, which are arranged in a multi-level tree just like 1-2-3's.

All the usual spreadsheet functions are present, and many have options not found in 1-2-3. For example, Silk can display numbers in nine date formats and three currency ones: dollar, pounds sterling, and yen. Silk's functions are intuitive; I was able to create several spreadsheets with few references to the manual or even to the on-line help screens.

Several control functions are implemented as half-screen miniature spreadsheets called forms. The printing form contains 21 options that range from page numbering to margins to number of copies—seeing a list of options on the screen is far easier than snaking through 1-2-3's hierarchical tangle of options and parameters.

Silk improves on 1-2-3 Release 1A's handling of functions, the base of a spreadsheet's usability. Equations can have in-line comments. You can define and use global numeric constants by name, instead of by cell address.

Silk duplicates all of 1-2-3 Release 1A's built-in functions, such as AVG (average), PMT (mortgage payment), and Round (number rounding). It adds a few financial functions and 18 string-handling routines. There's also a comprehensive macro capability.

The program has some unusual spreadsheet commands, such as Data Allocate, which performs the opposite of the Sum function. For example, assume that cells A1 through A5 contain five numbers, and cell A6 the sum, 20. What if you want the sum to be 60? Store 60 in cell A6, and use the Data Allocate command to spread the increase proportionately across the range A1.A5.

Among Silk's other spreadsheet operations are matrix inversion and multiplication, linear regression, data parsing (splitting the contents of a cell into several cells according to user-specified parameters), and goal seeking (iterative solutions to an equation).

Pretty Pictures

Silk's graphics are similar to 1-2-3's, offering line graphs; horizontal, vertical, and stacked bar charts; pies with or without exploded slices; X-Y charts; and high-low-close graphs suited for financial data. Like spreadsheet printing, all of the spreadsheet options are on one 50-question form. Some options are more difficult to use than they should be.

I produced a spreadsheet containing the numbers −3 to 3 by .1 increments in columns A1 through A61, and the sine of these values in B1 through B61. When I graphed these values, I found a square wave instead of the smooth sine curve; apparently the automatic scaling function for the Y axis doesn't work properly.

To see the correct curve, I had to enable manual scaling and change the upper Y limit to 1 and the lower limit to −1. At this point I discovered one of several typographical errors within the program: The on-screen description of the X-axis lower value reads, "Define the lower limit of the Y axis display" (italics added). The manual has its share of typos, too.

Graphs, once displayed on screen, can be saved to disk and printed using a utility accessible through the DOS-level Access program.

Plenty of Help

One of Silk's best features is an extremely context-sensitive on-line help system. When you press the help key, F1, the screen splits in half vertically, the left half containing your spreadsheet and the right half displaying the help information. You can con-

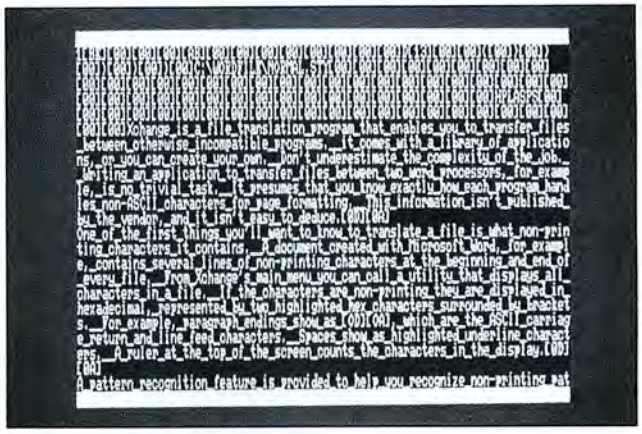
tinue manipulating the spreadsheet with this help information still displayed on screen.

Summary

Silk is an interesting product, striving to compete with Lotus's 1-2-3 without any secret weapons. If you're shopping on the basis of price alone, then Paperback Software's VP Planner is inexpensive, and more closely resembles 1-2-3 in feel and features. If you're looking for superior graphics, SPI's Open Access II is the obvious choice.

The bottom line: Although Silk has some nice features that make it suitable for those who don't need serious power, it's not strong enough to stand toe-to-toe with 1-2-3. If you're shopping for a spreadsheet, I recommend that you keep looking. ■

Translation Creation



Xchange requires 320K and MS-DOS 2.x. Emulation Technologies Inc., 1501 Euclid Ave., Cleveland, OH 44115, 216-241-1140. $495.

by Harry Green

If you need to transfer files between otherwise incompatible programs, you have three choices: use a standard such as Document Content Architecture (DCA) or Document Interchange Format (DIF), convert the file to ASCII, or use a translation program such as Xchange. DCA or DIF are by far the most effective if your program supports them, but many do not. ASCII is usually the easiest, but you lose most text formatting and often run into problems caused by embedded characters.

Xchange offers a third solution. It lets you create your own translation programs, but don't underestimate the complexity of the job. Writing an application to transfer files between two word processors, for example, is no trivial task. Unless you're going to put your program to heavy use, it probably isn't worth the effort. Xchange also comes with a library of applications, but they are of limited usefulness.

Detective Work

Before you can translate a file, you need to know what non-printing (embedded) characters it contains. A document created with Microsoft Word, for example, contains several lines of non-printing characters at the beginning and end of every file. From Xchange's main menu, you can call a utility that displays all characters in a file.

The Photo shows part of the display from a Microsoft Word test file containing the first paragraph of this review. Non-printing characters are displayed as two hexadecimal (hex) digits surrounded by brackets. For example, paragraph endings show up as [OD][OA], which represents the ASCII carriage-return and line-feed characters. Spaces show up as highlighted underline characters. A ruler at the top of the screen counts the characters in the display.

Xchange provides a pattern-recognition feature to help you recognize non-printing patterns. The program scans a file for groups of non-printing codes and displays them together with their frequency of occurrence. A scan of a Microsoft Word file of approximately 6,900 characters revealed 27 occurrences of the pattern [14][03]. These are the ASCII codes for device control 4 and end of text. After you know that, the problem is to figure when and why Word uses these characters.

A scan of the Word document revealed 42 such patterns, many of which Word uses for text formatting. If, for example, you want to indent paragraphs five spaces, Word embeds the appropriate formatting characters at the end of the file.

Discovering the function of each character combination would be a tedious job without some form of documentation from Microsoft. Your task as translator to another word processor, such as Word Perfect,

is to discover the pattern that represents the indents in Word as well as the corresponding pattern under Word Perfect. Fortunately, this task is simplified somewhat for Word with an option package that was included for this review, along with similar packages for Revisable Form Text/Document Content Architecture (RFT/DCA), Dbase, Multimate, and Lotus/Symphony.

In several of these option packages, Xchange uses a meta-file language to create a more easily readable file. When Word is translated into a DOS file, for example, the non-printing headings are clarified. At this point, the non-printing characters shown in the Photo are displayed with clues to their meanings, but the connection still isn't obvious.

Translation Basics

To create a translation file yourself, you must tell the program how to handle each pattern the source program originates. Xchange presents you with a series of input fields of three lines each. The first line contains comments, the second specifies the character for which to search, and the third line specifies which character will replace the search character. A simple translation program to remove hard carriage returns at the end of a line looks like the following:

```
C:  Hold paragraph endings
S:  [0D][0A] [0D][0A]
R:  [0D][0A]
C:  Remove hard carriage returns
S:  [0D][0A]
R:
```

Performing translations is simple after you have created and debugged your program. You call the file-translation function from the main menu, specify the translation program, the input file, and the output file, and let Xchange do the rest. Xchange registers the number of bytes read and translated while work is in progress, finishing with a final tally. On a standard PC, Xchange removed hard carriage returns from a 43K file in 26 seconds using the above program.

Diverse Difficulties

Xchange is not a program that you can unwrap and use immediately. Unless you are experienced at handling files or have lots of patience, you'll find any but the most basic translations difficult to write and debug. The manual states that if your translation fails, you should repeat the pattern-recognition step and create a new translation file until you obtain the desired output.

You'd think that the optional translation packages would help, but their capabilities are limited. Although the packages support several popular input programs, they only support a few output programs. I was able to translate a Word file into a DOS file, but not to Multimate, even though the latter is on the supported-output list.

I encountered difficulties arising both from bugs and from documentation deficiencies. Several features did not work in the first version of the program I received. Emulation Technologies supplied an updated disk, but I was still unable to edit translation fields.

The manual doesn't mention the keystroke combination required to add, copy, or delete a line of code. After a call to technical assistance and another hour of trial and error, I finally discovered the key.

Summary

Xchange is too complex to be feasible unless you have plenty of time to spend researching embedded codes and developing translation programs. To justify the task, you'd need to use a particular translation program many times.

With less programming effort, you can use Xchange's search-and-replace function to change text in files such as data bases—Xchange can insert or delete character strings at the start or end of a file. Emulation Technologies suggests using Xchange to translate files from word processors to automatic typesetting machines. An application of this scope would be worth the effort, but the program is not effective for small-scale translations. ■

Printer Marshal

by Eric Grevstad

Printer Marshal requires 128K. Client Marketing Systems, 2582 North Santiago Blvd., Orange, CA 92667, 714-921-1768. $29.95.

The advent of laser printers has brought a crop of memory-resident programs to simplify the job of sending escape sequences and control codes. Client Marketing Systems has taken the idea a step further, bundling three pop-up utilities together and offering them in versions for dozens of dot-matrix and laser models.

The utilities serve little purpose if you use Microsoft Word or other programs with sophisticated printer drivers; they help programs that lack printer controls of their own, spicing up plain text files or mixing bold titles and compressed columns in a spreadsheet.

Printer Deputy (11K) supplies pop-up menus of functions such as setting lines per page or putting a laser into landscape mode. It's mostly for general printer setup, though word processors with a pause-printing command like Wordstar's Control-PC will let you call Printer Deputy to change fonts between paragraphs.

Deputy Translator (6K) monitors all data in the printer pipeline, intercepting embedded, typed commands such as {ITALIC} or {6LPI} (six lines per inch) and converting them to non-printing codes. Printer Marshal (15K) does both functions, combining setup menus with lists of Translator equivalents.

The programs are not copy-protected, but use an installation program that reads the supplied ASCII file of your particular printer's codes and menus to make working utilities. Editing the ASCII file and re-installing the trio with your own menus and functions is easy enough; the thin manual has more detail about customizing the programs than using them.

Compared to fancy software drivers, the Printer Marshal tools are simple (underlining affects margins as well as text; two-word Translator commands like {BOLD OFF} are ignored if split by a line break). But they're cheap and effective—worth a look for dot-matrix owners who use generic software or the DOS Print command—and very convenient for laser printers. ■

FINE LINES

Keys to the Kingdom

■ by Harry Bee ■

When last we visited the kingdom, Squire Waldo, having rescued the king's daughter, fair Gwendolyn, found himself with 500 yards of golden rope, an uncertain land grant, and a one-way ticket to far-far-away. The question was how much land would Waldo's rope enclose? Would it make him rich enough to sue for the hand of the princess?

All of you agreed that Waldo laid out his rope in a circle, if he was at all sharp. That promised to net him 19,894.4 square yards of the king's real estate. Close to the kingdom's business district, two-and-a-half acres might have made the young squire a landholder to reckon with; in the boondocks, what the lad had was a meager farmstead at best.

Several of your solutions demonstrated that, given a constant perimeter, the area of regular polygons increases with the number of sides. Mark Carusa (Stanton, CA) pointed out that regular figures enclose more area than irregular ones—a property that holds true for circles, which have more area than other ellipses with the same circumference. Charles Dills (San Luis Obispo, CA) made his program interesting with a table that shows how the area and the factors involved in calculating it change as the number of sides increases. As a bonus, his solution (Program Listing 1) demonstrates the close relationship between proving the answer to Waldo's problem and a method of approximating pi.

Is Waldo forever doomed to subsistence farming? Not if he takes the advice of Dr. Thomas Easton (Belfast, Waldo County, ME.) "If Waldo is clever," writes Tom, "he'll unravel the rope into its constituent strands, as Dido of Carthage pared the bull's hide into a thong, and claim not only the kingdom's newest landholdings, but all the old lands as well." I love a devious mind.

Summing Up

Last October, I also asked you which two sets of consecutive positive integers added up to exactly 100? Then I wondered aloud how many sets of consecutive even numbers totaled 100? Unable to leave well enough alone, I impulsively suggested that you send along programs capable of finding "any definable series of integers that add up to any other integer." The impulse got me into a bit of trouble that I'll tell you about later.

First, though, the two series that answer the first question are nine through 16 and 18 through 22. The answer to the second question is two sets of even numbers—16 through 24 and 22 through 28.

Most of your programs used brute force to get the answers: Within one loop that stepped through all the possible starting points, you enclosed another to add consecutive values until you found the total you wanted, or failed to (see Program Listing 2). It's easy to fall into the trap of reaching for the brute force method of problem solving when you're writing a program. The computer's ability to perform feats of strength and endurance without your breaking a sweat is seductive. Sometimes brute force is the only way to solve a problem, and it always works no matter what the situation, but it's also always slow and cumbersome. Before you settle for it, look for a more dignified approach.

Patrick Gainer (Tanner, WV) worked out a pretty solution to my original question by examining how the sum of a series of consecutive integers comes about. If the first number is X, Pat explained, the sum of a sequence N + 1 elements long is X + (X + 1) + (X + 2) + . . . + (X + N). If you factor out X, another way of looking at it is X times the number of elements (N + 1) plus the sum of consecutive integers from 1 to N, or X*(N + 1) + N*(N + 1)/2, an expression you'll find in any decent math text. If the sum is S, and you solve for the starting point, X, in terms of the number of additional elements, N, you get the nifty equation at the end of line 10 in Program Listing 3.

Robert McClernan (Kearney, MO) streamlined the arithmetic and added another variable, I, to represent the interval between numbers. Robert's program, shown in Program Listing 4, improves on Patrick's by solving the puzzle for not only even numbers, but odd ones and any series of consecutive numbers with a consistent interval. Both of these programs produce results much more quickly than the brute force approach.

"Any definable series? Oh, yeah? What do you mean by definable? What do you call a series?" wrote Julius Nadas (Chicago, IL). He took me to task for my impulsive, fuzzy suggestion. Julius's program (Program Listing 5) shows how much trouble a poorly stated objective can cause. In case you don't want to give up your computers for the weeks it takes the program to generate solutions, I'll share its results for my original sum: In addition to the sequences I've already mentioned, nine sets of multiples—such as 10 + 15 + 20 + 25 + 30—and 69 arithmetic series consisting of two or more elements add up to 100. There are 444,793 sets of positive integers that add up to 100, if you don't allow numbers to repeat within the set; with repetitions, you get 190,569,292 sets.

