

80 micro

the #1 magazine for Tandy users

AUGUST 1986
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A CWC/I PUBLICATION

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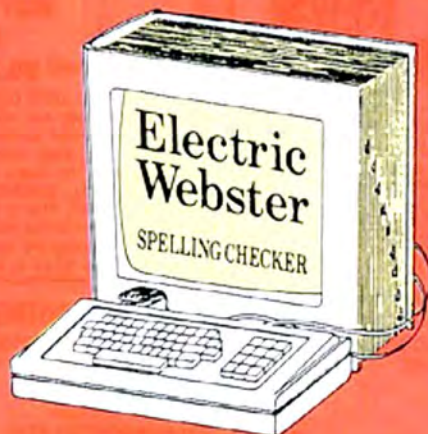
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Every now and then a terrific program comes along. This appears to be the one for this year. DOSTAMER is a "must have" program for Model 4 users.

It is now available from DiskCount Data for \$69.95. DOSTAMER. . . for the Models 4/4P/4D only.

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PowerSoft NewsFlash #10

Summertime fun

with Leo Christopherson



Welcome again to our *Newsflash*. This is summer now, so let's have fun! How do you have fun in the summer with computers? GAMES! Games that you and your family will enjoy for years; by Leo Christopherson - "The Walt Disney of the TRS-80". We present "Leo's Greatest Hits". (We're re-running some from last time so that any who missed it will get a chance to order. If you haven't already ordered - do it today!)

We are very proud to have assembled this very classic game collection. Old-timers know his name instantly. For those who don't know Leo, his games set a pace that other authors had to follow. Leo was the first programmer to utilize string-packing to create not only truly animated graphics (that even blink at you), but he also created the standard for *SOUND*, spreading to two and three part harmony on some games. Lastly, they exhibit a terrific sense of humor. If you remember the enjoyment that any of these brought you, buy this disk. You'll show off your computer to all your friends with these! *If you don't have any great games, this is the disk to get!* Buy this for yourself or as a gift! Put some fun and laughs back in your TRS-80!

Originally, the games sold for \$14.95 apiece and up. Unfortunately, they disappeared - doomed to extinction - when the TRS-80 game market went cold around 1982/83. We thought of the newer people who missed them the first time around, as well as those who remember, but don't have them. These are definitely quality CLASSICS that should be part of every TRS-80 collection and not forgotten. We now offer them together for the very first time in this Collector's Edition at only \$19.95 complete. Use the cassette I/O cable & any mini-amp for sound, except Mod 4P which has sound built-in.

See your TRS-80 do a soft-shoe shuffle, and then take a bow - with "LEO'S GREATEST HITS!"

The Collection - only \$19.95

on disk for Mod I, III, 4* (III mode)

ANDROID NIM (Living animated graphics with sound)

The classic animated game that set the pace that all others would have to follow. It appears that there are living, breathing creatures in your computer who will keep you laughing for hours, especially when they chatter at each other while you're trying to make your move! They stare right at you and blink! They also shake their head if they disagree with your requested move. Many comical moments, plus a great game of logic.

DUELING DROIDS (Animated sword fighting with 16 song soundtrack)

Those same great little guys from ANDROID NIM are back! This time they're waving light-sabers and are entering a fencing contest. You control one of them and guide him through training and then competition that gets fiercer as it goes. There are sixteen different songs in this game that are played at different times depending on progress.

DANCING DEMON (Fully animated tap-dancing side-show with music)

This is perhaps the most comprehensive, fun, and comical program of the lot, and one that will entertain you and your family for months on end. It features one of Leo's comical characters, but this guy tap-dances! There are four song and dance routines included, but the best part is you can easily compose and save your own songs and dance routines to disk! Easy and fun for the whole family! Your kids will have a great time with this one, and it teaches coordination between the notes and the steps. Soft shoe is possible and demonstrated on the TRS-80 to the tune of "AIN'T SHE SWEET?"!

SNAKE EGGS (Animated graphics with sound and table-talk)

Leo's comical version of "21", except this involves two snakes that roll eggs (yes, eggs) a certain distance for points. Trouble is, they like to argue, and sometimes "get tired" because you've been playing too long without giving them a break. Amazing!

BEEWARY! (Fully animated graphics with sound and burps)

The old game of spider and the fly - except you're the fly (or bee in this case)! The object is to hang above the spider until you can buzz down and sting him in the right spot. Trouble is, he keeps jumping at you. On top of that, you're getting tired! Lots of humorous comments from the spider. Sometimes he doesn't think you taste very good.

Please turn to Page 26 in this issue
for a VERY MAJOR announcement!

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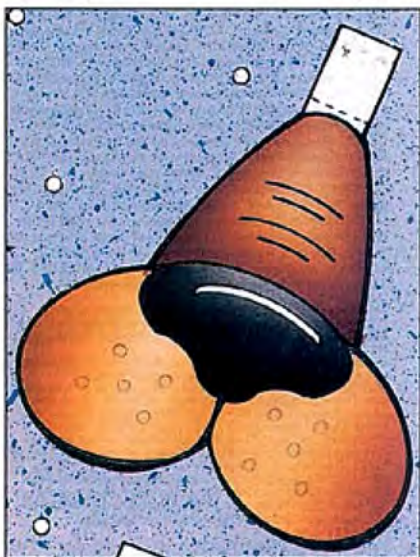
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LOAD 80

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

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

Using Load 80 is simple. If you own a tape system, load the Load 80 tape as per the in-

structions provided. If you own a Model I or III disk system, you boot the Load 80 disk and transfer the files to a TRSDOS system disk according to simple on-screen directions. If you own a Model 4, copy the Model 4 programs from the Load 80 disk to your TRSDOS 6.x disk using the COPY command.

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

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

Directory

Cryptic Code

Article: Disguise Your Data (p. 48).
System: Model 4, Model III with changes; 48K RAM.

Keep your messages private.
Language: Disk Basic.
Cassette filespec: B.
Disk filespecs: CRYPTSYS/BAS, CRYPTSYS/KEY, CRYPTSYS/DEF, CRYPTSYS/KNF.

Files the Way You Ordered

Article: Good Filekeeping (p. 60).
System: Model 4, 64K RAM.

Create master file directories.
Language: Basic.
Cassette filespec: C.
Disk filespec: FILEKEEP/BAS.

Data-Base Encore

Article: Easydata, Take Two (p. 66).
System: Model III, Model 4 with changes; 48K RAM.

Enhancements to the Easydata data-base program previously published in *80 Micro* ("Little Wonder," December 1984, p. 72).
Language: Disk Basic.
Cassette filespec: D. E.
Disk filespecs: EASYDATA/BAS, EASYDATA/SRT.

Unpatch

Article: Unpatch (p. 70).
System: Model III, 48K RAM.

A simple way to undo patches.
Language: Disk Basic.
Cassette filespec: J.
Disk filespec: Unpatch/BAS.

Overlay Express

Article: DOS Diversions (p. 80).
System: Model III, 48K RAM; Model 4, 64K RAM; Model 4P, 128K RAM; Model 4, 128K RAM; TRSDOS 1.3; EDAS editor/assembler.

Store TRSDOS overlays in memory.
Language: Assembly.
Cassette filespecs: MEMSYS (SRC); MEMSYS (CMD, Model III); MEMSYS (CMD, 64K Model 4); MEMSYS (CMD, Model 4P); MEMSYS (CMD, 128K Model 4).
Disk filespecs: MEMSYS/SRC, MEMSYS3/CMD, MEMSYS4/CMD, MEMSYS4P/CMD, MEMSYS4E/CMD.

Model 4 Scrolls

Article: The Next Step (p. 94).
System: Model 4/4P/4D, 64K RAM; EDAS editor/assembler.

Perform partial screen scrolls on the Model 4.
Language: Assembly, Basic.
Cassette filespecs: F, G, H.
Disk filespecs: LISTING1/ASM, LISTING2/ASM, LISTING3/ASM, LISTING4/ASM, LISTING5/ASM, LISTING6/ASM, LISTING7/BAS, LISTING8/BAS, LISTING9/BAS.

Checksum

Article: How to Use *80 Micro* Program Listings (p. 112).
System: Models I, III, and 4; 32K RAM.

Use our checksum program to check the accuracy of the Basic listings you type in.
Language: Disk Basic.
Cassette filespec: I.
Disk filespec: CHECKSUM/BAS.

BAS, SRT = Basic KEY, DEF, KNF = Basic data file SRC, ASM = source code CMD = object code

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Hell Freezes Over

I didn't accept it at first. The letter from Tandy stated that the company had "begun to furnish sales information to several key research firms." Was this someone's idea of a joke? Not until I talked with someone in Fort Worth did I begin to believe the news.

If you're new to Tandy computing, you'll probably respond to this announcement with a big "So what?" But if you've been around for a while, you'll realize the magnitude of the event. Few people believed Tandy would ever release sales figures to anybody. As one wit at *80 Micro* put it, "Hell finally froze over."