There's more, but you get the idea. Julius is right, and his joke on me underscores a point I've made more than once in this space: A good program begins with a clearly defined goal. Don't you let me forget it.

Disk Business

Several of you have asked if it's necessary to send a disk with your Fine Lines solutions. No. Just keep your programs as brief as possible. To some, brief means crowded; to others, brief is elegant; to me, brief is brief. It's no trouble to type in a few lines of code, but it's often a chore to decipher your more inventive solutions. I welcome a few words of explanation to point me in the right direction, and if you get the urge to chat, I always enjoy hearing from you.

World-class Series

All this talk about series—and because I'm writing this as the St. Louis–Minnesota World Series gets under way—leads me to this month's puzzle. Many applications require you to supply your program with a specific set of numbers. They might be

Photograph by Stella Johnson

screen locations for a chart, factors in a simulation, or steps in a tax table. Often you know what the numbers are, and you may want to include them as data for your program to read. Data statements work well when the list is small. When you have a lot of numbers, however, it's to your advantage (and your program's) to find a compact routine to generate them.

It's easy enough to construct a simple loop to produce a "definable" series of numbers. Anyone can do it. For instance, suppose you wanted to generate the series 1, 3, 5, 7, 9, 11, . . . and so forth. You'd start by initializing a couple of variables, such as L = 0:N = 0. Then you'd set a limit for the series with the loop:

```
WHILE L<25:N = N + 1:PRINT STR$(N^2 - L
^2);",";:L = N:WEND.
```

What? You thought it was the series of odd numbers, N*2 – 1? Maybe it was. Or maybe it was the series of sums of adjacent integers:

```
FOR L = 0 TO 24:N = L + 1:PRINT STR$(L + N);
",";:NEXT L.
```

All of which proves that you can always find more than one road to get where you're going, or that things are seldom what they seem at first glance. In this case I opt for the latter. While it's a simple task to program a loop of some sort to generate a series of numbers, the hard part is to recognize that you have a series you can define. Such is the nature of the items below. You can reproduce and extend each of them with a couple of variables and a few simple statements. You just have to figure out the relationship among the terms and what the next elements in each series might be.

A. 99, 98, 94, 76, –20, . . .
B. 149, 162, 536, 496, . . .
C. 3, 6, 1, 4, 7, 2, 5, 0, 3, . . .
D. !#&*/5<D, . . .
E. 23, 52.9, 121.67, 279.841, . . .
F. 182764125216343, . . .

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 January 15, 1988, to be considered for the April 1988 issue and a T-shirt if we use it.
3. Employees of CW 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 your 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. Charles Dills approaches circular thinking.

```
5241 | 1Ø PRINT" Sides"," Side length"," Angle"," Area",CHR$(34);"Pi";CHR$(34):
       PRINT
3051 | 2Ø PERIMETER=5ØØ:SIDES=3:GAP=1:WHILE SIDES<1ØØØ
8722 | 3Ø SEGMENT=PERIMETER/SIDES:ANGLE=36Ø/SIDES:RADIANS=ANGLE/36Ø*6.28318:ARE
       A=SIDES*(SEGMENT/2)^2/TAN(RADIANS/2):PI=PERIMETER^2/(4*AREA)
5025 | 4Ø PRINT SIDES,SEGMENT,ANGLE,AREA,PI:SIDES=SIDES+GAP:GAP=GAP+1:WEND:PRIN
       T
5461 | 5Ø PRINT "A circle with the same perimeter:",(PERIMETER/6.28318)^2*3.141
       59
```

Program Listing 2. Brutality.

```
1Ø745 | 1Ø INPUT "Sum, Step";SUM,STP:FOR I=1 TO SUM/2:ADD=I:TOTAL=Ø:WHILE TOTAL<
        SUM:TOTAL=TOTAL+ADD:ADD=ADD+STP:WEND:IF TOTAL=SUM THEN PRINT "From";I
        ;"to";ADD-STP
 1509 | 2Ø NEXT I:PRINT:GOTO 1Ø
```

Program Listing 3. Patrick Gainer's arithmetic reduction.

```
4198 | 1Ø INPUT"Sum: ",S:N=Ø:WHILE (N*N+N)<=2*S:N=N+1:X=(2*S-N*N-N)/(2*(N+1))
5Ø3Ø | 2Ø IF INT(X)=X THEN PRINT"Beginning with";STR$(X);",";N+1;"integers."
1388 | 3Ø WEND:PRINT:GOTO 1Ø
```

Program Listing 4. Robert McClernan extends the series.

```
4121 | 1Ø CLEAR:DEFINT I,J,K:J=1:INPUT"Enter Sum, Interval";S,I
4819 | 2Ø J=J+1:X=(S/J)-(J-1)*(I/2):IF X<1 THEN PRINT:GOTO 1Ø ELSE IF X<>INT(X)
       THEN 2Ø
6789 | 3Ø PRINT J;"terms:";:FOR K=Ø TO J-1:PRINT STR$(X+K*I);",";:NEXT K:LOCATE
       CSRLIN,POS(Ø)-1:PRINT".":GOTO 2Ø
```

Program Listing 5. Julius Nadas takes me to task.

```
5Ø21 | 1Ø CLS:CLEAR ,,1ØØØØ:DEFINT A-M,O-Z:DIM T(99),A(99):INPUT "Enter a numbe
       r";S
9982 | 5Ø PRINT:PRINT"The prime factors of"S"are:";:P=2:Q=S:WHILE P*P<=Q:WHILE
       P<>Q AND INT(Q/P)*P=Q:PRINT P;"*";:Q=Q/P:WEND:P=P+1-(P<>2):WEND:PRINT
       Q
12721 | 6Ø PRINT"There are";:Q=S:N=1:WHILE INT(Q/2)*2=Q:Q=Q/2:WEND:P=3:WHILE P*P
       <=Q:M=1:WHILE INT(Q/P)*P=Q:M=M+1:Q=Q/P:WEND:P=P+2:N=N*M:WEND:N=N*(1-(
       Q<>1)):PRINT N-1"sequences whose sum is";S
7783 | 7Ø PRINT"Sequences which add up to"S"are:":FOR B=1 TO S/2:C=S+S+B*B-B:D=
       INT(SQR(C)):IF D*D+D=C THEN PRINT B"..."D
1Ø356 | 9Ø NEXT B:PRINT"Integral multiples which add up to"S"are:":FOR M1=1 TO S
       QR(S):IF M1*INT(S/M1)=S THEN M=M1:GOSUB 11Ø:M=S/M1:IF M<>M1 THEN GOSU
       B 11Ø
 1205 | 1ØØ NEXT M1:GOTO 13Ø
7439 | 11Ø S1=S/M:FOR B=1 TO M/2:C=M+M+B*B-B:D=INT(SQR(C)):IF D*D+D=C THEN PRIN
       T "Multiples of"S1"from"B*S1"thru"D*S1
 1134 | 12Ø NEXT B:RETURN
13204 | 13Ø PRINT "Arithmetic series which add up to"S"are:":FOR I = 1 TO S:FOR
       F=1 TO I:B=F:T=F:A=F:WHILE B+B+I<=S:WHILE T<S:A=A+I:T=T+A:WEND:IF T=
       S THEN PRINT B"to"A"in steps of"I:T=T-B:B=B+I
3265 | 14Ø WHILE T>S:T=T-B:B=B+I:WEND:WEND:NEXT F:NEXT I
4973 | 15Ø PRINT"Sets which add up to "S":":X=Ø:A(X)=Ø:T(X)=Ø:GOSUB 16Ø:GOTO 19
       Ø
8574 | 16Ø A(X+1)=A(X)+1:T(X+1)=T(X)+A(X):X=X+1:WHILE T(X)+A(X)*3+3<=S:GOSUB 16
       Ø:WEND:WHILE T(X)+A(X)*2+1<=S:GOSUB 17Ø:WEND:X=X-1:GOSUB 17Ø:RETURN
4748 | 17Ø FOR X1=1 TO X:PRINT A(X1);:NEXT X1:PRINT S-T(X)-A(X):A(X)=A(X)+1:RET
       URN
5Ø12 | 19Ø PRINT"Sets which add up to "S":":X=Ø:A(X)=1:T(X)=-1:GOSUB 2ØØ:GOTO 2
       1Ø
8286 | 2ØØ A(X+1)=A(X):T(X+1)=T(X)+A(X):X=X+1:WHILE T(X)+A(X)*3<=S:GOSUB 2ØØ:WE
       ND:WHILE T(X)+A(X)*2<=S:GOSUB 17Ø:WEND:X=X-1:GOSUB 17Ø:RETURN
768Ø | 21Ø PRINT"There are"2^(S-1)"permutations of sets which add up to "S":":X
       =Ø:A(X)=1:T(X)=-1:GOSUB 22Ø:END
81Ø5 | 22Ø A(X+1)=1:T(X+1)=T(X)+A(X):X=X+1:WHILE T(X)+A(X)+2<=S:GOSUB 22Ø:WEND:
       WHILE T(X)+A(X)+1<=S:GOSUB 17Ø:WEND:X=X-1:GOSUB 17Ø:RETURN
```

1987 ARTICLE INDEX

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APPLICATION

Barton, "Land of the Bulging Files," 10:56. (1000/1200/3000) Help organize and put order to all those small files on floppies.

BUSINESS

Bradshaw, "Payday Made Easy," 4:56. (4, 1000 w/changes) An easy-to-use Model 4/Tandy 1000 payroll program.

Jenkins, "Tally and Track," 7:44. (4, 1000, 3000) A menu-driven budget-analyzing program that features screen or printer listings of the status of up to 26 individual accounts.

Quindry, "Business Bargains," 10:87. Discussion of business shareware available for MS-DOS.

Richardson, "Taking Stock of Your Stock," 7:50. (III/4, 1000/1200/2000) Stoctrac lets you track a portfolio of up to 20 different stocks.

DATA-BASE MANAGEMENT

McMullan, "The No-Nonsense Disk Editor," 7:63. (4, 1000) A disk editor that takes data, organizes it, and stores it.

GENERAL

Crew, "So, You Want to Buy a House?" 3:54. (4, 1000, and others w/changes) Determine how much house you can afford.

Essex, "Where Are They Now?," 8:53. Find out what past luminaries of the TRS-80 world are doing today.

"The Family Tree," 8:66. Trace the evolution of every Tandy computer ever made.

Fosdick, "Checking References," 1:48. (1000/1200/3000, 4 w/changes) Catalog anything with this easy-to-use reference data base.

Moffat, "Taking Measure," 2:48. (1000, III/4 w/changes) Calculate material requirements for improvement projects.

"Tandy Trivia," 8:60. Can you name all the TRS-80 clones? All the TRS-80 DOSes?

Tonkin, "That Thinking Feeling," 2:42. (1000, 4 w/changes) A thought outliner that simplifies the task of organizing ideas.

White, "The Tandy Story," 8:50. It all started 10 years ago in a converted used-car showroom. . . .

GRAPHICS

Albrecht and Inman, "Understanding Tandy 1000 Graphics," 4:42. (1000) An introduction to GW-Basic's graphics abilities on the Tandy 1000.

Goben, "Add Pizzazz to Your Characters," 12:46. (1000) Enhance your Tandy 1000's display with customized text characters.

Heuer, "Putting It on the Line," 9:77. (4) Plot data on a line graph using your Model 4.

Wolfskill, "Tandy 1000 Custom Character Generator," 6:58. (1000) Create a data base of custom text fonts and graphics symbols.

HARDWARE

Clinton, "Troubleshooting Your Tandy 1000," 9:80. (1000) Fix some common hardware problems yourself.

Collins and Alford, "All the Way to 320K," 10:60. (4/4P) Gain four 64K memory banks with this do-it-yourself modification.

Harrell, "Disk Repair 101," 3:42. (1000) Learn the basics of fixing crashed MS-DOS disks and using debug.

SCIENCE/MATH

Refinetti, "Easy Interpolation," 3:72. (4, 1000/1200/3000 w/changes) Determine the relationship between variables on your computer.

Swatloski, "Test Tester," 8:78. (I/III/4, 1000) Perform statistical analyses on test and other data.

TUTORIAL

Brothers, "8088 Assembly Language: Learning the First Steps," 6:38. (1000) Learn MS-DOS assembly-language programming.

Feldman, "The Custom Cable Connection," 3:62. Make your own cables to connect serial devices to your computer.

Gadd, "All About Allwrite," 1:78. (I/III/4/4P) Squeeze more utility out of Prosoft's popular word processor.

Gernhardt Jr., "File Relocation at 9,600 Baud," 7:72. (III/4/4D) Transfer files speedily from a Model III or 4 to a Tandy 1000.

Goben, "Turning Pro," 9:66. (4) Convert your customized Superscripsit printer drivers to work with Scripsit Pro.

Heenan, "Deskmate Printer Control," 5:90 (8:80). (1000) Use ASCII characters for printer control codes in Deskmate text.

Holtzman, "Life Above 640K," 10:44. (1000/3000) The LIM Expanded Memory Specification (EMS), what it is and does.

McComas, "Teach Deskmate New Tricks," 11:52. (1000) Enhance Deskmate II with printer codes, headers, footers.

Welch, "Good-bye Floppy," 1:40. (All) Mass-storage alternatives to floppy disks.

Williams, "Basic and Assembly: Together Again," 4:109. (1000) Combine the speed of assembly language with the ease of Basic.

UTILITY

Andrews, "Functions Defined," 11:71. (1000, 4) DEF FN routines from our readers.

Bass, "Profile Handler," 7:78. (III/4/4P/4D) Allows you to merge Profile data files with Superscripsit text files more easily.

Bulmur, "Routine Plays," 3:78. (All) Two subroutines that find errors and make corrections on a data-base file.

Chaiken, "Remote Possibilities," 1:73. (III) Remote data-transmission rates up to 9,600 baud.

Chaiken, "Memdisk III," 6:51. (4) A Model 4-like Memdisk in III mode.

Coffin, "Set Drive Zero Free," 1:69. (4) Liberate your disk drives by creating a memory-resident version of TRSDOS 6.x.

Collicott, "Easy Labels," 7:76. (4, 1000) Make custom individual labels quickly with your 4 or 1000.

Collicott, "No More Pencils, No More Rulers," 11:57. (1000, 4) Create customized graph paper on a dot-matrix printer.

Cooper, "Changing of the Guard," 2:60. (1000) Change the files attribute byte to hide a file from the directory or make it read-only.

Cooper, "Deep-Six Your Directories," 3:70. (1000) Rid your disks of unwanted subdirectories and files with just a few keystrokes.

Cooper, "Hidden Attributes," 1:66. (1000) A simple way to keep your MS-DOS subdirectory files under cover.

Fox, "Improve Your Backups," 6:79. (4) Clear or set MOD flags when backing up files.

Gainer, "Free Your Trapped Superscripsit Files," 7:59. (III/4) Save your too-large Superscripsit files by splitting them in two.

Gemmell, "Inner Vision," 2:66. (4) Page through memory on your Model 4 with a dynamic-memory monitor.

Goben, "A Disassembler for All DOSes," 8:86. (I/III/4) Dissassemble assembly programs written under nearly any Model I/III/4 DOS.

Goben, "Data Statement Generator," 5:80. (All) Convert assembly code to Basic data statements with checksums.

Goben, "In Search of Lost Superscripsit Files," 4:114. (I/III/4) Reconstruct crashed Superscripsit files with a minimum of fuss.

Goben, "Jumping Flash Backup," 7:69. (4/4P/4D) Back up your TRSDOS 6.x or LDOS disks in just one pass.

Goben, "Switching Station," 2:62. (4 in III mode) Bank switching for the Model 4 in Model III mode.

Hall, "A Fine Trio of Fonts," 6:82. (4) Add three character sets to a Tandy DMP printer.

Hawes, "A Quick Comparison," 5:69. (4) Display two Model 4 text files on split screen and compare them.

Hawes, "KSM Helper," 3:66. (III, 4) Take greater advantage of the Model 4's keystroke-multiply filter.

Kuzminski, "Data to Order," 8:69. (4, 1000/2000) Generate dummy data to test your home-brew programs.

McMullan, "Communal Data Entry," 8:75. (III/4, 1000) Enter data on either MS-DOS or TRSDOS computers with this common data-entry routine.

McMullan, "Label Your Disks. . .Automatically," 12:69. (1000, 4) Print up to 24 names on a standard mailing label.

Mueller, "Calendars to Go," 9:73. (III/4, 1000) Create activity calendars for all occasions.

Ratzlaff, "Imperfect Matches," 1:60. (4) Pinpoint differences between two similar files.

Risler, "The Old Shell Game," 1:81. (4) Automate TRSDOS 6 with a customized shell.

Roberts, "Supercharge Your BBS," 4:74. (4) A BBS driver that adds difficult-to-program features to your Basic BBS.

Rowell, "Quick Boot," 5:46. (1000) Bypass the 1000's memory test on a warm reboot.

Scheer, "CRT Saver," 10:75. (4) Protect your video screen from burn-in.

Tercier, "Caught in a Time Stamp," 5:65. (4, 1000/1200/3000) Automatically insert time stamps in first line of programs.

Tonkin, "Make It Snappy," 11:44. (1000) A basic compiler that outputs assembly source code.

Wolstrup, "Strip Your TRSDOS," 5:84. Purge unprotected files from your system disks in one step.

Wright, "The Route to DOS," 6:72 (8:48). (I/III/4) Perform DOS functions without leaving Superscripsit.

Williams, "Leave the Printing to Spooli," 5:58 (8:80). (1000/1200/3000) Set up a RAM buffer to free your Tandy 1000 while printing files.

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JANUARY

"Checking References" (48). Keyword-indexed database. (4, MS-DOS)
"Imperfect Matches" (60). Compare two similar files. (4)
"Hidden Attributes" (66). Hide files in a directory. (MS-DOS)
"Set Drive Zero Free" (69). Memory disk. (4)
"Remote Possibilities" (73). Access your Model III remotely. (III)

"The Old Shell Game" (81). Automate TRSDOS commands with a customized shell. (4)
The Next Step (106). Build macro and subroutine libraries. (4)

FEBRUARY

"That Thinking Feeling" (42). Thought outliner. (4, MS-DOS)
"Taking Measure" (48). Calculate material requirements for home improvements. (III/4, MS-DOS)
"Changing of the Guard" (60). Change a file's attribute byte. (MS-DOS)
"Switching Station" (62). Bank switching in the Model III mode. (4)
"Inner Vision" (66). Page through memory. (4)
The Next Step (86). Find out where a file is stored on disk. (4)

MARCH

"Disk Repair 101" (42). Analyze key areas of a PC-/MS-DOS floppy disk. (MS-DOS)
"So You Want to Buy a House" (54). Determine the home you can afford. (4, MS-DOS)
"KSM Helper" (66). Expand and edit keystroke-multiply files. (III/4)
"Easy Interpolation" (72). Interpolate mathematical equations as points on a curve. (III/4)
"Routine Plays" (78). Correct errors in data-base files using these subroutines. (I/III/4)
The Next Step (95). Take control of your video. (4)

APRIL

"Payday Made Easy" (56). Calculate and print current and month-to-date payroll reports. (4, MS-DOS)
"Supercharge Your BBS" (74). A driver that adds features to your Basic BBS. (4, MS-DOS)
"In Search of Lost Superscripsit Files" (114). Reconstruct crashed Superscripsit files. (I/III/4)
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MAY

"Quick Boot" (46). Bypass the 1000's memory test on a warm reboot. (MS-DOS)
"Leave the Printing to Spooli" (58). Set up a RAM buffer to free your 1000 while printing. (MS-DOS)
"Caught in a Time Stamp" (65). Time-stamp your Basic programs. (I/III/4)
"A Quick Comparison" (69). Compare two ASCII files. (III/4)
"Data-Statement Generator" (80). Convert assembly-language source code to Basic Data statements. (I/III/4, MS-DOS)
"Strip Your TRSDOS" (84). Remove unprotected files. (4)
The Next Step (103). Use Pro-Wam to access your printer's special features. (4)

JUNE

"Memdisk III" (51). Create a 75K Memdisk on your Model 4 in the III mode. (4)
"Tandy 1000 Custom Character Generator" (58). Design graphics screens. (MS-DOS)
"The Route to DOS" (72). Execute DOS commands from within Superscripsit. (III/4)
"Improve Your Backups" (79). Set or clear the MOD flags of TRSDOS 6.2. (4)
"A Fine Trio of Fonts" (82). Add three character sets to your Tandy DMP printer. (4)
John's MS-DOS Column (93). Switch the \ character to something else for convenience. (MS-DOS).
The Next Step (98). Learn how to use the alternate banks of memory in the Model 4. (4)

JULY

"Tally and Track" (44). Organize checks by category, balance your checkbook, and obtain budget information. (4, MS-DOS)
"Taking Stock of Your Stock" (50). Follow the performance of your stock investments. (4, MS-DOS)
"The No-Nonsense Disk Editor" (63). Organize, edit, and store commodities data or other data. (4, MS-DOS)
"Jumping Flash Backup" (69). Back up your TRSDOS 6.x or LDOS disks in a single pass. (4)
"Easy Labels" (76). Print custom labels in five print styles. (4, MS-DOS)
"Profile Handler" (78). Merge Profile data files with Superscripsit text files. (III/4)
John's MS-DOS Column (84). Change the working directory. (MS-DOS)
The Next Step (92). A help filter for help screens. (4)

AUGUST

"Data to Order" (69). Generate dummy data to test your home-brew programs. (4, MS-DOS)
"Communal Data Entry" (75). Set up a data base with this common data-entry routine. (III/4, MS-DOS)
"Test Tester" (78). Perform statistical analysis on test and other data. (I/III/4, MS-DOS)
"A Disassembler for All DOSes" (86). Disassemble Model I/III/4 object code files. (I/III/4)
The Next Step (101). Understand the LS-DOS 6.3 security system. (4)

SEPTEMBER

"Turning Pro" (66). Convert Superscripsit printer drivers to work with Scripsit Pro. (4)
"Calendars to Go" (73). Print activity calendars for your club, school, church, or family. (III/4, MS-DOS)
"Putting It on the Line" (77). Produce line graphs on a dot-matrix printer. (4)
The Next Step (97). Use reserved SVCs to link assembly routines with Basic. (4)

OCTOBER

"Life Above 640K" (44), Memstat, a program that provides a status report on system and EMS memory. (MS-DOS)
"The Land of the Bulging Files" (56). Put some order to all those small files on your floppies. (MS-DOS)
"CRT Saver" (75). Protect your video screen from phosphor burn-in. (4)
"All the Way to 320K" (60). Gain four 64K memory banks with this do-it-yourself modification. (4)
The Next Step (91). Use pop-up windows on your Model 4. (4)
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"Make It Snappy" (44). A Basic compiler that converts Basic code to speedy assembly. (MS-DOS)
"No More Pencils, No More Rulers" (57). Create customized graph paper on a dot-matrix printer. (4, MS-DOS)
The Next Step (82). Extended memory handler using alternate memory banks. (4)
Bonus program: "Filecard-80." A menu-driven file-card management system. (III)

DECEMBER

"Adding Pizzazz to Your Characters" (46). Create customized text characters on the Tandy 1000. (MS-DOS)
"Label Your Disks. . .Automatically" (69). Avoid labeling your disks by hand. (4, MS-DOS)
The Next Step (89). A disk sector recovery program. (4)
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READER FORUM

edited by Mare-Anne Jarvela

MERGING DONOR LINES

■The hard way to insert your routines into a program you're developing is to merge parts saved in ASCII. The easy way is to load the "donor" program, list the part you want to screen (renumber it if you like), and load the "receiving" program (but don't list it).

Move the cursor to the beginning of the first line of the donor program, and press the enter key. Press enter for each line you want absorbed into the program you are developing. When the cursor stops moving, you're finished.

David P. Hunter
Champaign, IL

JULIAN DAYS FOR THE NEW YEAR

■The Julian Day (JD) number of a given date is the number of days that have elapsed since Jan. 1, 4713 B.C., Julian Day zero. You can find the number of days between dates by subtracting their Julian Day numbers.

The program Julday (see Program Listing 1) performs conversions between calendar dates and Julian Day numbers. I based it on a program published in *TRS-80 Microcomputer News* (January 1981) and added some features.

The program not only converts calendar dates to Julian Days, but also Julian Day numbers to dates. It is accurate over the entire Julian Period. The Julian calendar extends from JD zero to JD 2299160, Oct. 4, 1582 A.D. The Gregorian calendar begins with JD 2299161, Oct. 15, 1582 A.D. The intervening calendar dates are non-existent.

When you convert calendar dates to Julian Day numbers, enter the month, day, and year as integers. Enter the years B.C. as negative numbers. Do not abbreviate the year; "88" means 88 A.D., not 1988 A.D. The Figure shows some sample calculations.

Jack Porter
San Diego, Ca

Figure. Sample calculations for Julian Day conversion.

```
JULIAN DAY NUMBER CALCULATOR
1. Calculate Julian Day,  2. Calculate calendar date? 1
Month, Day, Year? 12,31,1987
Thursday, December 31, 1987 A.D.  -  Julian Day 2447161

Month, Day, Year? 3,15,-44
Wednesday, March 15, 44 B.C.  -  Julian Day 1705426
```

Program Listing 1. Julday.
See page 80 for information on how to use checksums.

```
1879 | 110 DEFINT D-I, K-Y: DEFDBL C, J
1977 | 120 DIM C(2), D$(7), M(12), M$(12), Y$(2)
2031 | 130 C(1)=32113#: C(2)=32075#: C1=2299160#
1791 | 140 C2=1721058#: C3=365.2425#: I2=2
2258 | 150 FOR K1=1 TO 12: READ M(K1): NEXT K1
2477 | 160 DATA 31, 0, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31
2296 | 170 FOR K1=1 TO 12: READ M$(K1): NEXT K1
4133 | 180 DATA January, February, March, April, May, June
5207 | 190 DATA July, August, September, October, November, December
2237 | 200 FOR K1=1 TO 7: READ D$(K1): NEXT K1
6164 | 210 DATA Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday
1489 | 220 Y$(1)="A.D.": Y$(2)="B.C."
3395 | 230 CLS: PRINT TAB(14) "JULIAN DAY NUMBER CALCULATOR"
2844 | 240 PRINT "1. Calculate Julian Day,  ";
3238 | 250 INPUT "2. Calculate calendar date"; I1
1576 | 260 ON I1+1 GOTO 650, 270, 350
2666 | 270 INPUT "Month, Day, Year"; M1, D1, Y1
1112 | 280 IF M1=0 THEN 230
1404 | 290 IF Y1<0 THEN Y1=Y1+1
 744 | 300 GOSUB 500
1336 | 310 IF D1>M(M1) THEN 340
 752 | 320 GOSUB 560
1117 | 330 IF K5<3 THEN 460
2942 | 340 PRINT "Non-existent date": GOTO 270
1827 | 350 INPUT "Julian Day"; J1
1108 | 360 IF J1=0 THEN 230
1875 | 370 M1=1: D1=1: Y1=INT((J1-C2)/C3)
1916 | 380 IF J1>C1 THEN I2=2: ELSE I2=1
 759 | 390 GOSUB 560
 745 | 400 GOSUB 500
1242 | 410 Y4=INT((J1-J5)/D4)
2147 | 420 IF Y4<>0 THEN Y1=Y1+Y4: GOTO 390
1074 | 430 M1=1: D1=J1-J5+1
2895 | 440 IF D1>M(M1) THEN D1=D1-M(M1): M1=M1+1: GOTO 440
 756 | 450 GOSUB 560
2384 | 460 IF Y1<1 THEN Y1=Y1-1: I3=2: ELSE I3=1
3349 | 470 PRINT D$(D5); ", "; M$(M1); STR$(D1); ","; ABS(Y1); Y$(I3);
2534 | 480 PRINT "  -  Julian Day"; J5; CHR$(13)
1258 | 490 ON I1 GOTO 270, 350
1342 | 500 IF Y1<=1582 THEN 530
2690 | 510 IF Y1=400*INT(Y1/400) THEN D4=366: GOTO 540
2684 | 520 IF Y1=100*INT(Y1/100) THEN D4=365: GOTO 540
2670 | 530 IF Y1=4*INT(Y1/4) THEN D4=366: ELSE D4=365
2237 | 540 IF D4=366 THEN M(2)=29: ELSE M(2)=28
 666 | 550 RETURN
1517 | 560 K5=0: M6=FIX((M1-14)/12)
2153 | 570 J5=D1-C(I2)+INT(1461*(Y1+4800+M6)/4)
1830 | 580 J5=J5+INT(367*(M1-2-12*M6)/12)
2983 | 590 IF I2=2 THEN J5=J5-INT(3*INT((Y1+4900+M6)/100)/4)
1110 | 600 IF I1=2 THEN 630
1922 | 610 IF J5>C1 THEN I5=2: ELSE I5=1
1251 | 620 IF I5<>I2 THEN 640
1843 | 630 D5=J5-7*INT(J5/7)+1: RETURN
2921 | 640 I2=I5: K5=K5+1: IF K5<3 THEN 570: ELSE RETURN
 402 | 650 END
```

Program Listing 2. Test to ensure your printer is ready.

```
 910 | 100 DEF SEG=&H40
1963 | 110 PRTBASE=PEEK(9)*256+PEEK(8)+1
1923 | 120 IF INP(PRTBASE)=223 THEN 500
5546 | 130 IF INP(PRTBASE)<>223 THEN LOCATE 13,1:PRINT"Printer is not ready.":G
     |     OTO 120
     | 500 'Printer is now on line -- Begin the printer operations.
```

ARE YOU READY?