Before I launch into a long-winded reflection on the impact this change in policy will have, here are the numbers for the first quarter of 1986. TRSDOS fans be warned—this information might be hazardous to your health:

MS-DOS systems	42,000
Color Computers	36,000
Portables	14,500
TRSDOS	3,750

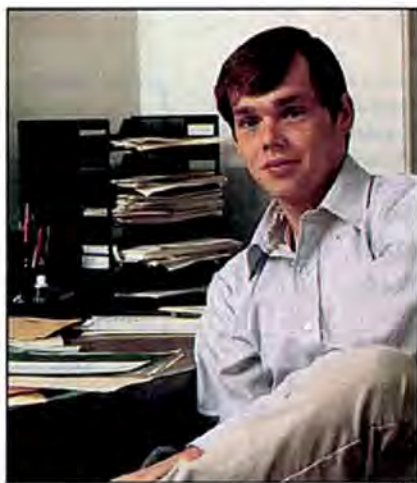
For those of you who disbelieve, let me repeat myself. These sales figures are not the dartboard guesses of a research firm. They were not divined by the *80 Micro* staff from astrology charts. They are actual sales figures released by Tandy Corp. itself. Burn my clothes, Lord, I'm going to heaven.

Figuring It Out

Long ago, in a galaxy far, far away, Tandy was one of the Big Three, its TRS-80 vying with the Commodore PET and Apple II for territorial rights. With its massive Radio Shack retail chain, Tandy sold computers in spite of itself. Tandy execs saw no reason to release sales figures. Why give out information that might only help the competition? As long as Tandy sold lots of computers, it didn't care whether anybody knew what its portion of the market was.

The strategy was fine in a small industry in which a few manufacturers sold relatively few computers. You didn't need a lot of proof to see that Tandy was clearly number 1 or 2. But then the market took off, and firms as diverse as IBM and Sinclair started selling computers by the boatload.

The fortunes of various firms seemingly ebbed and flowed with the phases of the moon. Nobody had the slightest idea of who was doing well and who was doing poorly. As anecdotal evidence be-



came increasingly unreliable, analysts started to seek out empirical data. People began paying attention to the market-share reports being circulated by such research outfits as Future Computing, IDC, and Dataquest.

Of course, these reports included every manufacturer but Tandy. Eventually, the public began to forget about the TRS-80; as far as it was concerned, the principal vendors were IBM, Apple, and Commodore. Tandy was lumped along with Heath, SWTP, OSI, Texas Instruments, and other archaic manufacturers as part of microcomputing's quaint, irrelevant past.

Tandy's refusal to release sales figures was not the only reason the company faltered. In fact, it was more a symptom of the company's woeful failure to understand the dynamics of the microcomputer market. The company's credo was "isolationism at all costs," and Tandy believed it could remove itself from the competitive microcomputer arena and maintain sales through sheer brute force. This is the same philosophy that led Tandy to stick with its TRSDOS line long after the IBM and Apple standards had clearly won the day, and that led it to neglect and discourage third-party support for its products.

So what prompted the policy change? Not coincidentally, the company decided to release sales figures shortly after the *Wall Street Journal* and *Business Week* named Businessland as the world's largest chain of computer stores. Tandy, of course, holds that distinction, and its execs were upset by the slight.

Don't think for a minute, though, that the company acted capriciously. Tandy

is above all else pragmatic; it does what it needs to do to increase profits. Company leaders have simply realized at long last that providing sales information begets press coverage, and press coverage begets success.

Tandy is correct that the numbers games played by research firms are often meaningless. Statistics vary widely from study to study, while methodologies are sometimes questionable. Computer magazines publish research results because they're easy press releases to rewrite, not because they say anything important.

But consumers, hardware and software developers, and analysts do read these reports. When you're on the list of top sellers, and not merely part of the "Other" category, you're legitimized as a market leader. People begin to pay attention to you. And you begin to sell more computers.

Tandy has been full of little surprises over the last couple of years. I can't wait to see what's next. Can Hell freeze over more than once?

Odds and Ends

I was going to spend some time discussing the numbers from Tandy's first report, but they pretty much speak for themselves. Tandy has rebounded on the backs of its MS-DOS machines. The Model 4D is simply on its back. . . .

Some people apparently misinterpreted my June editorial as anti-Model 4. Au contraire. The point I tried to make was that if third-party vendors don't support the MS-DOS machines, they won't be around long to continue supporting the TRSDOS systems. Model II/III/4 owners should be glad to see the third-party market embrace the 1000. Any other response is just stupid, self-defeating chauvinism. . . .

A few months ago, I lamented the decline and fall of *Computers & Electronics*, formerly *Popular Electronics*. I subsequently got a note from Stan Veit, former *C&E* technical editor, pointing out that many of *C&E*'s writers now appear in *Computer Shopper*, of which Veit is assistant publisher. In case you haven't seen it, *Computer Shopper* is a bulging monthly newspaper gorged with mail-order ads for discounted PC clones, boards, peripherals, and the like. They're at 407 S. Washington Ave., P.O. Box F, Titusville, FL 32781. ■

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>WRAP THE TOWEL AROUND MY HEAD

And the story responds:

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AND TELL YOU WHAT A GREAT CHAP YOU ARE AND THEN THE EARTH GETS UNEXPECTEDLY DEMOLISHED, YOU WAKE UP WITH A HANGOVER WHICH LASTS FOR ALL ETERNITY. YOU HAVE DIED.

Suppose, on the other hand, you decide to:

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Opportunity Knocks

As Bob Dylan once sang, "The times, they are a-changing."

The TRS-80 Model I runs at a speed of about 2 megahertz (MHz). Think of that speed as 2 miles per hour (mph). If 2 mph is the equivalent of a slow scroll, then the Model 4 moves at 4 mph, a brisk walk.

The Model 1000 uses a different processor. In my tests, it runs two or three times as fast as a Model 4. I'll call that 8–12 mph. The Model 3000 uses the 80286 processor. It's about four times as fast as the Model 1000. That puts it at 32–48 mph.

A typical minicomputer is a 600-mph machine.

In early tests, the 80386 chip performs instructions about three times faster than the 80286 at the same clock speed. Since it runs at twice the clock speed, that puts it at 192–272 mph. A 600-mph mini with 10 users will appear to run at less than 60 mph, since it spends time switching users.

Minis let users share storage and printers. But users will be attracted to a computer with stable and generally faster response, especially if networking allows them to share peripherals. IBM blamed the PC/AT for decreased mini sales and decreased profits last year. The new micros will be about five times as fast as an AT.

Some analysts feel that the impact of these faster micros will be blunted because mini and micro software is incompatible. I disagree.

Mini software often carries maintenance or lease payments; micro software almost never does. For equivalent programs, micro software costs far less and prices are dropping. Mini software is usually proprietary. "Locking in" customers with proprietary micro software has always failed. The last company to try this was Texas Instruments with the TI 99/4A.

So, suppose that proprietary software won't be a factor. Suppose that software prices will continue to drop and that the 80386 machines are as capable as rumored.

There's still more. A professor at the University of Illinois has announced a good, cheap way to make computer chips from gallium arsenide on silicon. That's important; gallium arsenide chips are as much as 10 times faster than chips made conventionally.

That process could prove workable, and there are others.

Suppose that an existing chip can be made to run only 10 times faster within five years, which appears very likely.

An 80386 chip would lead to a 1,920–2,720-mph computer. It would have more computing power than most mainframes. We are no longer walking or jogging: This is Mach 4!

Two potential problems might prevent a near-total turn to micros:

- Software incompatibility.
- A lack of networking software.

Software incompatibility isn't a problem. Most software is written in standard languages that are already available for the 80286 and can run on the 80386 with few or no changes. Also, most new software is already written for micros.

Networking software already exists. To extend the software to the new computers is only an evolutionary step.

Many minis and mainframes are leased from the manufacturer. If they become obsolete, they will come off lease and the manufacturers' income will drop. Software lease and maintenance charges will end. Even companies that succeeded in selling their hardware will suffer.

So, companies such as IBM might try to slow the introduction of these new machines or keep prices for them high. That won't work; a small company could grow rapidly with a new computer. Compaq made the Fortune 500 in four years; so could someone else. Overseas industry will also undercut any attempt to keep prices high. Independent developers will sabotage any attempt to make software prices high. I know I will!

Present mini and mainframe manufacturers will be vulnerable as never before. If not Tandy, then Compaq, AT&T, or any one of a dozen Japanese or Korean companies can step in.

Tandy is everywhere. A real killer micro from Tandy would rule the market in short order. Will they do it? ■

Bruce Tonkin is an independent software developer, industry critic, and author of The Creator data-base manager. You can reach him at 34069 Hainesville Road, Round Lake, IL 60073.