■I've had my computer hang up when I try to send something to my printer. It sometimes turns out the printer was off, but I had no indication anything was wrong.

I wanted to ensure the printer was ready. If you have an IBM or Epson printer, you can enter in Program Listing 2 into your program.

Line 100 points to the BIOS (basic input/output system) data area. Line 110 gets the input staus register address. Line 120 determines if the printer is ready and, if so, goes on with the program. If the printer isn't ready, line 130 displays an error message until it is ready.

Steve Tennison
Safety Harbor, FL

THAT TANDY KEYBOARD

■Michael Everson asked for information on an IBM-compatible keyboard for his Tandy 1000 (see Feedback Loop, September 1987, p. 14). A software solution is simpler and cheaper than an adapter and new keyboard.

You can use the MS-DOS 3.20 program, KEYCNVRT.SYS, to convert the insert and delete keys to the gray plus and minus keys, respectively. See the Key Convert Utility section in the appendix of your DOS reference manual.

I've found a couple of other key tricks. When you use Sidekick, the alternate-break combination acts as the scroll-lock key. Control-S acts as the left-arrow key.

In Framework II, the hold key acts as the scroll-lock key. The F11 function key acts as the "up level" key and F12 as the "down level" key. The insert key activates the current pull-down menu.

Arnold V. Scalpati
Ocean, NJ

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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
28 33 38 43 48	178 183 188 193 198	328 333 338 343 348	478 483 488 493 498
29 34 39 44 49	179 184 189 194 199	329 334 339 344 349	479 484 489 494 499
30 35 40 45 50	180 185 190 195 200	330 335 340 345 350	480 485 490 495 500
51 56 61 66 71	201 206 211 216 221	351 356 361 366 371	501 506 511 516 521
52 57 62 67 72	202 207 212 217 222	352 357 362 367 372	502 507 512 517 522
53 58 63 68 73	203 208 213 218 223	353 358 363 368 373	503 508 513 518 523
54 59 64 69 74	204 209 214 219 224	354 359 364 369 374	504 509 514 519 524
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101 106 111 116 121	251 256 261 266 271	401 406 411 416 421	551 556 561 566 571
102 107 112 117 122	252 257 262 267 272	402 407 412 417 422	552 557 562 567 572
103 108 113 118 123	253 258 263 268 273	403 408 413 418 423	553 558 563 568 573
104 109 114 119 124	254 259 264 269 274	404 409 414 419 424	554 559 564 569 574
105 110 115 120 125	255 260 265 270 275	405 410 415 420 425	555 560 565 570 575
126 131 136 141 146	276 281 286 291 296	426 431 436 441 446	576 581 586 591 596
127 132 137 142 147	277 282 287 292 297	427 432 437 442 447	577 582 587 592 597
128 133 138 143 148	278 283 288 293 298	428 433 438 443 448	578 583 588 593 598
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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 is made up exclusively of remarks, 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. By using this Checksum program to enter Basic programs found in *80 Micro*, you can test the accuracy of your typing a line at a time as you enter the program.

When you are ready to enter a program found in *80 Micro*, load and run Checksum. The program will prompt you with the message "Checksum program ready." Enter the first line of the new program without the checksum number and bar at the beginning of the line. Do not type in comments at the end of a line. Press enter. The line will be redisplayed with a checksum at the front of the line before the line number. Compare this number with the one found in *80 Micro*. If they are the same, you have typed the line correctly and can go on to the next line. If they are not the same, you made an error in your typing.

When you find the error, use the cursor control keys to move the cursor to the first space of the line just typed. Press the delete key seven times to delete the checksum on the line. Move the cursor to the part of the line that is in error, and correct it by typing over the error with the right information or use the insert and delete keys to add or delete information. Press enter and recheck the checksum number. If you prefer, you can retype the entire line. The new line will replace the old line. To delete an entire line, just type the line number.

After you enter the entire program and check each line, you need to save the program to disk with the Save command.

Because the Checksum program replaces the computer's Basic line editor, it has to include many of Basic's commands. Checksum simulates List, LList, Load, Save, Files, and New commands. These are used in the same format and perform as they would in Basic. Checksum has 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.

After you type in a program and save it to disk, you can exit the checksum program with the Basic command. This takes you back to the Basic editor. You can now load your new program as usual and run it. You may want to save the new program to disk again because 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 the Checksum program unless you convert it back to

an ASCII file. You can do this with the Basic editor by using the SAVE"file name",A command. You can prepare any Basic program in this way to be used with the Checksum program, not just ones found in *80 Micro*.

When using the List, LList, Check, or LCheck commands, you can stop the listing by pressing any key (except control-break). If you enter New, the program prompts you to press "Y" to confirm that you want to erase the program that is currently in memory.

The Checksum program is well worth the time it takes to type it in and get it up and running. It will save you hours in looking for typing errors, and you will know your programs will run right the first time.

Program Listing. Checksum.

```
      | 10 'Automatic Checksum Program Version 1.0 by Randall D. Hamilton
4440  | 20 DIM LS(500),LNUM(500):COLOR 13,1,1:KEY OFF:CLS:MAX=0:LNUM(0)=65536!:C
      LS
1671  | 30 DEF SEG=&H40:W=PEEK(&H4A)
4380  | 40 ON ERROR GOTO 620:PRINT:PRINT"Checksum Program Ready."
3389  | 50 LINE INPUT LS:Y=CSRLIN-INT(LEN(LS)/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 LS:DEF SEG:IF LS="" THEN 50
2679  | 70 IF LEFT$(LS,1)=" " THEN LS=MID$(LS,2):GOTO 70
2204  | 80 IF ASC(LS)>57 OR ASC(LS)<48 THEN 210
4235  | 90 BL=INSTR(LS," "):IF BL=0 THEN BL$=LS:GOTO 100 ELSE BL$=LEFT$(LS,BL-1)
3089  | 100 LNUM=VAL(BL$):TEXT$=MID$(LS,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 EL
      SE 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(LS):CKSUM=CKSUM+ASC(MID$(LS,I)):NEXT:LOCATE Y
      ,1
12314 | 170 IF CKSUM<10 THEN A$="    "+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$(CKSU
      M)+" "
 870  | 180 PRINT A$+LS
3408  | 190 GOSUB 540:IF LNUM(P)=LNUM THEN LS(P)=TEXT$:GOTO 50 'replace line
1253  | 200 GOSUB 560:GOTO 50 'insert the line
5579  | 210 TEXT$="":FOR I=1 TO LEN(LS):A=ASC(MID$(LS,I)):TEXT$=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$="LCHECK" THEN CKFLAG=1:OPEN "lpt1:" FOR OUTPUT AS #1:GOT
      O 340
2839  | 260 IF COMMAND$="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
9685  | 290 IF COMMAND$="NEW" THEN INPUT "Errase program - Are you sure";LS:IF L
      EFT$(LS,1)="y" OR LEFT$(LS,1)="Y" THEN MAX=0:LNUM(0)=65536!:GOTO 30:
      ELSE 30
4028  | 300 IF COMMAND$="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$=LS(X)
3512  | 410 IF LEFT$(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$+LS(X):FOR I=1 TO LEN(A$):CKSUM=CKSUM+ASC(MID$(A$,I)):N
      EXT
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$(CKSU
      M)+" "
1324  | 450 PRINT #1,A$+N$+LS(X)
1567  | 460 IF INKEY$<>"" 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,LS:BL=INSTR(LS," "):BL$=LEFT$(LS,BL-1
      ):LNUM(P)=VAL(BL$):LS(P)=MID$(LS,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$:GOTO 30
3610  | 540 P=0:WHILE LNUM>LNUM(P) AND P<MAX:P=P+1:WEND:RETURN
4677  | 550 MAX=MAX-1:FOR X=P TO MAX:LNUM(X)=LNUM(X+1):LS(X)=LS(X+1):NEXT:RETURN
6911  | 560 MAX=MAX+1:FOR X=MAX TO P+1 STEP -1:LNUM(X)=LNUM(X-1):LS(X)=LS(X-1):N
      EXT:LS(P)=TEXT$: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
```

Sounding Off on the 1000

■ by Hardin Brothers ■

Excuse me while I move from my Model 4 to my Tandy 1000.

We changed The Next Step. I'm writing about a different computer, and I'm changing this column's focus. Previously, The Next Step dealt primarily with assembly-language programming and interactions with the operating system. Now, I'll focus on the unique features of the Tandy 1000 and general programming techniques. I'll occasionally include assembly language, because sometimes it's the best or only way to accomplish a specific task. I'll also include plenty of Basic, some C, and maybe some Pascal.

'Tis the season for holiday parties, and there's no reason to leave the 1000 out of the celebrations. This month and next, I will explore the 1000's unique sound capabilities and ways to add sound to programs.

Several books and articles explain how to use the sound capabilities of PC-compatible computers, and all of those techniques work on the 1000. The 1000 has advanced sound capabilities that tend to be underused, and they will be the topic of the first two Next Steps of 1988.

In the Chips

To understand the 1000's sound system, you should start at the chip level and work up to the necessary programming. Inside your 1000 is a chip marked SN76496, a programmable tone and noise generator manufactured by Texas Instruments. The only computers that include this chip are the 1000 and the IBM PCjr.

This sound chip has 16 pins. Twelve of them concern programmers. The computer can send instructions through eight data lines to the chip, an audio input and audio output, a clock input, and a ready output. The remaining pins enable the chip and provide it with voltage and ground.

Eight registers or storage locations inside the SN76496 concern the programmer: three tone generators, one noise generator, and four volume controls. The chip is controlled and sound is produced by storing information in those registers. Internally, the chip uses the information in the tone and noise generators to create sound signals, send each signal through a volume control, and mix all the sounds together with any signals that arrive at the audio input pin. The resulting sound signal is sent to the 1000's speaker and, optionally, to the audio output jack in the back of the computer.

The wiring inside the 1000 sends sound signals generated by more traditional MS-DOS sound routines into the sound chip, where they are mixed with any tones the chip produces. I suspect that the chip partially "cleans" the input signal. Even when using the primitive, traditional sound algorithms, the 1000 produces more pleasant tones than many other computers.

The sound chip is wired into the 1000 as an I/O (input/output) device. All such devices are accessible to the CPU as a "port" through the use of In and Out instructions in machine language. Basic uses the same words, but the process is slower; in C, inp( ) and outp( ) perform the same functions. In Turbo Pascal, a pair of pseudo-arrays, Port[ ] and PortW[ ], provide access to I/O devices.

The CPU, and hence a program, can't retrieve useful information from the sound chip. It is a "write-only" device, which means program information can be sent to it but not read from it. The internal wiring of the 1000 sets the address of the sound chip as port 0C0 hex. Any byte sent to that port is automatically routed to the sound chip.

The 1000 doesn't completely decode the port 0C0 hexadecimal (hex) address; you can also access the sound chip through ports 0C1–0C7 hex. This range of addresses lets programs save time when writing to the port.

In assembly language, Turbo Pascal, and some versions of C, it's possible to send a 2-byte value to a port in a single instruction. The least-significant byte is sent to the designated port; the most-significant byte is sent to the next higher port. For example, the following assembly instructions send the byte 80 hex to port 0C0 hex and the value 20 hex to port 0C1 hex:

```
mov ax,2080h
out 0c0h,ax
```

The order is important: the sound chip receives a value of 80 hex and then a value of 20 hex. It doesn't know that the data was sent through two different port addresses. Unfortunately, this double-addressing technique is not possible in Basic, where the extra speed is most needed.

Sound Chip Instructions

Information is sent to the sound chip a byte at a time. The chip interprets each byte as a series of bit fields. Different parts of each byte have special meaning to the sound chip. A program (or programmer) must manipulate the individual bits in a byte before sending data to the chip.

The 8088 CPU and most desktop computers use 8-bit-wide bytes. Programmers normally number these bits from zero to 7. Bit zero is the right-most, least-significant bit, and bit 7 is the left-most, most-significant bit. If you have *The Tandy 1000 Technical Reference Manual*, read about the sound chip. Notice that Texas Instruments uses a different numbering scheme. In this article, I will use Intel's numbering for the 8088 CPU, not the numbering system in the Texas Instruments documentation.

Some values shown in the technical manual are different from those in this article. The documentation in the technical reference manual was written for two similar sound chips, and many of the numerical values in the manual apply to the slower of the two, the SN76494.

I found these values by experimenting with the sound chip in my 1000. Everything should work the same on 1000A/SX/EX/HX/TX machines, but I can't test the other models.

The first field in each instruction sent to the sound chip is a single bit wide. If bit 7 is set to a 1, the sound chip knows that a register address is included in the instruction. If bit 7 is reset (has a value of zero), the register address is implied and was stated explicitly in the previous instruction.

If bit 7 is set, the next 3 bits contain a register address. The eight sound-chip registers are numbered from 000 to 111 (binary). Figure 1 shows the register and

System Requirements: Tandy 1000

Photograph by Greg Newman

address pairs.

You should realize that once data is placed in a sound chip register, it stays there until it is replaced with a new instruction. For example, once you send the proper instructions to create a tone, that tone is produced continuously until a new instruction turns it off. At full volume, the sounds are loud enough to disturb your family and neighbors. If you can't turn off an annoying sound, you can always reset the computer.

Creating a Tone

A note's pitch is determined by the frequency of its sound wave. The frequency is the number of complete oscillations per second of the sound wave. Sound waves are usually measured in cycles per second or hertz (cps or Hz). Sending the frequency of a tone to the sound chip and having it produce that tone would be handy, but the chip doesn't work that way. The values placed in the frequency registers on the sound chip are not absolute frequencies. They represent a ratio between the chip's clock frequency and the desired tone frequency.

The clock frequency for the sound chip is supplied by the computer. In a 1000, the computer's main oscillator runs at 28.63636 megahertz (MHz), or 28,636,360 cycles per second. This signal is divided by eight to produce a 3.579545-MHz (3,579,545 Hz) signal that is sent to the clock input on the sound chip.

From a hardware perspective, the sound chip's handling of the clock frequency gets complicated. From a programmer's point of view, however, it is simpler. The chip divides the input-clock frequency by 32 to create a tone clock with a frequency of 111,860.7813 Hz (111.8607 kilohertz [kHz]). The values placed in the tone registers are ratios between the tone clock and the actual frequency of the output tone.

To create a specific tone, you must divide the tone-clock frequency by the tone's frequency to calculate the number to send to the sound chip. That number can be any integer from 1–1,023 or 3FF hex (a value of zero is interpreted by the sound chip as 1,024 or 400 hex).

Suppose you want to produce a 440-Hz tone (the traditional musical note of A that orchestras and bands use to tune). The value you need to place in a tone frequency register is the tone clock divided by 440, or 254.229+. Since the registers only hold integer values, rounding off our result produces a value of 254 or 0FE hex. See Figure 2 for a summary of the process.

The tone value can be up to 10 bits long, so it must be divided between 2 bytes. The first byte sent to the sound chip contains the tone generator address and the 4 least-significant bits of the desired tone. The second byte contains the 6 most-significant bits of the tone value. At first, the process seems complicated, but in an actual program, the algorithm can be expressed in two lines as shown in Figure 2.

To see it work, enter Basic and type:

```
OUT &HC0, &H8E
OUT &HC0, &H0F
```

Setting the Volume

If nothing happened when you typed those lines, don't worry. Your computer isn't broken. You need to increase the volume. Four volume controls are in the sound chip: one for each tone generator and one for the noise generator. Technically, they aren't volume controls. They are attenuators, since each reduces the sound produced by the generators. The difference is more important to hardware hackers than programmers.

Each volume register can contain values from zero–15 (0F hex or 1111 binary). The larger the number, the quieter the sound that comes from the chip. If you place a value of 15 in a volume register, output from the associated generator is completely turned off. The 1000's bootup sequence loads a 15 into each volume register to ensure that all four generators are normally turned off.

One byte has room for the address flag bit, the volume register address, and the volume level value. Figure 3 shows how they are all put together. By following the information in Figure 3, you can hear the tone you just created by typing:

```
OUT &HC0, &H98
```

That's half-volume. To determine know how loud each channel can be, type:

```
OUT &HC0, &H90
```

Before your neighbors complain too much, you can turn off the sound by typing:

```
OUT &HC0, &H9F
```

Simple Programs

So far, we can create a program to demonstrate the sound chip's possible tonal and volume ranges. Program Listing 1, which is written for interpreted Basic, contains that program.

Listing 1 begins by turning on the volume control for tone generator 1. Then it sends commands to the sound chip for every frequency that the chip can produce. As the first part of the program runs, you might hear short clicking noises, especially when it produces the higher notes. This is not a defect in the sound chip or the program. It's the result of Basic's slow operation. Each click lasts from the time the first Out instruction is executed to the time the second Out instruction occurs. The time in between is taken up by Basic's interpretation of the second Out instruction. If you write the program in a compiled language, the clicks should disappear.

The second part of Listing 1 sets the tone generator to a mid-range tone and then turns the volume control from loud to soft and back to loud. At each stage, the program inserts a short pause to let you hear the output. No clicks occur in this part of the program because the volume command requires only a single byte, and the sound chip can react when it gets that byte from Basic.

The final section of Listing 1 produces three tones through the three different tone generators. Pressing any key stops the tone and turns off everything. Don't worry about how the tone values were selected for the chord. We'll get to that after experimenting with the last register on the sound chip.

Making Noise

For a programmer, the most complex part of the sound chip is the noise generator. A program can control the type of noise generated. It can also select from three default noise frequencies or create the noise frequency by manipulating the third tone generator. All these commands fit into a single byte with a bit to spare.

Figure 4 shows the structure of the noise command byte and what the values in each field mean. Program Listing 2 demonstrates

Figure 1. Sound chip registers and their addresses. If the first bit of a data byte sent to the sound chip contains a "1," the next 3 bits specify an on-chip register. If the bit has the following format, the 3 bits "n n n" contain the register address. If bit 7 is zero, then the address is implied.

Bit #	7	6	5	4	3	2	1	0
	1	n	n	n	x	x	x	x

The registers and their addresses, given in binary notation.

Address	Register	Byte format in hex when address is used
0 0 0	Tone 1 Frequency	8x hex
0 0 1	Tone 1 Volume	9x hex
0 1 0	Tone 2 Frequency	0Ax hex
0 1 1	Tone 2 Volume	0Bx hex
1 0 0	Tone 3 Frequency	0Cx hex
1 0 1	Tone 3 Volume	0Dx hex
1 1 0	Noise Control	0Ex hex
1 1 1	Noise Volume	0Fx hex

NEXT STEP

the features of the noise control registers. The ideas involved are relatively simple, but the expression that generates the command byte for the noise generator is more complex than the expressions in the first listing.

The last loop in Listing 2 surprised me when I first ran the program. The documentation in the reference manual suggests that when tone generator 3 produces a frequency for the noise generator, the two pitches will be the same. But when I ran Listing 2, I realized that the relationship between the two was more complex. Some experimenting showed me that the ratio between the two is 1-to-15; the tone produced by the periodic noise generator is the same that tone generator 3 produces if its value were multiplied by 15, although the timbre of the tone is different.

Adding Pitch

You have enough information now to

Figure 2. The basic formula for calculating tone values.

The basic formula for the SN76496 chip is:

freq = external clock / (32 * n)

where "n" is the value placed in a tone register and "freq" is the frequency of the sound produced by the chip. The external clock is set at 3,579,545 Hz by the computer. Therefore, the formula can be simplified to:

freq = 111,860.7813 / n or n = 111,860.7813 / freq

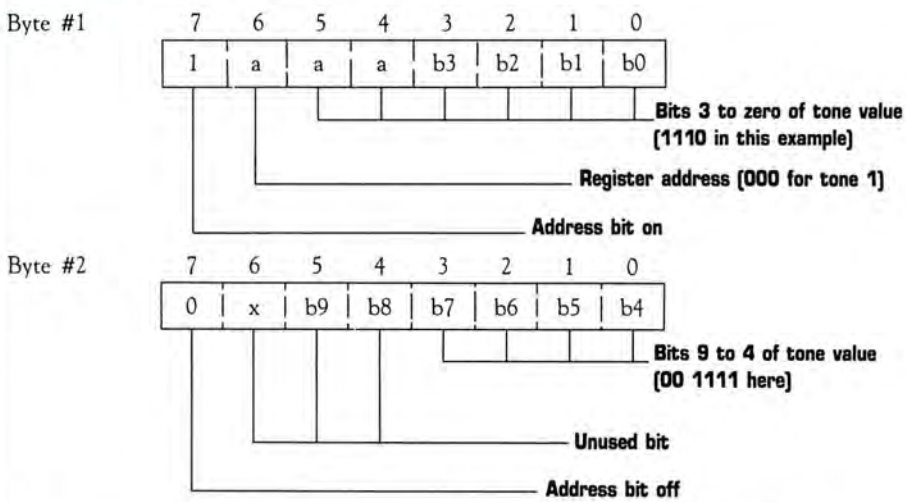
To produce a tone of 440 Hz, substitute 440 for "freq" above and find the closest integer to the result:

111,860.7813 / 440 = 254.229 + = 254.

Next, convert the value to hexadecimal or binary:

254 = 0FE hex = 00 1111 1110 binary

Two bytes are required to send a value to a tone register:



To create a 440-Hz tone in tone generator #1, the first byte sent to the sound chip will be:

1000 1110 binary or 8E hex

The second byte will be:

0000 1111 binary or 0F hex

In a program, this algorithm can be used to generate the bytes:

```
ADDR <= = register address
TONE <= = tone value
BYTE1 <= = 80 hex
                OR (ADDR shift_left 4)
                OR (TONE AND 00F hex)
BYTE2 <= = TONE shift_right 4
```

In Basic, you could use the following lines once ADDR% and TONE% have the proper values:

```
BYTE1% = &H80 OR (ADDR% * 16) OR (TONE% AND &H0F)
BYTE2% = (TONE% AND &H3F0) / 16
```

create sound effects like sirens and drums with the sound chip by manipulating the frequencies, volumes, and duration of each sound. But playing music requires a knowledge of the relationships between notes, which means we need to explore simple music theory.

If you take a tone of any frequency and make another tone with double that frequency, you create two notes that are an octave apart. In Western music, for the past several centuries the octave was divided into 12 parts. If you start at middle C on a piano and play every key as your fingers move up the keyboard, you will play 12 distinct notes before you start octaves of previous notes. If you play just the white keys (starting at C), you are playing a major scale, which contains seven distinct tones. The octave is the eighth tone of the scale, as its name suggests.

The number of notes in a scale, the total number of divisions in an octave, and the relationships between those notes is determined by our culture, not by any inherent quality of sound.

For centuries, the notes of a major scale were related by simple ratios as shown in the first column of the Table. You can easily construct or tune an instrument using these ratios, but the result has a nasty peculiarity: If you change keys and select a new tonic or starting tone, the instrument will be out of tune. With musical instruments such as the violin that give the musician full analog control over the pitches produced, this is not a problem. Instruments with fixed tuning, such as a piano, are extremely inconvenient to retune.

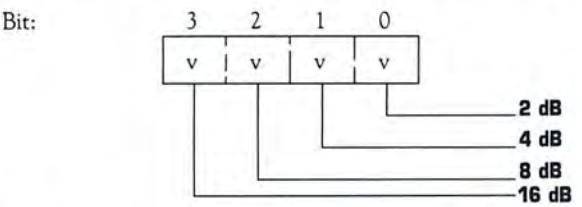
A solution to this problem appeared in the 18th century, when musicians slightly mistuned every note on the keyboard to keep the relationship between any two adjacent notes constant. In this "tempered" tuning, the only interval based on a simple ratio is the octave.

Every other note deviates slightly from its "just" tuning, but the deviation is constant, regardless of the key in which the music is played.

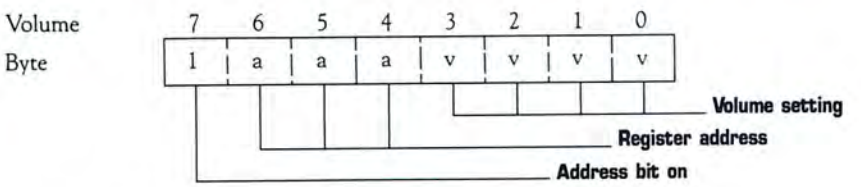
Since 12 notes are in an octave, and because the octave ratio is 1-to-2, the ratio between any two notes in the tempered scale is 1-to-2^(1/12). Another way to read the second expression is "the twelfth root of two." The third and fourth columns of the Table show the resulting pitches in a tempered scale.

A piano tuner has complete analog control over the pitch of every note. Unfortunately, the sound chip only allows integral tone values and doesn't provide

Figure 3. Adjusting the volume. Each volume control has 16 settings ranging from 0000 binary (loud) to 1111 binary (no output). The bits represent a specific number of decibels of attenuation. Adding the bits that are set gives you the total amount of attenuation.



The greatest amount of attenuation (the quietest tone) possible without turning off the output completely is 16 + 8 + 4 = 28 dB. A volume command is sent to the sound chip in a single byte. The format of that byte is:



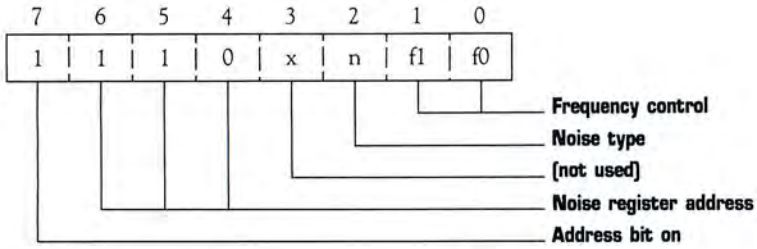
You can use the following algorithim to create a volume command byte:

```
ADDR <= = volume register address
VOL <= = volume to set
BYTE <= = 80 hex
                OR (ADDR shift_left 4)
                OR VOL
```

In Basic, the byte can be created this way:

```
BYTE% = &HB0 OR (ADDR%*16) OR VOL
```

Figure 4. Programming the noise generator. The generator can produce periodic (a "raspy" version of the tone generator sound) and white noise (this sounds like static that you can use in a variety of sound effects). A single-byte command to the sound chip controls both the type of noise created and the frequency (pitch) of that noise:



If the noise bit, n, is zero, the chip produces periodic noise. If the bit is set to "1," then white noise is generated. The frequency bits are more complex:

Frequency f1	Bits f0	Equivalent Tone Generator Value
0	0	240
0	1	480
1	0	960
1	1	Use frequency stored in tone 3

To program the noise generator:

NTYPE <= = type of noise (0 or 1)
NFREQ <= = frequency value (0 to 3)

BYTE <= = 0E0 hex
OR ((NTYPE AND 1) shift_left 2) OR (NFREQ AND 3)

In Basic:

```
BYTE% = &HE0 OR ((NTYPE% AND 1) * 4) OR (NFREQ% AND 3)
```

The And operations ensure that NTYPE% and NFREQ% contain legal values. They can be omitted if you are sure that the values in the variables are correct:

```
BYTE% = &HE0 OR (NTYPE% * 4) OR NFREQ%
```

Table. Relationships of musical notes. This assumes an octave based on A = 440 Hz.

Note Name	"Just" Ratio	Intonation Frequency	Tempered Scale Ratio	Tempered Scale Frequency	Sound Chip Tone Value	Sound Chip Frequency
A	1/1	440 Hz	1/1	440 Hz	254	440.3968
A#/Bb			1.05946	466.16376	240	466.0866
B	9/8	495	1.12246	493.88330	226	494.9592
B#/C			1.18921	523.25113	214	522.7139
C#	5/4	550	1.25992	554.36526	202	553.7662
D	4/3	586 2/3	1.33484	587.32953	190	588.7410
D#/Eb			1.41421	622.25397	180	621.4488
E	3/2	660	1.49831	659.25511	170	658.0046
E#/F			1.58740	698.45646	160	699.1299
F#	5/3	733 1/3	1.68179	739.98885	151	740.7999
G			1.78180	783.99087	143	782.2432
G#	15/8	825	1.88775	830.60940	135	828.5983
A	2/1	880	2/1	880	127	880.7936

nearly enough resolution to produce accurate tones. No matter how carefully we pick the tone value for each note, a scale produced by a digital sound source like the chip in the 1000 will always sound slightly out of tune. As Figure 5 shows, the tones are close but not exactly correct; most trained musicians will consider the tones to be noticeably out of tune.