Courier 2400: No Parity

I'm perplexed by your star rating system.

In his review of the U.S. Robotics Courier 2400 Modem (May 1986, p. 29), Bradford N. Dixon awards our product three out of five stars for ease of use. Built-in help screens, a printed operations summary on the button panel, accessible DIP switches, an on/off switch, adjustable volume control for the speaker, call-duration reporting, nine LEDs, call-progress detection, two phone jacks—all these functions add up to an easy-to-use modem. How could it be any better?

The same goes for documentation. It seems inconsistent for Dixon to complain about the intimidating TBBS documentation and still give it four stars.

Giving the Courier 2400 Modem two stars in the "well made" category implies that the product is poorly made, but the author doesn't substantiate this. Our quality-control statistics show that 99-100 percent of our products passed their first quality-control inspections; those that didn't got passing marks in the second inspection.

Two stars for "Does the job" sounds particularly harsh, even in light of the bugs mentioned. On a scale of five, two stars indicates that the modem does the job only 40 percent of the time, or only does 40 percent of the job. Is this fair?

Since Dixon says the modem works well and he likes it, I'm puzzled that he only gave it two-and-a-half stars out of five overall.

Mark Smith
Communications director
U.S. Robotics Inc.
Skokie, IL

Bradford Dixon's review of the Courier 2400 Modem is unfair to the product and to readers who might be misled by the author's inconsistencies. Dixon gives the unit three stars in the "easy to use" and "good docs" categories, yet he says setting it up is "a snap," the instructions are complete, and the DIP switches and plug ports are labeled clearly. What would he require for more than a three-star rating? A triple "snap?"

In the "well made" and "does the job" categories, Dixon is even less consistent—a mere two stars. But by his own admission, the Courier worked "flawlessly" in originate mode and he accessed BBSes "without a hitch." I suspect his demand-



ing standards would require the modem to pay the phone bill as well.

Luis M. Garcia-Barrio
Philadelphia, PA

I was disappointed in Bradford Dixon's review of the Courier 2400 Modem.

No mention is made of extended result codes and dialing, the built-in help screens, or the integral timer/clock. Dixon also didn't say that with Models I/III/4 you must cut lead 12 of the RS-232 cable for the "HS" light to work properly at 2,400 baud. Perhaps he used another machine.

The review is beneath 80 Micro's usual level of objectivity and glosses over the finer qualities of a superior modem many people have been using successfully for months.

Jim Gaffney
El Paso, TX

The Courier 2400's performance isn't particularly exceptional, and it's certainly not superior. The one-word translation for two-and-a-half stars is "average."

I stand by my conclusion that the modem performs flawlessly in the originate mode, but it still has problems with premature disconnects when it's used on the phones here in Peterborough. Unlike modems from Hayes and

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

other manufacturers that test for both a tone and energy to determine the presence of a carrier, the Courier 2400 tests only for energy.

This causes trouble on older phone systems that don't automatically cut off energy on an inactive line after 30-60 seconds. Recently, after a caller to the 80 Micro BBS had hung up, the Courier mistook the subsequent dial tone to be the caller's carrier, since there was energy still on the line. The result was screen garbage and a tied-up computer until the board could be reset. Other modems don't display this quirk; if U.S. Robotics knew about it, they should have warned us in the documentation.

The company bends over backwards to keep customers happy, and I like the Courier 2400 to the extent that it works. Still, I wish I'd known about the energy/tone problem before I bought it.

—Brad Dixon

Primitive Art

Why is The Art of Programming written by a man who dislikes languages other than Basic? The Art of Programming indeed! Bruce Tonkin's column mirrors all the other series for Basic beginners we've seen year after year.

I suggest you rename the column The Art of Basic and publish articles that go beyond the silliness of arguing over which languages are better or worse than Basic.

I hope that as my programming interests broaden, I'll be able to find new programming ideas in the pages of 80 Micro.

Ronald B. Stern
Boca Raton, FL

They Were Bluffing

Willi Wald of Hamilton, Ontario, says he won't buy VisiCalc because it's copy-protected (June 1986, p. 16). It isn't.

When I bought VisiCalc 2.9.2 for my Model 4 (\$69.95 plus tax), I found it was not copy-protected even though the manual said it was. I now have VC/CMD on several floppies, including a couple of data disks, and have made it invisible in all the directories.

Henry A. Blumenthal
Jacksonville, FL

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Printer Problem Solvers

Q: R.M. Doerr's problem (December 1985, p. 16) with his FX-80 printer not accepting the OUT 248,15 command is probably one of those "oh yeahs" we keep reinventing. If the failures occur only during printing from the buffer, the problem is nobody's home at the parallel port.

During every print cycle, the printer (via port 248) informs the computer whether it is ready to receive data. If the computer sends data to port 248 while the printer is sending "busy," the strobe signal goes undetected and the printer never looks for the data. If INP(248) AND 240 = 48, the printer is between print cycles and is temporarily capable of accepting data. Your suggestion of LPRINT CHR\$(15) does this checking automatically. Sound familiar? (Mike Zarowitz, San Carlos, CA)

Q: In response to R. M. Doerr: The key is to make sure the printer is loaded with paper, selected, and not busy. To do this, you must input the value of the port and see that the proper bits are set. In Basic, the following statements should do the job:

```
100 CHAR = 15
110 IF (INP(248) AND 224) <> 32 THEN
    GOTO 110
120 OUT 248, CHAR
```

This technique isn't the best for general use because it bypasses the operating system and is much longer than LPRINT CHR\$(15). I've found it to be useful for passing bit-image graphics codes directly to the printer without interference from the operating system. (Eric Haskell, Charlotte, NC)

A: You're right Mike, it does look familiar. The problem is, not all printers give the same results with an INP (248), as Eric's letter shows. When using this method to check the printer port, test to see which values the printer uses for error messages (out of paper, not ready, not turned on, not on line, and so on).

Super Headache Plus

Q: I'm having a problem using Super Utility Plus (SU+) 3.0 on my Model 4P in Model III mode. When selecting option 10 (exit to DOS), I have to reload the Model III ROM image from the MODELA/



III file. This causes a load error, and I have to swap the disk in drive zero with one containing the MODELA/III file. PowerSoft's answer was "No suggestions, except that we have sold a true Mod 4 version for one-and-a-half years."

How can I get around this? Having to reload the Model III ROM is annoying. The file won't load from a NEWDOS80-, MULTIDOS-, or DOSPLUS-formatted disk. (R. A. Basham, Bellevue, NE)

A: I can't help you because the solution requires changing the SU+ disk to include the MODELA/III file—not an easy task, since the disk is copy protected. Does anyone else have a solution?

Running Red Lights

Q: I recently changed a Basic program on my Model 4, saved the change to disk, and removed the disk from drive 1 after the red light went out. The light came on again briefly, and later the program wouldn't load. I had to patch the program since it was lengthy and I didn't have a good backup.

I listed the program (call it Mail) from TRSDOS using the command LIST MAIL (HEX), which showed the program in hexadecimal along with a near-English listing. The last few lines were missing. I listed other Basic programs and all had hex notation ending in 00 00 00 1C, compared to 002B:EO = 0F FF 3A 8E 00 for the faulty program.

To change FF 3A 8E 00 to 00 00 00 1C, I entered the following patch from TRSDOS:

```
PATCH MAIL / (D2B,EO = 0F 00 00 00
1C:F2B,EO = 0F FF 3A 8E 00)
```

The program loaded normally. I retyped the missing lines and saved the pro-

gram, this time waiting for the red light to go out.

I'd be happy to help readers restore their crashed Basic programs. (Jack Marks, Rochester, MI)

A: Thanks for an interesting solution that doesn't require retyping the whole program. Fortunately, this type of problem doesn't happen very often.

Jack's address is 860 Lynhaven Court, Rochester, MI 48063.

Notes on the BBS

Q: When Will Rose (January 1986, p. 14) asked why he couldn't run the long program in BBS Express (May 1984 through May 1985), you said he could buy it for \$15 from Saturday Software. Actually, the Towne Crier 2.0 version published in 80 Micro was discontinued by Saturday Software in July 1985, according to coauthor Stu Schneider. Saturday Software sells a new, improved version for about \$80.

I chose to type the listings in, and added such features as word-wrap, a time limit, bulletins, a way to read errors saved to disk, and others. Interested readers may call my BBS if they can't get the program to work or to see it in operation. The number is 801-943-0955, 24 hours a day.

Two major errors prevent the program from functioning as listed. The Field parameters of the left (LP\$) and right (RP\$) pointers in lines 250 and 270 are incorrect. Since those values are written with an MKI\$ variable and read with a CVI variable, 2 bytes are needed for each. Change FIELD 1 AS LP\$, 1 AS RP\$ to 2 AS LP\$, 2 AS RP\$ in both lines.