You could derive the note values for other octaves from Figure 5 by dividing or multiplying each tone value by two. However, this would increase the amount of error in each tone. If you use Program Listing 3 to generate tone values for the sound chip, each note will be as close to correct as possible. Listing 3 is designed to create Data statements that can be merged into a Basic program.

If you want to use the data statements with Quickbasic or Turbo Basic, remove the logic that creates line numbers. Similarly, you can modify the program to create the correct data format for an assembly, C, or Pascal program. Listing 3 creates the tone values for six octaves, which seems to be the useful range of the sound chip's tone generators.

You might wonder why the Table and Listing 3 begin with an "A" instead of another note, such as C. There are two important reasons: First, the 440-Hz A (and by extension, the A in each octave) is a generally accepted tuning standard. Second, the lowest possible tone that a sound chip can generate is slightly below the 110-Hz A, so generating octaves from A to A uses as much of the effective range of the sound chip as possible.

Two Final Programs

Once you run Listing 3 to create the list of tone values, you probably want to hear the outcome. Program Listing 4 uses the data statements created in Listing 3 to play an ascending six-octave chromatic scale and then an ascending major scale. The scales are produced by reading the values in the data statements into a double array and then selecting the appropriate values to send to the sound generator.

Program Listing 5 is more interesting and just might earn your 1000 an invitation to your New Year's Eve party. I won't ruin the surprise by telling you the title of the song the computer plays. As you can tell by the listing, creating a melody with the sound chip necessitates long lists of Data statements, most of which I had to calculate before I could start writing the program. Next month, we'll examine how to simplify the process, but we'll use a compiled language. Basic isn't fast enough to produce multi-voiced music without help. ■

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. A demonstration of tone and volume on the 1000 sound chip.

```
    1 'Simple demonstration of tone and volume
    2 '  on the Tandy 1000 sound chip
    3 '
  851  100 DEFINT A-Z                          'All commands should be integers
  853  110 PORT = &HC0                         'Define the sound port
 3510  120 PRINT "Demonstrating a sliding scale"
 1052  130 OUT PORT,&H98                       'Turn on channel 1, half volume
 1930  140 FOR TONE = &H3FF TO 1 STEP -1       'Cycle through possible tones
 2013  150   BYTE1 = &H80 OR (TONE AND &HF)    'Merge LSBs of tone with address
 1889  160   BYTE2 = (TONE AND &H3F0) / 16     'Collect MSBs of tone value
 2351  170   OUT PORT,BYTE1: OUT PORT,BYTE2    'Send command to sound chip
  846  180 NEXT TONE
 1072  190 OUT PORT,&H9F                       'Turn off channel 1
       200 '
 3548  210 PRINT "Demonstrating volume control"
 1657  220 BYTE1 = &H80: BYTE2 = &H20          'Pick a mid-range tone
 2284  230 OUT PORT,BYTE1: OUT PORT,BYTE2      'Send it to sound chip
 1187  240 FOR VOL = 0 TO 14                   'Go from loud to soft
 1577  250   OUT PORT,VOL OR &H90              'Send each volume to sound chip
 1647  260   FOR ZZ = 1 TO 200: NEXT           'Then pause
  777  270 NEXT VOL
 1665  280 FOR VOL = 14 TO 0 STEP -1           'Now go from soft to loud
 1581  290   OUT PORT,VOL OR &H90              'Send each volume
 1642  300   FOR ZZ = 1 TO 200: NEXT           'A short pause
  772  310 NEXT VOL
 1627  320 FOR ZZ = 1 TO 1000: NEXT            'Wait a little longer
 1068  330 OUT PORT,&H9F                       'Then turn it off
       340 '
 4646  350 PRINT "Creating a chord -- press a key for each note"
 2030  360 OUT PORT,&H8C: OUT PORT,&H1A        'Middle C to Tone 1 generator
 1058  370 OUT PORT,&H98                       'Turn on half volume
 1004  380 Z$ = INPUT$(1)                      'Wait for a keystroke
 2014  390 OUT PORT,&HA3: OUT PORT,&H15        'Send E to Tone 2 generator
 1061  400 OUT PORT,&HBB                       'Turn on half volume
  998  410 Z$ = INPUT$(1)
 2023  420 OUT PORT,&HCD: OUT PORT,&H11        'Send G to Tone 3 generator
 1066  430 OUT PORT,&HDB                       'Turn on half volume
 1001  440 Z$ = INPUT$(1)
 1071  450 OUT PORT,&H9F                       'Turn off tone 1
 1003  460 Z$ = INPUT$(1)
 1082  470 OUT PORT,&HBF                       'Turn off tone 2
 1005  480 Z$ = INPUT$(1)
 1086  490 OUT PORT,&HDF                       'Turn off tone 3
  396  500 END
```

End

Program Listing 2. A demonstration of the noise generator.

```
    1 ' Demonstration of the noise generator
    2 '  in the Tandy 1000 sound chip
    3 '
  851  100 DEFINT A-Z                              ' Use integers for speed
  853  110 PORT = &HC0                             ' Set the sound port
  814  120 ADDR = &HE0                             ' Address and flag for noise
 4725  130 PRINT "Generating noise -- press a key for each demo"
 3505  140 PRINT "     White noise -- high frequency"
 1099  150 OUT PORT, &HF8                         ' Set noise volume to half
 1400  160 NTYPE = 1: NFREQ = 0                   ' Set values
  754  170 GOSUB 550                             ' Make noise and wait
 3716  180 PRINT "     White noise -- middle frequency"
  740  190 NFREQ = 1                             ' Change noise frequency
  748  200 GOSUB 550                             ' Make noise and wait
 3425  210 PRINT "     White noise -- low frequency"
  735  220 NFREQ = 2                             ' One more change
  751  230 GOSUB 550                             ' Make noise again
  579  240 PRINT
       250 '
 3810  260 PRINT "     Periodic noise -- high frequency"
 1401  270 NTYPE = 0: NFREQ = 0                  ' Set for periodic, high
  756  280 GOSUB 550                             ' Make noise again
 4020  290 PRINT "     Periodic noise -- middle frequency"
  733  300 NFREQ = 1                             ' Raise the pitch
  750  310 GOSUB 550                             ' Make noise again
 3729  320 PRINT "     Periodic noise -- low frequency"
  737  330 NFREQ = 2                             ' Raise pitch again
  753  340 GOSUB 550                             ' And make noise
 3547  350 PRINT "     Periodic noise based on Tone 3"
  741  360 NFREQ = 3
 2619  370 OUT PORT, ADDR OR (NTYPE * 4) OR NFREQ  ' Set up noise generator
 1225  380 FOR I = 1 TO &H3FF                     ' From high to low
 1825  390    BYTE1 = &HC0 OR (I AND &HF)
 1681  400    BYTE2 = (I AND &H3F0) / 16
 1315  410    OUT PORT, BYTE1
 1317  420    OUT PORT, BYTE2
  607  430 NEXT I
 2615  440 PRINT "     Adding tone output"
 1068  450 OUT PORT,&HDB
 1698  460 FOR I = &H3FF TO 1 STEP -1
 1824  470    BYTE1 = &HC0 OR (I AND &HF)
 1689  480    BYTE2 = (I AND &H3F0) / 16
 1323  490    OUT PORT, BYTE1
 1316  500    OUT PORT, BYTE2
  606  510 NEXT I
 2069  520 OUT PORT,&HFF: OUT PORT,&HDF                    ' Turn off outputs
  399  530 END
       540 '
 2619  550 OUT PORT, ADDR OR (NTYPE * 4) OR NFREQ
 1004  560 Z$ = INPUT$(1)
  668  570 RETURN
```

End

Program Listing 3. The tone value generator.

```
    1 ' Tone value generator.
    2 '    In a tempered scale, the frequency of each semitone is
    3 '      2^(1/12) * frequency of the previous tone.
    4 '    The floating point inaccuracies in Basic make it a poor
    5 '      choice for generating the frequency list in the data statements
    6 '      I used a hand calculator to create that list, on which all of
    7 '      the tone values are based.
    8 '
    9 '  Frequencies on the sound chip are derived by the
   10 '      following formula:
   11 '                  freq = 111,860.7813 / n
   12 '      or
   13 '                  n  =  111,860.7813 / freq
   14 '      where n = the number placed in a tone register
   15 '
  100 '   These are the frequency values for the lowest octave the sound
  110 '   chip can generate:
  120 '
```

Listing 3 continued

Listing 3 continued

```
 3191  130 DATA 110, 116.5409403, 123.4708252, 130.8127825, 138.5913153
 2945  140 DATA 146.8323837, 155.5634915, 164.813778, 174.6141152
 2376  150 DATA 184.9972107, 195.9977172, 207.6523479
       160 '
  951  170 DIM FREQ#(12)                 'Room for one octave of frequencies
 1060  180 DIM NOTE%(6,12)               'Room for six octaves of tone values
 1307  190 CLOCK# = 111860.7813#
       200 '
 1015  210 FOR I = 1 TO 12
 1051  220   READ FREQ#(I)
  605  230 NEXT I
       240 '
  974  250 FOR I = 1 TO 6                          'For each octave
 1085  260   FOR J = 1 TO 12                      'For each note in the octave
 1602  270 TONE# = CLOCK#/FREQ#(J)               'Find the tone value
 1838  280 NOTE%(I,J) = INT( TONE# + .5)         'Round off result
 2024  290 PRINT USING "####"; NOTE%(I,J);       'Let's see the list
 1639  300     FREQ#(J) = FREQ#(J) * 2#              'Prepare for next octave
  669  310   NEXT J
  642  320   PRINT
  606  330 NEXT I
       340 '
 6254  350 PRINT "Press any key to write tone values to TONES.INC or <ESC> to s
       top"
 1002  360 Z$ = INPUT$(1)
 1637  370 IF Z$ = CHR$(27) THEN END
 4772  380 PRINT "First line number for the data statements: ";
 1048  390 INPUT LINE.1%
 3484  400 PRINT "Increment for the data lines: ";
 1210  410 INPUT LINE.INC%
 1529  420 OPEN "O",1,"TONES.INC"
  974  430 FOR I = 1 TO 6                                  'For six octaves ...
 2559  440    PRINT #1, LINE.1% + (LINE.INC% * (I - 1));   'Print line number
 1311  450    PRINT #1, "DATA ";                           ' and the word DATA
 1118  460    FOR J = 1 TO 11                              'Repeat for 1 octave
 2442  470       PRINT #1, USING "####_,";NOTE%(I,J);      'Print values with ,
  709  480    NEXT J
 2239  490    PRINT #1, USING "####"; NOTE%(I,12)          'No , after the last
  605  500 NEXT I                                          'End octave loop
  637  510 CLOSE 1                                        'Close the file
  398  520 END                                            'We're done
```

End

Program Listing 4. Chromatic scale with 12 tones per octave.

```
    1 '  Chromatic scale (12 tones per octave)
    2 '    The Data statements are merged into this program from
    3 '    the output generated by Listing 3.
    4 '
  807  50 DEFINT A-Z                          'Work with integers only
  938  51 S.PORT = &HC0                       'Address of the sound chip
  772  52 DELAY = 100                         'Adjust duration of each note
  972  60 DIM TONE(6,12)                      'Six octaves of 12 tones each
  954  100 RESTORE 5000                       'Read the tone values
 1346  110 FOR OCTAVE = 1 TO 6                'For each octave
 1316  120   FOR NOTE = 1 TO 12               'For each note in an octave
 1819  130     READ TONE(OCTAVE,NOTE)         'Fill array from Data
  906  140   NEXT NOTE
  983  150 NEXT OCTAVE
       155 '
 1352  160 DIM MAJOR.SCALE(7)                 'Set the tones of a major scale
 1213  170 FOR NOTE = 1 TO 7                  'There are 7 of them
 1771  180    READ MAJOR.SCALE(NOTE)          'Read the tones of the scale
  847  190 NEXT NOTE
       200 '
 1212  210 OUT S.PORT, &H98                   'Turn on volume for tone gen. #1
 1348  220 FOR OCTAVE = 1 TO 6                'For all octaves
 1318  230   FOR NOTE = 1 TO 12               'For each tone in an octave
 2367  240     TONE.VALUE = TONE(OCTAVE,NOTE)  'Get the tone value
 2505  250     BYTE1 = &H80 OR (TONE.VALUE AND &HF)  'Calculate output bytes
 2381  260     BYTE2 = (TONE.VALUE AND &H3F0) / 16
 1480  270     OUT S.PORT, BYTE1              'Send bytes to sound chip
 1454  275     OUT S.PORT,BYTE2
 1932  280     FOR I = 1 TO DELAY: NEXT I     'Pause on each note
  912  290   NEXT NOTE
  980  300 NEXT OCTAVE
 2954  310 PRINT "Press a key for each note"
 1348  320 FOR OCTAVE = 1 TO 5                'Start again from the beginning
 1275  330   FOR NOTE = 1 TO 7                'Pick notes of a major scale
 3232  340     TONE.VALUE = TONE(OCTAVE,MAJOR.SCALE(NOTE))
 2506  350     BYTE1 = &H80 OR (TONE.VALUE AND &HF)
 2382  360     BYTE2 = (TONE.VALUE AND &H3F0) / 16
 1449  370     OUT S.PORT,BYTE1
 1451  380     OUT S.PORT,BYTE2
 1009  385 Z$ = INPUT$(1)
  905  400   NEXT NOTE
  982  410 NEXT OCTAVE
 1197  420 OUT S.PORT,&H9F
       4998 '   Data lines from 5000 to 5005 are merged into
       4999 '   this program with the command  MERGE "TONES.INC"
 3333  5000 DATA 1017, 960, 906, 855, 807, 762, 719, 679, 641, 605, 571, 539
 3277  5001 DATA  508, 480, 453, 428, 404, 381, 360, 339, 320, 302, 285, 269
 3237  5002 DATA  254, 240, 226, 214, 202, 190, 180, 170, 160, 151, 143, 135
 3136  5003 DATA  127, 120, 113, 107, 101,  95,  90,  85,  80,  76,  71,  67
 3050  5004 DATA   64,  60,  57,  53,  50,  48,  45,  42,  40,  38,  36,  34
 3028  5005 DATA   32,  30,  28,  27,  25,  24,  22,  21,  20,  19,  18,  17
       5999 '  The notes in a major scale: A, B, C#, D, E, F#, G#
 1459  6000 DATA 1, 3, 5, 6, 8, 10, 12
```