The other major error is in setting up the program. The May 1985 BBS Express article (p. 94) refers to the message index as MB\$; it should be MN\$. Instead of using:

```
MBS = MKI$(1) + STRING$(98,CHR$(0))
```

I use MN\$ = MKI\$(1) to index the message index.

There were several minor errors: In line 1280, replace X = CVI(SM\$) with SM = CVI(SM\$); in line 1750, replace 180 with 1860; in line 1940, replace 210 with 2510.

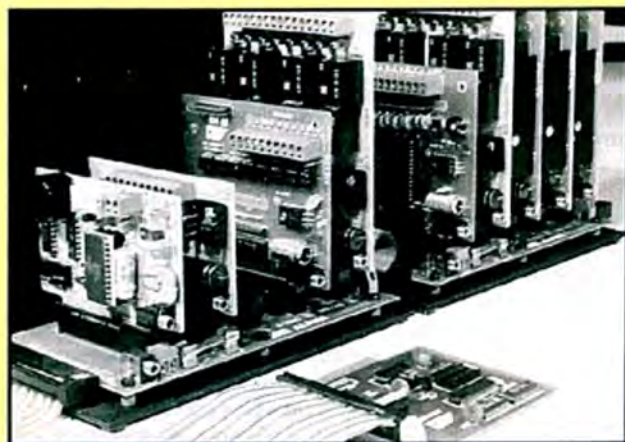
Finally, you must set up the auto-answer modem to produce a ring detect and then patch those lines into the Basic program at lines 1356-1359. (Darrell Lee, Sandy, UT)

A: Thank you for the updated information and for sharing your corrections.

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Creative Accounting

Q: I'm a certified public accountant and would like to computerize my practice. I own a 64K Model 4 with two built-in disk drives of 184K each, a DMP-120 printer, and Montezuma Micro's CP/M, which I use once a year with a tax program. I'd like to buy a computer for my bookkeeper and keep the Model 4 for myself.

Am I wasting my money by staying with the Model 4 or should I go with an IBM compatible, such as a Tandy 1200HD? If I stay with the Model 4, will I need two hard disks or will one suffice with some kind of network arrangement? I have about 50 small clients. (*William E. Townsend, Caruthersville, MO*)

A: You should convert to MS-DOS only if the Model 4 will no longer do the work required.

A dual hard-drive system (one for each computer) is more expensive, but does provide an important backup feature: if one drive fails, your business won't come to a halt as it would with a networked, single hard-drive system. Given the size of your business, I would opt for the dual hard-drive system. If you amortize the cost over five years, two hard drives aren't much more expensive than one.

Check out Software Support (1 Edgell Road, Framingham, MA, 01701, 617-872-9090). They offer many different-sized hard drives, including some with removable cartridges for easy data backup.

Getting into Position

Q: I have a Tandy LP VIII line printer that won't work with CHR\$(27);CHR\$(10). Also, I've been unable to get line positions under 255.

Is it possible to obtain a listing of the LP VIII's ROM code or other technical literature? (*Jacques LaPorte, Morigny-Champigny, France*)

A: You have several problems. First, the LP VIII has two print modes: data processing and word processing, which are identical except for certain commands. Line-spacing commands, for example, are acted on immediately in word-processing mode and at the end of the line in data-processing mode. CHR\$(27);CHR\$(10) is a line-spacing command.

The LP VIII sets itself to data-processing mode when you turn it on. For word-processing mode, you must send the printer a CHR\$(29) command (as in LPRINT CHR\$(20)).

Most versions of Radio Shack Basic intercept the CHR\$(10) and substitute CHR\$(13); you can get around this by issuing a CHR\$(137) command. Some printers will strip 127 from the code and treat it as CHR\$(10). A better solution is to substitute two CHR\$(27);CHR\$(30) commands for the single CHR\$(27);CHR\$(10).

Similarly, the line-positioning commands only work in word-processing mode. Remember that the first two CHR\$(x) character codes are CHR\$(27);CHR\$(16), and the next two define the dot column; for column positions under 255, the first of these last two will be zero. If you're having problems with Basic intercepting the CHR\$(0) command and not sending it to the printer, try using CHR\$(127) instead.

Unfortunately, the printer's Japanese manufacturers haven't released a disassembly of the LP VIII programming ROM to Radio Shack. You're at a dead end until someone decodes the ROM.

Cleaning Up the Dump

Q: Your answer to J. S. Prather's question on how to dump monochrome graphics from a Tandy 2000HD to a dot-matrix printer (January 1986, p. 17) was off target.

Two files, DUMPBW and CGPDMP.BIN, are required. Contrary to your advice, LPDRVR is incompatible with DUMPBW.SYS and not used in this process.

The correct method is as follows:

1. Put the line DEVICE=DUMPBW.SYS in the CONFIG.SYS file.
2. Start Basic with /M:&H770 (for a 128K system) or /M:&HFF00 (for all other systems).
3. Include two statements in the Basic program to load the machine-language routine. For 128K systems, insert:

```
CGPDMP=&H770
BLOAD "CGPDMP.BIN",CGPDMP
```

For other systems, insert:

```
CGPDMP=&HFF00
BLOAD "CGPDMP.BIN",CGPDMP
```

4. Use control-I to dump the screen to the printer.

I have a problem of my own. I've had no luck using BIOS Service 10H, AH=5 (select active page) in an Assembly-language program. The command either produces weird screen graphics or duplicates the typed material in every column. Am I missing something, or is there a bug in the BIOS Service?

While IBM publishes a BIOS source-code listing for the PC, Tandy won't release the same information for the 2000. Where can I find it? (*Bruce F. Blissett, Littleton, CO*)

A: Thanks for the updated information.

The service call should work as described. Can anyone help Bruce? Also, I'm afraid I don't know of any publications that cover the 2000's BIOS.

Tape to Disk

Q: I recently installed 64K and drive zero in my Model 4. Is there a program for transferring my tape software to the Model 4?

I'd like to correspond with other Model 4 owners in the United States and Canada, and I need advice on using the TRSDOS 6.1 file system. (*Don Hughes, London, Ontario*)

A: There should be a program on your TRSDOS 6.1 disk called TAPE100, which transfers most tape programs to disk. Notable exceptions are machine-language programs that don't load sequentially into memory (they load a program segment directly to video memory and the rest of the program in noncontiguous RAM sections), programs that have their own tape-loading routine (usually to prevent duplicating), and programs that combine machine-language and Basic programming.

You can't tell ahead of time which programs are transferable, so good luck on that score.

Don's address is 1147 Nashua Ave., London, Ontario, Canada N6K 2C4.

1000 and 1 Programs

Q: How can I transfer Model I, Level 2 programs on cassette and Exatron Stringy-Floppy (ESF) wafers to a Tandy 1000? (*David Moore, Ottawa, Ontario*)

A: The simplest way is to use a Model I/III/4 disk system to transfer the files to disk (using the Tapedisk command for the Model I, Tapc for the Model III, or TAPE100 for the Model 4). You must first transfer ESF tapes to standard tapes. You can then use PowerSoft's new TRSCROSS program to transfer the files to MS-DOS disks.

The next-best method is to use an RS-232 interface to transfer the files from Model I/III/4 memory directly to the 1000. Both machines must be equipped with RS-232 boards, telecommunications software, a null modem, and the appropriate cables.

Good luck.

Machine Shop Talk

Q: We can't get LDOS 5.1.4 to output printer control code 13 (in decimal, for carriage returns) from a network of 16 driveless Model 4's, which we run in Model III mode from a 15-megabyte hard-disk host. The latter uses version 2.1.4 of Network 3 and LDOS. TRSDOS 1.3 (our old system) will output 13 (CR) from within a Basic program through the RS-232 port. LDOS will only send the code through the RS-232 from the keyboard (*KI) at the system level and if it is routed to the COMM line (*CL).

Since LDOS Basic doesn't work with PEEKs and POKEs (as does TRSDOS 1.3), we must set the COMM line to an RS-232 driver (RS232T/DVR), route the printer (*PR) to the COMM line, and output a character stream from within the

Basic program using LPRINT CHR\$(C). Apparently, LDOS filters out control code 13 when LPRINT is used. How can we get around this?

Our students use a Basic editor to create data files, each representing a command block to a computer-numerical controlled (CNC) machine tool that makes parts for the California aerospace industry. Blocks strung together and separated by carriage returns make up a CNC program. The RS-232 output controls a paper-tape punch that prepares an eight-track, 1-inch-wide tape to be read by the CNC machine tool. The tape I've sent you shows how TRSDOS 1.3 punched a hole in track 8 (the code 13 carriage-return separator) while LDOS didn't. (Gordon J. Eisenbart, Woodland Hills, CA)

A: It appears from looking at the tapes that you might be using only a 7-bit ASCII system, in which there are no codes greater than 127. Try sending character 140 (127 + 13) out the RS-232. LDOS should simply pass the 8-bit code to the RS-232, which will remove the eighth bit and leave the carriage return in (although the tape uses eight tracks, the eighth track is used only by character 13).

Ghost in the Machine

Q: I'm having problems using SuperScripsit on my Model 4. Since a second disk Tandy sent me exhibits the same symptoms, the computer appears to be the cause.

The program works fine for about 15 minutes and then creates its own input. It mostly enters the letter F, but other letters sometimes appear. When I go to open a file, SuperScripsit will fill the field with letters and open the file. It adds letters to words; if I leave for a second, it fills the screen with FF.

Do you know what this is all about? (Dan Beit-Halahmi, Middletown, NY)

A: First, I'm assuming you either don't own any other programs or that they all work correctly.

If you only have SuperScripsit, the trouble is probably with either the RAM or the power supply. Some Model 4 power supplies are unreliable and put out a fluctuating dc signal that could cause memory troubles. Also, a RAM that is sensitive to voltages at the lower end of the standard power range could cause a program to misbehave.

The quality of ac power feeding into your home is another potential culprit. If your area has frequent brownouts and power problems, the resulting drag on the computer's power unit can cause trouble, although this is likely to come up only sporadically.

If the power supply checks out, try the RAM. There may be a single bad bit or byte

with a large role in SuperScripsit's operation. You must run an extensive RAM diagnostic test to detect this sort of defect.

Take the computer back to the repair center and have them double-check the power supply's stability under load. Then have them run a 24-hour RAM-test cycle.

Calling LDOS

Q: I use SuperScripsit with a Model III and a DMP-120 printer. With LDOS, which puts the directory on track 20, it has become impossible to call up the directory from the main menu; the only way is to exit to DOS and use the DIR command. Can anyone give me a patch or a debug function to correct this situation?

Also, what causes SuperScripsit to print out an X on the first line at the left margin? (Alain Gulloton, New York, NY)

A: I don't have any patches for the directory problem. However, PowerSoft's Super Utility lets you create LDOS disks with a directory on track 17, as in TRSDOS. Does anyone have a patch for this?

The DMP-120 printer always prints an X (actually an hourglass character) when it gets a control or character code it doesn't understand. Because SuperScripsit always sends a "reset to default mode" control character when it starts printing, you must be using the wrong printer driver. Check the documentation for the correct driver.

RAM Chip Blues

Q: My Tandy 2000 (256K, MS-DOS 2.00.00) occasionally locks up, a "Memory parity error" message appears on screen, and the only solution is to reboot. Do you know what's wrong and how I can fix it? (Hasjtm Tatra, Surabaya, Indonesia)

A: A RAM chip has gone bad and must be replaced. You'll need to have your repair shop run a RAM test to locate the bad chip.

Hi-Res Resolve

Q: Like John Dauphiny (February 1986, p. 16), I tried to install a high-resolution board on my Model III without using instructions.

I removed the insulating cover to examine the PC wiring and determined that the two-pin connector was for power (5-volt line and ground) and the two six-pin connectors were for video input from the CPU and video output to the CRT. By tracing the route to the IC (integrated circuit), I figured out that the center connector handled output to the CRT. I also had to add a wire to serve as the 12-volt line missing from the supplied power-cable assembly.

I ran the I/O (input/output) ribbon cable through its hole in the bottom of the case and connected it to the hi-res and

CPU boards. Next, I removed the video output cable from the CPU board and connected it to the right six-pin connector on the hi-res board (if you're looking at the back). I then ran the short, six-pin cable (supplied) between the CPU video output and hi-res center connector and, lastly, replaced the cable from the power supply to the CPU with my modified cable and connected the two-wire branch to the hi-res board.

I have one problem, however. At boot-up, the system comes up with the graphics screen instead of text, and I'm forced to enter the date and time while seeing nothing on screen. Once I'm in TRSDOS, the GROFF command sets everything straight. How can I correct this? (Thomas Harris, Ann Arbor, MI)

A: Congratulations on getting the board to work. My first thought is simply to patch TRSDOS to bypass the date and time prompts. Then set up an Auto command to execute the GROFF command and to prompt for the date.

Q: I had the same problem as John Dauphiny in installing the hi-res board, and found a clue in the clicking noises and other symptoms from the power supply.

While installing the board, you short out the 5-volt line because the supplied two-pin cable is improperly made. The solution is to pull out the two wires from one connector and reverse them.

Once the board is installed, the graphics display may be too big for the screen and some characters may be lost at the bottom. To fix this, adjust vertical size pot R617 located on the video board under the CRT. (D.E. Williams, Medley, Alberta)

A: Thanks for the information. Apparently, not all boards had such problems, as the previous letter indicates. ■

Note to Readers

This is the last time I'll be writing Feedback Loop. The technical staff of 80 Micro will handle the column starting next month. Those wishing to correspond with me can reach me at P.O. Box 481, Peterborough, NH 03458.

I've enjoyed writing the column and will miss your many problems, questions, and creative solutions. Take care and keep on computing!

—Terry



Terry Kepner is a freelance writer, programmer, and editor. He writes monthly columns for Portable 100 Magazine, Pico, and 80 Micro, and is publisher of The Kepner Letter.

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Tandy Plays The Number Game

Tandyland

In an interesting turn of events, Tandy has decided to let the rest of the world know just how good, or disappointing, its computer sales are. Inaccurate reports in *The Wall Street Journal* and *Business Week* of Tandy's sales figures and the performance of Radio Shack Computer Centers compared to other retail computer chains has induced the company to relax its "no numbers" policy.

From now on, Tandy will report monthly sales to a select group of market-research organizations, including Infocorp, Future Computing, Dataquest, The Gartner Group, and International Data Corp. (IDC). However, sales information will be broken down by operating system, not by machine.

The MS-DOS line was Tandy's biggest money maker during the first quarter of this year. The company sold 42,000 MS-DOS computers during the period, accounting for 44 percent of total sales. The second biggest seller was the Color Computer; it captured 37 percent of total sales with a tally of 36,000 units sold. In third place, representing 15 percent of total sales and with 14,500 units sold, was Tandy's portable computer line. The TRSDOS line trailed, accounting for only 4 percent of total sales with 3,750 units sold. (See Fig. 1.)

Despite the machines' lackluster first-quarter performance, Tandy remains supportive of the TRSDOS line, citing continued popularity with schools and home users. Considering the strong showing of the CoCo, it's easy to see why Tandy sticks with its oldest money makers.

Help is available (at a price) for those of you having difficulty reading the liquid-crystal display (LCD) screen on your laptop computer. For \$250, Axonix Corp., a Salt Lake City peripherals manufacturer, will retrofit your Tandy 200 or 600 with its Thin E/L Electroluminescent Backlighting system. Attach-

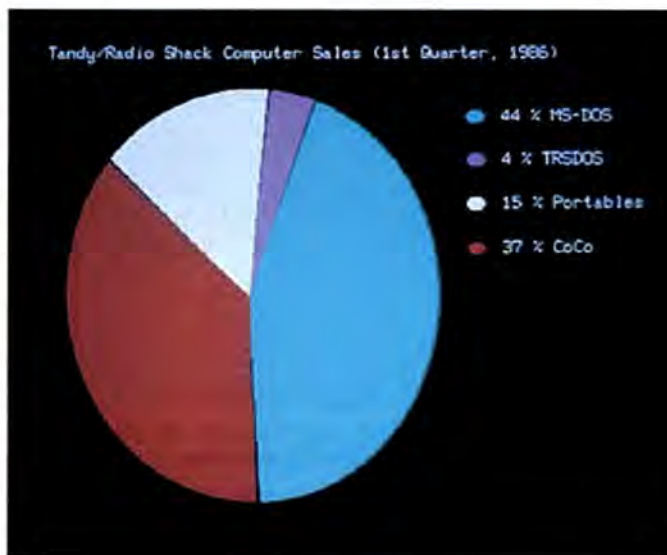


Figure 1. Tandy's sales totals by operating system (January-March 1986).

ing the electroluminescent panel to the back of the existing LCD increases the contrast-level ratio from 3-to-1 to 6-to-1. The result is much higher readability and less eyestrain for the user. Average turnaround time for Axonix to complete the retrofit is about a week.

In addition to the Tandy 200 and 600, single retrofits are available for the Hewlett-Packard, Kaypro, and Data General laptops. Axonix will retrofit Radio Shack's Model 100, but because the machine's screen is so small and encased with the keyboard, the firm only accepts orders in lots of 10. The per unit cost to convert a Model 100 to a backlit LCD is \$150.

For more information, contact Axonix Corp., 417 Wakara Way, Salt Lake City, UT 84108.

In the spring, Roy Soltoff, president of MISOSYS Inc., confirmed that his firm will produce a new LDOS operating system for the Model 4, to be available near the end of this year or in early 1987. LDOS Version 5.3 will include time-stamping on new or updated files, in addition to the date-stamping provided on older versions. The new version will also allow date-stamping beyond December 31, 1987, something the current version does not allow. The cost to upgrade will be around the usual price of \$19.95 for registered owners of the older operating system.