End

Program Listing 5. The 1000 celebrates New Year's Eve.

```
    1 '   The Tandy 1000 Celebrates New Years Eve
    2 '
   90 '  Program setup
  403  100 CLS
 3184  110 PRINT "The Tandy 1000 on New Years Eve"
 2534  120 PRINT "One moment, please ..."
  854  130 DEFINT A-Z                    'Use integers for speed and accuracy
 1050  140 OPTION BASE 1                  'Index arrays from 1
 2038  150 TRUE = (1=1): FALSE = NOT TRUE  'Define logical constants
  858  160 PORT = &HC0                    'Sound port
  820  170 VOL1 = &H96                    'Set voice volumes
  842  180 VOL2 = &HBA                    '  including register addresses
  846  190 VOL3 = &HDA
  981  200 V1.ADDR = &H80                 'Set tone register addresses
  992  210 V2.ADDR = &HA0
  996  220 V3.ADDR = &HC0
 1102  230 DIM NOTES(6,12)                'Array for note values
  959  240 RESTORE 5000                   'Point to note array
```

Listing 5 continued

Listing 5 continued

```
 974 | 250 FOR I = 1 TO 6                        'For each octave
1149 | 260     FOR J = 1 TO 12                   '  and each note in the octave
1422 | 270         READ NOTES(I,J)
 739 | 280     NEXT J
 611 | 290 NEXT I
1463 | 300 TOTAL.TIME = 9 * 32 - 1               '9 measures at 32 beats each
     | 310 '   Set values for voice 1
 959 | 320 RESTORE 6000                          'Values for voice 1
 902 | 330 READ V1.LEN                           'Number of notes to play
 983 | 340 READ V1.TIME                          'When to start
1588 | 350 DIM V1.NOTES(V1.LEN,3)                'Array for this voice
1326 | 360 FOR I = 1 TO V1.LEN                   'For the number of notes
1896 | 370    READ OCTAVE,NOTE,LENGTH            'Read information
1996 | 380    TONE = NOTES(OCTAVE,NOTE)          'Find the tone
2765 | 390    V1.NOTES(I,1) = V1.ADDR OR (TONE AND &HF) 'Calc. 1st output byte
2427 | 400    V1.NOTES(I,2) = (TONE AND &H3F0) \ 16      '  and 2nd output byte
2040 | 410    V1.NOTES(I,3) = (LENGTH * 4) -1            '  and duration of tone
 606 | 420 NEXT I
1009 | 430 V1.ON = FALSE                         'Voice isn't turned on yet
     | 440 '   Set values for voice 2
 964 | 450 RESTORE 7000                          'Values for voice 2
 907 | 460 READ V2.LEN                           'Number of notes to play
 988 | 470 READ V2.TIME                          'When to start
1594 | 480 DIM V2.NOTES(V2.LEN,3)                'Array for this voice
1331 | 490 FOR I = 1 TO V2.LEN                   'For the number of notes
1891 | 500    READ OCTAVE,NOTE,LENGTH            'Read information
1991 | 510    TONE = NOTES(OCTAVE,NOTE)          'Find the tone
2762 | 520    V2.NOTES(I,1) = V2.ADDR OR (TONE AND &HF) 'Calc. 1st output byte
2432 | 530    V2.NOTES(I,2) = (TONE AND &H3F0) \ 16      '  and 2nd output byte
2045 | 540    V2.NOTES(I,3) = (LENGTH * 4) -1            '  and duration of tone
 610 | 550 NEXT I
1014 | 560 V2.ON = FALSE                         'Voice isn't turned on yet
     | 570 '   Set values for voice 3
 969 | 580 RESTORE 8000                          'Values for voice 3
 912 | 590 READ V3.LEN                           'Number of notes to play
 984 | 600 READ V3.TIME                          'When to start
1591 | 610 DIM V3.NOTES(V3.LEN,3)                'Array for this voice
1327 | 620 FOR I = 1 TO V3.LEN                   'For the number of notes
1895 | 630    READ OCTAVE,NOTE,LENGTH            'Read information
1995 | 640    TONE = NOTES(OCTAVE,NOTE)          'Find the tone
2768 | 650    V3.NOTES(I,1) = V3.ADDR OR (TONE AND &HF) 'Calc. 1st output byte
2437 | 660    V3.NOTES(I,2) = (TONE AND &H3F0) \ 16      '  and 2nd output byte
2050 | 670    V3.NOTES(I,3) = (LENGTH * 4) -1            '  and duration of tone
 614 | 680 NEXT I
1019 | 690 V3.ON = FALSE                         'Voice isn't turned on yet
     | 700 '   Now let user set the tempo
 410 | 710 CLS
5243 | 720 PRINT "Enter tempo value -- larger numbers = slower song."
3118 | 730 PRINT "Try a value near 30 at first"
1917 | 740 INPUT "Tempo ==> ", TEMPO
     | 750 '
     | 760 '   This is the main program loop
     | 770 '
1876 | 780 FOR BEAT = 1 TO TOTAL.TIME
 801 | 790 GOSUB 1000                            'Voice 1 routine
 794 | 800 GOSUB 2000                            'Voice 2 routine
 796 | 810 GOSUB 3000                            'Voice 3 routine
1721 | 820 FOR I = 1 TO TEMPO: NEXT              'Pause
 822 | 830 NEXT BEAT
1532 | 840 OUT PORT,VOL1 OR &HF                  'Be sure all voices are off
1534 | 850 OUT PORT,VOL2 OR &HF
1536 | 860 OUT PORT,VOL3 OR &HF
 417 | 870 CLS
 407 | 880 END
     | 890 '
     | 900 '   Voice 1 routine
2139 | 1000 IF BEAT < V1.TIME THEN RETURN        'We're not ready yet
1645 | 1010 IF V1.ON THEN GOTO 1100
1362 | 1020 V1.PTR = V1.PTR + 1                  'Increment array index
2052 | 1030 OUT PORT,V1.NOTES(V1.PTR,1)          'Set up output tone
2054 | 1040 OUT PORT,V1.NOTES(V1.PTR,2)
1169 | 1050 OUT PORT,VOL1                        'Then turn on speaker
2608 | 1060 V1.TIME = V1.TIME + V1.NOTES(V1.PTR,3) 'Set turn-off time
1015 | 1070 V1.ON = TRUE                         'Set the flag
 713 | 1080 RETURN
     | 1090 '
1570 | 1100 OUT PORT,VOL1 OR &HF                 'If the sound was on, turn it off
1476 | 1110 V1.TIME = V1.TIME + 1                'Set time for next note
1054 | 1120 V1.ON = FALSE                        'Reset the flag
 709 | 1130 RETURN
     | 1140 '
     | 1990 '   Voice 2 routine
2141 | 2000 IF BEAT < V2.TIME THEN RETURN        'We're not ready yet
1648 | 2010 IF V2.ON THEN GOTO 2100
1365 | 2020 V2.PTR = V2.PTR + 1                  'Increment array index
2055 | 2030 OUT PORT,V2.NOTES(V2.PTR,1)          'Set up output tone
2057 | 2040 OUT PORT,V2.NOTES(V2.PTR,2)
1171 | 2050 OUT PORT,VOL2                        'Then turn on speaker
2613 | 2060 V2.TIME = V2.TIME + V2.NOTES(V2.PTR,3) 'Set turn-off time
1017 | 2070 V2.ON = TRUE                         'Set the flag
 714 | 2080 RETURN
     | 2090 '
1572 | 2100 OUT PORT,VOL2 OR &HF                 'If the sound was on, turn it off
1479 | 2110 V2.TIME = V2.TIME + 1                'Set time for next note
1056 | 2120 V2.ON = FALSE                        'Reset the flag
 710 | 2130 RETURN
     | 2140 '
     | 2990 '   Voice 3 routine
2143 | 3000 IF BEAT < V3.TIME THEN RETURN        'We're not ready yet
1651 | 3010 IF V3.ON THEN GOTO 3100
1368 | 3020 V3.PTR = V3.PTR + 1                  'Increment array index
2058 | 3030 OUT PORT,V3.NOTES(V3.PTR,1)          'Set up output tone
2060 | 3040 OUT PORT,V3.NOTES(V3.PTR,2)
1173 | 3050 OUT PORT,VOL3                        'Then turn on speaker
2618 | 3060 V3.TIME = V3.TIME + V3.NOTES(V3.PTR,3) 'Set turn-off time
1019 | 3070 V3.ON = TRUE                         'Set the flag
 715 | 3080 RETURN
     | 3090 '
1574 | 3100 OUT PORT,VOL3 OR &HF                 'If the sound was on, turn it off
1482 | 3110 V3.TIME = V3.TIME + 1                'Set time for next note
1058 | 3120 V3.ON = FALSE                        'Reset the flag
 711 | 3130 RETURN
     | 4990 '   Tone values from Listing 3
3333 | 5000 DATA 1017, 960, 906, 855, 807, 762, 719, 679, 641, 605, 571, 539
3277 | 5001 DATA  508, 480, 453, 428, 404, 381, 360, 339, 320, 302, 285, 269
3237 | 5002 DATA  254, 240, 226, 214, 202, 190, 180, 170, 160, 151, 143, 135
3136 | 5003 DATA  127, 120, 113, 107, 101,  95,  90,  85,  80,  76,  71,  67
3050 | 5004 DATA   64,  60,  57,  53,  50,  48,  45,  42,  40,  38,  36,  34
3028 | 5005 DATA   32,  30,  28,  27,  25,  24,  22,  21,  20,  19,  18,  17
     | 5990 '   Data for voice 1
 828 | 6000 DATA 28, 24
 849 | 6010 DATA 2, 4, 2
 856 | 6020 DATA 2, 9, 3
 855 | 6030 DATA 2, 9, 1
 857 | 6040 DATA 2, 9, 2
 851 | 6050 DATA 3, 1, 2
 901 | 6060 DATA 2, 11, 3
 859 | 6070 DATA 2, 9, 1
 902 | 6080 DATA 2, 11, 2
 855 | 6090 DATA 3, 1, 2
 855 | 6100 DATA 2, 9, 3
 854 | 6110 DATA 2, 9, 1
 849 | 6120 DATA 3, 1, 2
 853 | 6130 DATA 3, 4, 2
 860 | 6140 DATA 3, 6, 6
 857 | 6150 DATA 3, 6, 2
 857 | 6160 DATA 3, 4, 3
 853 | 6170 DATA 3, 1, 1
 855 | 6180 DATA 3, 1, 2
 863 | 6190 DATA 2, 9, 2
 897 | 6200 DATA 2, 11, 3
 855 | 6210 DATA 2, 9, 1
 898 | 6220 DATA 2, 11, 2
 851 | 6230 DATA 3, 1, 2
 860 | 6240 DATA 2, 9, 3
 856 | 6250 DATA 2, 6, 1
 858 | 6260 DATA 2, 6, 2
 857 | 6270 DATA 2, 4, 2
 869 | 6280 DATA 2, 9, 8
     | 6990 '   Voice 2 data
 819 | 7000 DATA 10, 32
 853 | 7010 DATA 2, 1, 8
 857 | 7020 DATA 2, 4, 8
 858 | 7030 DATA 2, 4, 8
 859 | 7040 DATA 2, 6, 6
 852 | 7050 DATA 2, 2, 2
 858 | 7060 DATA 2, 1, 8
 860 | 7070 DATA 2, 2, 8
 861 | 7080 DATA 2, 4, 6
 856 | 7090 DATA 2, 2, 2
 853 | 7100 DATA 2, 1, 8
     | 7990 '   Data for voice 3
 820 | 8000 DATA 10, 32
 861 | 8010 DATA 1, 9, 8
 856 | 8020 DATA 2, 2, 8
 856 | 8030 DATA 2, 1, 8
 856 | 8040 DATA 2, 2, 6
 859 | 8050 DATA 1, 9, 2
 866 | 8060 DATA 1, 9, 8
 866 | 8070 DATA 1, 8, 8
 859 | 8080 DATA 2, 1, 6
 862 | 8090 DATA 1, 8, 2
 861 | 8100 DATA 1, 9, 8
```

End

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(continued from page 93)

arrived in nine days.

For the other two computers, I ordered Micro Mainframe's Memory Expansion Boards and dual serial/clock/calendar units. Hopefully this information is informative to your readers. I would add that the people in Ottawa were sincere in their dealings with me. —*J. B. Kerby, Edmonton, Alberta*

You're right about the ATD Zuckerboard memory upgrade for the EX. Once installed, it doesn't allow the back plate to be put back in place. I overlooked this fact in my review. Thanks for pointing it out.—M.N.

Doubled Single Quotes

When I converted the PRODRVR/SRC file from ALDS to EDTASM (see "Turning Pro," September 1987, p. 66), I was not aware that EDTASM has a problem with doubled single quotes. The Basic listing creates a proper PRODRVR/CMD file, but under EDTASM the source file does not. The CMD file on the *80 Micro* Disk Series disk contains this quirk.

To fix this, replace line 03590 (p.72) with the following lines:

```
03590 PT3   DEFM    ' (S = X'
03591       DEFB    39
03592       DEFM    '5F9E'
03593       DEFB    39
03594       DEFM    ',E = X'
03595       DEFB    39
```

Also, the drivers from ALPS have a problem with PRODRVR because they include a display header that shows crucial information about the driver version, copyright, and serial number. This causes PRODRVR to create a Pro driver that is functionally correct but too large.

To repair this problem, build the following JCL file by typing BUILD PROPREP from the DOS prompt, and enter the following lines:

```
MEMORY (CLEAR)
LOAD #S#
MEMORY (ADD = X'BB73',WORD = X'34C0')
DUMP #S# (S = X'BAD3',E = X'C034')
PRODRVR #S#
```

After the last line, type control-shift-@ to close the JCL file. Execute it using the line DO PROPREP (S = source file), where source file is the name of the file to convert, such as SG10/CTL. This JCL file modifies the driver's upper limit to be compatible with the limit set by Scripsit Pro, dumps the new information to the driver, and automatically executes PRODRVR for you. *Never* use this on an original driver file.

David Goben
Mansfield Center, CT

Two More Steps to 320K

"All the Way to 320K" (David H. Collins and Roger C. Alford, October 1987, p. 60) has two significant problems. First, on the schematic on page 60, line A7 IN, which is correctly listed in the text as going to pin 9 of U63, is shown in the schematic as going to pin 9 of U3.