Though MISOSYS does not work directly with Logical Systems Inc. in writing code for Radio Shack's TRSDOS 6 operating system, Soltoff expects that TRSDOS 6.3 will be upgraded with the same capabilities as LDOS 5.3.

New Threads

In a scene reminiscent of the old "Untouchables" television series, six Federal Communications Commission (FCC) agents—seeming very much like Elliot Ness and his 1920s gang of G-Men—conducted a surprise raid of the show floor at Comdex/Spring. Their mission: to identify products

and companies in violation of FCC radio-frequency emissions standards.

By the end of the four-day show, the commission had tagged more than 2,000 products, which will be banned from sale in the United States until they comply with FCC regulations. Fines of \$2,000 were levied against 80 manufacturers at the show.

In a report published on CW Newsnet, Richard M. Smith, chief of the FCC's Field Operations Bureau, said, "We're emphasizing the computer arena. The compliance level is much, much lower (compared to other electronic industries). It's a very competitive business, but these companies have got to follow the regulations."

The FCC is not likely to make its appearance at Comdex/Spring its last, either. The commission will probably be present and tagging boards, computers, and peripherals at this year's Comdex/Fall. In fact, because of noncompliance problems, especially among imports, the FCC might host a forum at Comdex/Fall to outline policies regarding radio-frequency emissions standards.

MicroTrends

Survey statistics released by Electronic Services Unlimited (ESU), a New York-based research firm, show that indi-

viduals who perform some portion of their regular jobs at home are twice as likely to own computers as those who never work at home. The firm polled 20,000 households in the United States to determine patterns in the increasingly popular work-at-home trend.

According to ESU, individuals who use a personal computer for work at home consider the computer to be a productivity enhancer, not a money-making tool. The majority of work-at-home respondents said they use computers primarily to catch up on their 9-to-5 work. Most transport the completed work back to their offices electronically, via telecommunications, or physically on magnetic media.

Among the reasons given for working at home were the ability to work at one's own pace, stress reduction, less time spent commuting, and the need to care for a child or other family member. A majority of the respondents—68.9 percent—recommended that other people give working at home a try.

The ideal number of days to spend at home, most felt, is either two or three; the least desirable number is six or seven. (See Fig. 2.)

At the beginning of the 1985-1986 academic year, 91.3 percent of all schools in the United States owned at least one microcomputer. That's the statistic given by Quality Education Data (QED), a Denver-based research firm specializing in microcomputers and education. According to QED, the nation's larger school districts led the charge toward increased computer use, expand-

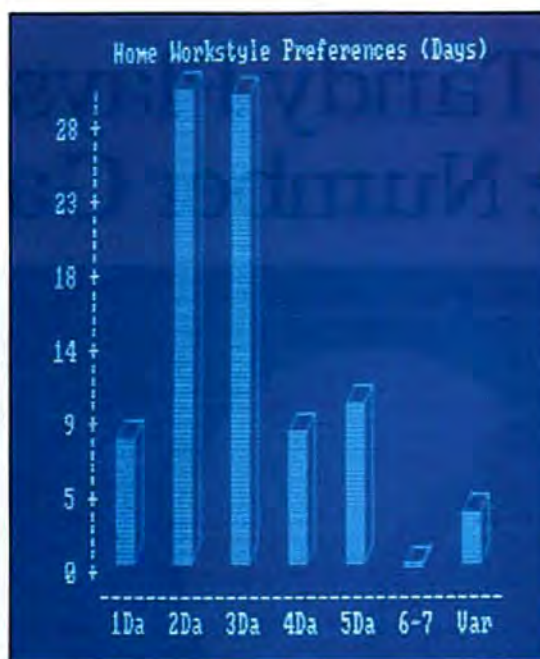


Figure 2. Work-at-home preferences in the United States. (Statistics compiled by Electronic Services Unlimited.)

ing inventories 60 percent over what they were in 1984-1985. (See Table 1.)

QED also reports that 10 percent of the high schools, 7 percent of the junior high schools, and 4 percent of the elementary schools that have microcomputers use modems, as well. (See Table 2.)

Mark Ferfolia, director of computer science at Trinity High School outside Cleveland, said the four modems that service his school's three computer labs are in use 14-16 hours a day. Students use telecommunications for a variety of purposes, including research of on-line data-base systems for school projects. Ferfolia's

students also host an electronic bulletin-board system dedicated to educational pursuits. An extensive catalog of public-domain educational software is available, demonstrating the extent to which schools can improve computer education by mixing modems with computers.

Hot Items

In April, Microsoft Corp. announced that it was ending direct distribution of its products to South Africa to protest that nation's apartheid policy. A press release distributed by Microsoft quotes Director of Intercontinental Operations Bob O'Rear as saying, "The South African government's insistence on their apartheid policy forces us to take the final option available to a foreign corporation, the severance of direct relations with South African companies."

The action is not the first Microsoft has taken to protest the South African government's policy. For some time, the company has been donating profits from South African software sales to the anti-apartheid activities of the American Friends Service Committee. The new action was taken, Microsoft said, to reflect the company's commitment to the anti-apartheid movement in a manner it expects to be more effective than the profit donations.

Expect to see at least two new products from Tandy before the year is out. Late word from Fort Worth is that Tandy is feeling pretty good about its industry position and will make a splash in the market with multiple announcements in the next few months. A source within the Tandy Towers told me that one of the products could be "the hottest thing to hit the market since the PC." Unfortunately, no specifics were available when this column went to press. Indications are, however, that something pretty interesting is going to happen before the first frosts.

Good news, TRS-80 fans. The results of the 1986 computer Othello playoffs are in, and guess which computer came in first? The not-so-lowly TRS-80 Model I.

Running a program written by Charlie Heath of Microsmiths Inc., the Model I beat out competition from Digital Equipment Corp., IBM, and AT&T.

For more information about the annual competition, write to the U.S. Othello Association, P.O. Box 342, Falls Church, VA 22046. ■

	Total number of schools	Number that own micros	Percent that own micros
1982	85,747	14,132	16.5
1983	83,648	30,859	36.9
1984	82,592	55,175	66.8
1985	81,171	70,255	86.6
1986	81,461	74,379	91.3

Table 1. Microcomputers in U.S. schools (1982-1986).

	Total number of schools	Number that own micros	Percent that own micros
Elementary	51,299	2,275	4.0
Junior High	12,578	911	7.0
Senior High	15,536	1,550	10.0
All	81,461	4,736	6.0

Table 2. Modems in U.S. schools.

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A Few Tips

Mike Zarowitz of San Carlos, CA, has discovered a 1-byte patch that controls all password checking in TRSDOS 6.2. Unlike other password-bypass schemes, you can execute this one on the fly, without resorting to disk zapping. To turn off password checking, type in the following from Basic:

```
POKE &H77,(PEEK(&H77) OR 128)
```

To turn it back on, type:

```
POKE &H77,(PEEK(&H77) AND 127)
```

Paul Trembley of Mt. Dora, FL, offers some advice that might help Daniel Onbekent access PFS:File from Basic (Reader Forum, November 1985, p. 25). Save the file using PFS:File; then exit the program and use the Copy command to change the logical record length from 1 to 256:

```
COPY filespec:d filespec:d (LRL = 256)
```

(d represents the drive number). You can then use the file as a Basic or word-processing file, or use SuperScript's convert utility to convert the file from ASCII format to a SuperScript document.

If you need more room on the SYSTEM1 disk for Tandy's Model 4 C compiler, David Goblen suggests that you use the ALEDIT/CMD program on Tandy's ALDS disk. It's a good stand-alone text editor that occupies only 9K of space. In contrast, the C editor, Edit, and its companion programs, CMD/HLP, Help/HLP, Key/HLP, Sample/EDT, Setup/EDT, and SETEDT/CMD, require 82.5K.

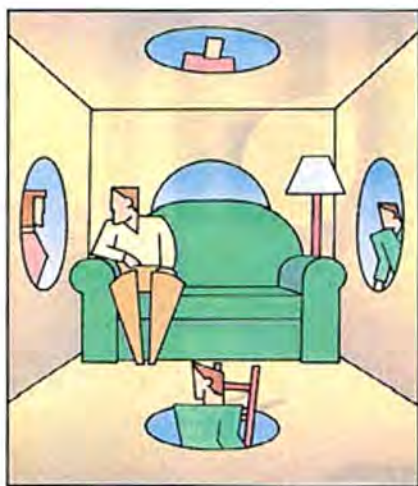
Goblen also recommends that you add a patch to change the default file extension to /C. From TRSDOS Ready, create a file named C/Fix with the Build command, and type in:

```
DOD.4A = 09
FOD.4A = 0B
DOD.52 = 43 OD
FOD.52 = 53 52
DOD.5B = 43 OD
FOD.5B = 53 52
```

Exit the build file by pressing the break key or control-shift-@. Then apply the patch by typing PATCH EDIT USING C.