The second involves the 256K Memdisk program. On page 62 at KEY:, the LD A,@KEY is not followed by the necessary RST 28H. The result is that the program aborts without installing the disk or pausing for user input. Adding a line with RST 28H will solve the problem.

David H. Collins
APO, NY

Line-Feed Limbo

On the road from me to Paul Jaeger to *80 Micro* a few characters were omitted in the line-feed program for the Model 100. (See "Line Feed and More for 100," Feedback Loop, August 1987, p. 14.) To the end of line 1, add +CHR$(201).

George Mueden
New York, NY

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

(continued from page 94)

■ Alas, and farewell. We could all see it coming, but it is still sad. Where shall members of the endangered TRS-80 species look for Model III/4 software information and advertising after December 1987?

Now that you've joined Tandy and the "surfers" on MS-DOS, do you have nightmares about Macintosh? I won't cancel my subscription, but when it runs out, what's to renew? Good luck among the PC beach boys. —*Walter Royal Jones, Jr., Fort Collins, CO*

■ I watched as your magazine changed over the years. Some of the changes were fundamental, while others were superficial. Is it a problem to include TRSDOS and MS-DOS in the same publication? Granted, you need a profit to continue. But don't dump all over us in the minority. Nobody looks out for us (TRSDOS users).

You had been doing a good job of providing print support for both. I realize that eventually I'll have to buy an MS-DOS machine. When I can afford it, I will. It seems the decision is already made. I won't cancel my subscription. It still provides me with the information that I desire. It is still better than any other. —*William W. Picknum, Euclid, OH*

■ Since 1984, your articles have given me ideas and help in writing specialized software. You helped me turn my computer into a useful tool that enhanced my professional productivity.

I note with sadness that you are moving exclusively into MS-DOS, but I also understand the pressures of the marketplace. My Model 4P is the third computer that I've owned and probably won't be the last. When I move to MS-DOS, I will probably go to Tandy, where I have gotten the quality and service that I need. At that time, I will certainly return to *80 Micro*. —*Ralph C. Regar, Northampton, PA*

■ I think the saddest thing about your decision to end TRSDOS coverage is that you had been the only source of true support and information interchange for those of us who received service from our tried and true technology. I suppose that's progress, but I wonder.

Oh well, our affair lasted longer than many marriages. —*Ralph Hawkins, Austin, TX*

P.S. I'll give you triple your money for the Model III that Eric Maloney bought at the flea market (see "Laptop Luck," October 1987, p. 9).

■ I could not believe my eyes when I read that you're dropping TRSDOS coverage. Is this a ploy of Fort Worth to sell more MS-DOS equipment? —*Douglas Boggess, Augusta, KS*

■ I traded a used car for my 4P and DMP 110 printer and figured I ended up with the worst part of the deal. For the first three months, I contemplated suicide; after the third month, I gave my electric typewriter away.

I ordered *80 Micro* for my 4P. I feel betrayed by the MS-DOS slant, but what really saddens me is knowing that I missed all those TRSDOS years. Did I really miss that much? —*Dale Hill, Washita, OK*

■ I regretfully admit that you made a sound business decision in your choice to drop coverage for the Z80-based machines. I'm thoroughly depressed. I feel as though an old friend has betrayed me when I was down on my luck. —*Rex A. Basham, Bellevue, NE*

■ I've been in broadcasting and around advertising too long to be gulled into believing that any business enterprise can exist on good will and intentions alone. "You gotta pay the light bills," as Maloney said.

Regarding the reader who Eric Maloney quotes as saying ". . .your attempts to be the representative of the toy-store systems is admirable but does make the mag a mish-mash of information"—for that person I wish an ultimate, terminal, fatal, and irrevocable hard-disk system crash and CPU meltdown. Our "toy store" systems do quite well for us, sirrah. We *like* them, thank you, and they do exactly what we

want them to do. —*Jim Merlini, Montgomery, AL*

■ Have you lost your senses? You're turning your back on the people that made *80 Micro* the forum that it is. Let's not lose sight of the fact that a good product without a devoted following is nothing more than any other product. —*Louis E. Clarke, Leland, MS*

■ You've really done it now. We TRSDOS users are officially abandoned. It's incredible, irresponsible, unprofessional, cowardly, and fraudulent.

Congratulations to all you rich, posh, MS-DOS owners. You won, and we lost. This is truly a sad day in the world of computers. —*David L. Nelson, Kirkland, WA*

■ I've been a subscriber since your ninth issue. I grew up with Tandy from the I to the Tandy 3000, but I haven't grown out of any of the models. Too bad you have. I took exception when you cut your size in half and then in half again, but I continued to subscribe because you fit the bill for the products I have. I subscribe to other magazines that provide me with the MS-DOS information that I need.

Sorry to see you go, but no TRSDOS, no cash. —*Bruce J. Buono, Omaha, NE*

■ Why am I not jumping up and down with joy at your announcement that *80 Micro* will be exclusively MS-DOS? As a long-time owner of a 1000A who's been searching for a magazine to satisfy my computing needs, I should be ecstatic.

I foresee the day when you will kiss MS-DOS goodbye as you are now doing to TRSDOS. It is bound to happen. Until then, I look forward to each issue and hope the inevitable is far away. I admire your courage for what truly must have been a painful decision. —*Randy D. Johnson, Coolidge, TX*

Ugly Rumors About Ellie

■ In your October 1987 New Products section you mentioned Ellie, our Dbase natural-language interface (p. 104) and incorrectly stated that it requires 512K. The error is our fault, as our news release was somewhat vague on this point.

Our biggest engineering task was squeezing one of the world's most powerful natural-language parsers into 250K so that users with only 512K can fit Dbase III Plus and Ellie into memory simultaneously. Perhaps your readers would like to know this information. Tandy users shouldn't be forced to chisel out Dbase code while the PC community sits back and "asks Ellie." —*Jon Greenblatt, President, Elfsoft, New York, NY*

Musical Boards

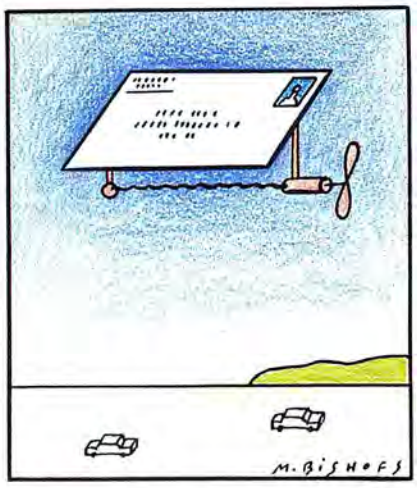
■ Michael Nadeau's closing remarks in his Home Computerist column ("Will They Fly," September 1987, p. 90) that referred to ATD'S new memory board for the EX caught my eye. I equipped a 1000 EX with a Tandy memory board. I ordered two ATD boards from a March 1987 issue's advertisement that stated a free clock came with the board. I ordered the boards on March 6, 1987 through the Canadian supplier in Ottawa. The boards were shipped in early July. The boards were installed and worked satisfactorily, but they didn't permit the plate on their slot to be installed. The port is open on the back of the computer.

I couldn't mount the clock on the board. I ordered dual serial port boards that supposedly mount the clock. I was then informed that the serial boards were in Ottawa, but when the people in that office checked the mountings, they discovered that the mountings wouldn't mount on their own boards. On the memory expansion board there was only one port for further expansion, not two as on Tandy's. The pins were wide open and not in an enclosure.

I returned the two boards and clocks. I ordered a dual serial/clock/calendar unit to fit my Tandy Expansion Board, and it

(continued on page 91)

TRSDOS Users Respond



Final Regrets

■ I just read your Side Tracks column ("Hard Decision, New Direction," November 1987, p. 8) and would like to thank you for making a decision for me. I didn't know whether to buy a Tandy 1200 or Commodore C-128D system. After reading your column, I immediately called an order in for the Commodore.

Two factors influenced my decision. One, I am tired of you bellyaching about Tandy's support. Two, you no longer cover any of my machines (Models I/III/4/100).

I'd like to wish you well on your new format, but I'm afraid my tongue would fall out from the lie. Therefore, as a former 6-year subscriber, I wish you the worst. —*Thomas Collins Jr., New Castle, DE*

■ I found good news and bad news in your November Side Tracks column. The good news is that Eric Maloney is leaving *80 Micro* for *PC Resource*. Just great! The bad news is the worst I've read since I bought my first Model I in 1978. You've decided to cover only MS-DOS.

I wish I could understand your reasons for doing this. You already publish *PC Resource* for MS-DOS—why aim two magazines at the same market? You say that 40 percent of your subscribers use the Model 4 and 20 percent still have Models I and III. That seems to be a fair market in itself. —*Fred E. Guth, St. Louis, MO*

■ Your November Side Tracks column stunned me. I can't adequately express my disappointment that *80 Micro* no longer covers TRSDOS. I've had my Model 4 for several years, and your magazine was the only good source of information and help for me.

I won't replace my 4 until a truly satisfactory (understandable, friendly, modular, expandable, standardized, and open) 32-bit system that is unhindered by arbitrary hardware or software restrictions is available at a justifiable price. —*Robert A. Bonilla Jr., Hephzibah, GA*

■ Your November editorial was a low blow. Based on your promises of continued support for the 4, I paid for a 2-year subscription that started in October 1987. I am not interested in Tandy MS-DOS. I will eventually go MS-DOS, but it will be an IBM.

After the shabby way Tandy treated its own computers, I won't buy a Tandy clone. Tandy's threat regarding no support for pre-6.3 versions of TRSDOS was a big laugh. —*William T. Cashin, Westwood, MA*

■ Your magazine is now so geared to advanced computing that I can't enjoy your articles. The one or two articles and programs that I find interesting (and can run on my hardware and software) are written as if the writer assumes the reader is at an equal level of expertise. I find these articles almost impossible to follow.

I think your magazine has become extremely—to use a computer cliche—user unfriendly. —*Roger Dobkowitz, Los Angeles, CA*

■ My 4 serves me well, and I intend to use it until it dies or (God forbid) gets zapped by lightning. If *80 Micro* follows MS-DOS (and the advertising money) into the sunset, where will I find support for my 4? Certainly not from magazines enamored with PC-compatibles or from computer-in-general books that don't understand the convoluted personality of my machine.

I know that popular support for the 4 is decreasing, but many of us, for a variety of reasons, continue to lead normal lives with their 4. We still need *80 Micro* the same way people need automotive parts stores to supply parts for their cars.

I would be willing to pay a higher subscription rate to support a magazine that supports my trusty 4. Concerning your decision to devote your magazine to MS-DOS, let me put it as simply as possible:

The heavens are draped in black.
I am in deep mourning.
Please cancel my subscription.

—*David Schmucker, Palisade, CO*

■ What to do? I've had a TRS-80 nearly from the beginning. I've added to the original 4K Level I machine much as people used to add accessories to their Model T Fords. Like the Model T Ford, the TRS-80 plods along, but it gets me where I want to go.

It's tempting to join the fast crowd and buy a shiny new PC-compatible, but what would become of all my old "friends" in my disk boxes? —*Jay Cox, Wayne, NJ*

■ Over the years, *80 Micro* has been an exciting source of programs and information that helped me survive the "beginner's blues." I remember the fantastic artwork in the full-color ads for the adventure games, but I never came up with the cash to buy them. Perhaps someone would like to part with their collection.

Thanks to everyone who wrote articles and programs, even if yours had incurable bugs (be assured some did). The 8-year-old file of magazines and disks will remain on the closet shelf until the sad day when I take them on the final trip to the trash. —*Wendell Morrill, 1222 Cherry Drive, Bozeman, MT 59715.*

■ I read with regret your announcement that you plan to abandon the TRSDOS line, because I grew up with the I, III, and 4P. But alas, my program of 60K and my desires for better data-base and word-processor programs outgrew the 64K memory and 8-bit processor limit.

After careful analysis, I bypassed the PC-compatible line and bought a Macintosh SE with a 20-MB internal hard disk. It is small in size, powerful, has excellent graphics, and I get more readable information on the small monitor than on a standard PC.

I will miss the writing of Eric Maloney. The Macintosh publications could use a lot of his honesty and level-headed analysis. —*A. Bruce Jacobs, Fargo, ND*

■ As one of your oldest subscribers, I was saddened to read the death knell for the last TRSDOS magazine. Over the years, whenever *80 Micro* arrived in the mail and I was working on a project around the house, my daughters hid it from me, because they knew everything would, and did, stop.

When I think back about the great articles that taught me so much, I wonder what happened to all these people. I enjoyed your tenth-anniversary article; reading it brought back the memories. I also enjoyed your efforts and will surely miss the old *80 Micro*. —*David J. Nicolaus, Valparaiso, IN*

(continued on page 92)

Illustration by Maris Bishofs

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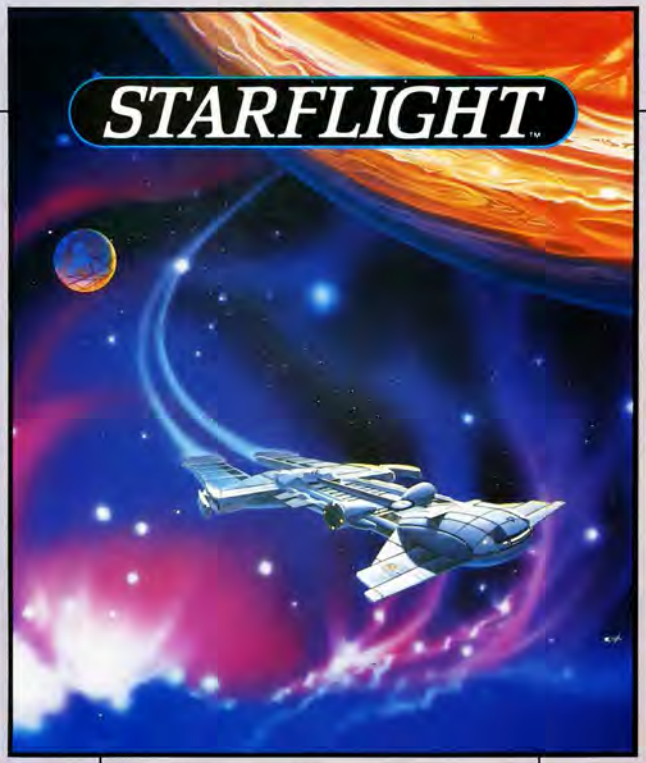

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