Clearing the Air

To properly install and operate Robert Covington's device driver for the Model 1000 ("A Driver of Your Own Device," July 1986, p. 40), you must modify the listings printed with the article. First, in both Program List-



ing 1 (host) and 2 (template) substitute 256 (100H) for 512 (200H). (As the article correctly states, the Done code is bit 8 of the status word.) This code appears in the Return and Init modules of both listings and in the host's NDINPUT and Output modules.

Then, make three additional changes in the host listing. Change all occurrences of DL,1 to DX,0 to specify Com1 for RS-232 BIOS routines. (You must use DX to set the communications port; 1 specifies Com2.) In the Input module (bottom of p. 49), edit JZ INSTAT to read JZ INPUT and add the move and interrupt instructions indicated in the Figure. In the Output module, change the JNZ OWAIT instruction to JZ OWAIT.

Technical editor Dave Rowell offers a few hints for using the host driver to access your computer from a remote terminal. Set your modem to auto-answer or host mode, set the communications parameters from DOS with the Mode command, and make sure the remote caller uses the same communications settings and full-duplex mode. When you hear the remote carrier, type CTTY HOST; to regain control, type CTTY CON.

While you can invoke the host pro-

gram before you expect an incoming call (so that you can later access your computer over the phone, for example), the host might send garbage to the screen. If this happens, press the backspace key. When you receive a phone call, the program will operate properly.

Model 4 users have expressed surprise at the contradiction between Bruce Tonkin's chaining instructions ("Chain Links," June 1986, p. 48) and those presented in the Model 4/4P Technical Reference Manual. Although the manual states that files to be chained must be saved as ASCII text files, this is necessary only if you chain with the overlay, delete, or merge options.

If you don't use these options, it is wise not to save the file in ASCII format, since chaining to an ASCII file automatically closes all current open files. Furthermore, chaining to programs saved in ASCII format is slower than chaining to non-ASCII files.

The example citing Chuck Swinehart's space-saving technique for incorporating an INKEY\$ statement within an INSTR() argument (Fine Lines, April 1986, p. 160) contains an error. As reader William Schlichtman points out, the first character of the INSTR parameter must be bogus (a space will do) because the routine always returns a one when no input has been detected. The following sample corrects the problem:

```
A = INSTR(" + - /Mm0123456789",
INKEY$) - 1
```

The - 1 at the end of the line adjusts the value placed in A to correspond to the desired position in the string.

Wanted

►Michael Ulik (P.O. Box 128, St. Peter, MN 56082) needs the patches that will enable him to run LDOS 5.1.3 on an LNWS0 computer.

```
NOKEY:      MOV     AH,3           ;Get RS232 status
            MOV     DX,0           ;Use RS232 port 1
            INT     14H
            AND     AH,1           ;Check for data ready
            JZ      INPUT          ;Jump if no input
            MOV     AH,2           ;RS2323 receive character
            MOV     DX,0           ;COM1
            INT     14H
RETINCHAR:
```

Figure. Corrections to Robert Covington's host program.

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DOS formats listed above flagged with * signify that earlier versions of these DOS's are readable as well, but one or more sectors may be skipped due to a format problem in that version of the DOS. One or more sectors may also be skipped on some NewDOS/80 formats. (Disks that were formatted with SUPER UTILITY + or SU4/4P do not, and have never had this problem.) TRSDOS 6.02.01, or higher should not have this problem. Disks formatted in any 80 track format, any single density or mixed density (Model I "boot" disks) are not supported.

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MS-DOS Disk Utilities: Don't Leave Home Without Them

by John B. Harrell III

★★★★

The Norton Utilities run on the Models 1000/1200/2000/3000 (256K) and require one disk drive. Peter Norton, 2210 Wilshire Blvd., Santa Monica, CA 90403, 213-556-0850. \$100.

★★★★

PC Tools run on the Models 1000/1200/3000 and require one disk drive. Central Point Software Inc., 9700 SW Capitol Hwy., #100, Portland, OR 97219, 503-244-5782. \$39.95.

★★★★

The Disk Management System runs on the Models 1000/1200/3000 (256K) and requires one disk drive. A&T Systems Inc., 12904 Olivine Way, Silver Spring, MD 20904, 301-384-1425. \$99.

★★★★

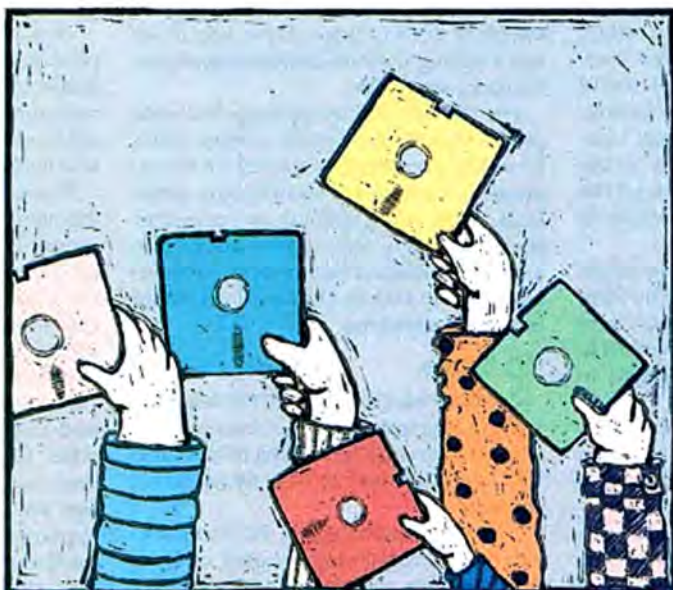
The Brown Bag File Recovery System runs on the Models 1000/1200/2000/3000 and requires one disk drive. Brown Bag Software, 15100 El Camino Grande, Saratoga, CA 95070, 408-395-7348. \$69.95 for copy-protected version, \$109.95 for unprotected version.

★★★★

Super Utility/PC runs on the Models 1000/1200/2000/3000 (256K) and requires one disk drive. PowerSoft Products, 17060 Dallas Parkway, Suite 114, Dallas, TX 75248-1921, 214-733-4475. \$89.95.

Disk utilities supplement the normal disk operating system (DOS) functions. Many are informative and let you explore disk structure, but others are vital to your mental health, particularly when you consider the size of today's hard disks, data security, and computer use.

It is absolutely essential that a disk utility be able to restore a deleted file. Nothing is more frustrating than deleting every batch file on your disk when you really meant to delete the backup files. Less vital but also important is the



ability to view and edit disk sectors.

I rated each package on the functions provided, how well it accomplishes these functions, user interface, and cost.

The Norton Utilities

The Norton Utilities are well known and considered an industry standard. Peter Norton has provided many insights into the IBM PC computers. The Norton Utilities are a collection of 18 utility programs, a read-me file, and a few batch files.

The main program, NU.COM, displays and edits disk sectors, restores files, and provides disk maps. It contains display drivers for use with the IBM PC and close compatibles, BIOS- (basic input/output system) compatible computers (Tandy 2000), and computers using the extended-video-and-keyboard driver (ANSI.SYS) such as the Wang PC. You

can select each with a simple command-line parameter.

NU.COM also supports display of file information coded in Extended Binary-Coded Decimal Interchange Code (EBCDIC) used by mainframe computers. You can also set a parameter to display any of the special European-language character set. And you can set a TopView-compatible environment using a switch.

NU.COM presents a series of well-designed menus that provide high-quality prompting to lead you through each task. Simple keystrokes allow you to quickly view any file or disk sector, make changes to it, and save the

modified result to the disk.

NU.COM tries to decipher sectors and display them in a reasonable format. Sectors containing ASCII text are automatically displayed as a text screen, while sectors containing directory entries are displayed in a directory format. Failing to recognize the sector, NU.COM displays it in a hexadecimal (hex)/ASCII format containing all of the sector's information on a single screen. You can toggle to each of these modes and interlaced information screens by repeatedly pressing the enter key.

One of NU.COM's most important features is its ability to recover files. You can select automatic, semi-automatic, or manual recovery of your file information. Automatic and semi-automatic modes make a best guess at attempting to recover your data while the manual-recovery mode allows you to select by cluster number. The file-recovery mode also has a powerful text/hex search mode to aid in locating the proper clusters.

The Norton Utilities disk also contains 17 other useful programs. Directory Sort is exceptionally good at managing directories on a hard disk or floppies. You can sort the file by name, extension, date, time, or any combination of these in ascending or descending order. The program can cover just the named directory or all disk directories.

Disk Test searches all disk areas and

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The stars mean:

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- ★★★★ Excellent
- ★★★ Good
- ★★ Fair
- ★ Poor

finds potential problems. You can test the disk by reading the entire disk, just the files, or both. If a file uses these clusters, Disk Test reports the problem and identifies the file. If unused, it requests permission to mark them as bad to later circumvent file problems.

Ever wondered why CHKDSK reports two (or more) invisible files on your disk? You can find and identify them (and others) easily with the File Attribute utility. It gives you full control over the attributes used by MS-DOS. I find it useful for controlling the state of the archive attribute used by the DOS Backup command. I reset all the archive bits on the disk using File Attribute and then set the bits on only the files I want to archive to a floppy disk.

Have you ever lost a disk file by copying it to the wrong directory? The Find File utility locates it and displays its name, as well as the full path required to reach it. One nice feature is its ability to search multiple volumes.

File Size displays the size of all files matching the filespec and displays a summary of the space required for this group. If requested, File Size also inspects the target disk drive and tells you if you have enough room to store the group there. The List Directories utility lists all directories on your disk.

Line Print provides parameters to control your file display in most conceivable fashions. This is what the DOS Print command should have been. Line Print supports both normal and compressed characters on Epson-compatible printers.

Quick Unerase recovers files using more abbreviated methods than NU.COM. It uneraser a file only when it can recover all data. If partial recovery is required, you must use NU.COM.

Undelete Directory aids in file recovery when you have made the colossal blunder of deleting an entire subdirectory. Undelete Directory and Quick Unerase both work best on small disks or a hard disk that you've recently organized (more on that later). Neither utility works well on a badly fragmented hard disk—one where the files are not stored in contiguous clusters.

Screen Attributes controls the display-screen attributes through the ANSISYS extended driver. System Information displays information about your computer, such as the amount of memory and disk-drive status. It also computes a performance index that compares your computer to an IBM PC.

Text Search searches files or disk areas for the text string specified on the command line. Unlike most command-line parameters, the text string can contain special characters and blanks.

The last two utilities, Wipefile and

Wipedisk, are similar. You can use either utility to protect sensitive information on your disks. Wipedisk "wipes" clean the entire disk, but you can erase only unoccupied areas of the disk. Wipefile allows wildcard selection of files to be erased or deleted. Both versions have command-line parameters to control the data value written and the number of passes made. A simple command-line switch in both utilities allows you to select a wiping method conforming to government standards.

The Norton Utilities package is a solid product and worth every penny. Each function performed exactly as documented. I could not identify any problems. I did find it difficult to remember the functions of the various utility files and the command parameters. Prompting and help text for the functions would be valued additions.

PC Tools

Central Point Software (CPS) has been writing disk utilities for quite some time. Almost everyone has heard of the Copy II PC software used to back up protected software.

CPS has excelled again. PC Tools provide an overwhelming number of functions and are among the best utilities I have used for three reasons: All functions are integrated into a common package, the user interface is terrific, and you can make this a truly memory-resident utility like SideKick.

With a modest knowledge of computers, you can easily follow all the screen prompts. In fact, I still haven't opened the program's documentation.

You can also make PC Tools memory resident. A simple, redefinable key sequence makes PC Tools "pop up" over any program. Unfortunately, CPS recommends that you dedicate at least 128K of memory to PC Tools. Unless you have unlimited memory or do not use other resident software, this is a large chunk of memory to dedicate. But it is impressive to copy a disk or move files while running your favorite program.

PC Tools are organized around a directory-tree structure displayed graphically as a beginning selection to most commands. For example, if you want to copy files, PC Tools first display the directory structure on the source disk. Using the arrow keys, you select the appropriate directory and press enter. A directory listing appears for that directory.

After you select the appropriate files and press the G (Go) key, the target disk's directory tree (if any) appears and you again use the arrow keys to select the appropriate subdirectory. Pressing the enter key starts the transfer. In the case of a floppy disk with no subdirecto-

ries, the file transfer begins as soon as you transfer the disk.

PC Tools commands are often organized into two modes: file oriented and disk oriented. Accompanying this flexible file-copy method is one of the fastest single-pass disk-copying facilities I've seen. It can gulp down a disk and format and write the copy in a single disk swap if you allow it enough memory (about 440K).

This dual-function philosophy also applies to compare, text search, view/edit, and verifying operations. Just follow the screen directions to select the appropriate mode and press the enter key. Screen text leads you along the way.

This is the only product reviewed that lets you format a floppy disk. PC Tools recognize the hardware present and prompt only for the appropriate formats. On a Tandy 1000, PC Tools present all the 40-track, double-sided options, but on the Tandy 3000 they offer the 1.2-megabyte disk-drive option, as well.

PC Tools are outstanding. You can't find this much power packed into any other utility group for the price. They have become permanent residents of my tool kit. On the sad side, PC Tools are apparently so dependent on the video hardware and other IBM PC features that they did nerve-wracking things when run on my Tandy 2000.

Disk Management System

A&T Systems, a relative newcomer to this market, has done an excellent job with the Disk Management System (DMS). Its user interface and clear presentation of information impressed me.

DMS is organized into two main program categories: scan-directories (file-manipulation) mode and the full disk-operations mode. The two broad categories provide services for performance enhancement, file management, application execution, and lost-data recovery.

Unlike PC Tools, DMS is organized around a directory display screen in the scan-directories mode. The directory tree resembles the CHKDSK output when you use the verbose (/v) parameter. Working through the disk file structure is easy using function- and arrow-key movements to select from the main- and submenu functions.

DMS performs many of the same functions that The Norton Utilities and PC Tools do. Its unique features include packing the directories, aligning the files on a disk, and the command-execution shell.

DMS is the only utility reviewed that can run executable files. Put the cursor on the appropriate file and press the function key marked EXEC. The program or batch file will run and return immediately to DMS when it is done.

POWER TOOLS

C Compiler

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Model 4 TRSDOS

Model 4 Montezuma CP/M

Model 4 Radio Shack CP/M

Tandy 1000/1200 MSDOS

Tandy 2000 MSDOS

TRSDOS version also works with LDOS, NEWDOS, DOSPLUS and MULTIDOS

You must have a clearly defined path to Command.COM on your disks as DMS doesn't use the environment pointer; it attempts to load the command processor from the current subdirectory.

Associated with this feature is the ability to "shell" out of DMS to the DOS command level by pressing the function key highlighted with the shell label. Once at the command level, you can perform any DOS command. To get back to DMS, use the Exit command. This is not a truly memory-resident program, but the technique can be handy if you perform many file operations.

DMS can pack marked files, directories, or the entire disk. DOS uses two types of directory entries to signify that a file is not present. It initially sets all entries to indicate that they haven't been used. When DOS deletes a file, it marks only the first byte of the entry with a deleted code. This is why you can restore deleted files.

As you use the disk more and more, the number of deleted entries can grow. When DOS attempts to find a disk file, it starts at the first directory entry and searches until it finds an unused entry or the matching file. Many unused entries significantly slow DOS file searches.

A more complex problem arises with subdirectories. On a typical hard disk, DOS allocates one 4K cluster to a subdirectory when it is created. This is enough to hold the two pointer-directory entries (. and ..) and 126 other entries. If you add more files to a subdirectory, DOS must allocate a new cluster. File searches often span wide areas of the disk to search a directory. Also, once DOS allocates additional clusters to a directory, it never releases them, even if you delete every file in the directory.

Packing a directory condenses it and changes the deleted entries to unused entries. The pack operation also releases unused clusters from a directory. File recovery after packing the directory is impossible, as it removes the residual information from the directory.

DMS contains an align feature to enhance disk performance, particularly that of hard disks. When DOS creates a file, it takes required clusters from the next available disk location. When you load a disk just after formatting, this allocation proceeds sequentially so that all file clusters are adjacent. This minimizes file-access time.

After a period of time, the disk becomes fragmented because files are written beginning with the first available cluster. For example, if you delete a 100K file and then create a 10K file, DOS puts the small file in the larger file's space. Later, if you want to reload the original 100K file, the file will consume

DMS has special features to pack directories and align and optimize disk structure.

90K where it previously resided and 10K in some other disk location. Repeat this operation several times and you have a badly fragmented disk.

Aligning the disk reorganizes the disk space so that each file again occupies a contiguous cluster location. DMS provides three options for aligning files: in, out, and by type. The align-in option relocates all files near the directory, with free space remaining at the end of the disk (inside tracks). The align-out option performs the inverse, moving all files to the inside tracks farthest from the directory.

DMS's align-by-type option is a unique idea. DMS attempts to recognize permanent files by their extensions (such as EXE, COM, BAT, and SYS) and writes these near the directory for rapid access. It writes more transient files, such as worksheets, documents, and so on, at the end of the disk, leaving the free-space gap in the middle of the disk.

I liked DMS. It is a good buy and provides all the normal disk-maintenance functions. The special features for packing directories and aligning and optimizing the disk structure are valuable. The execution and command shell are also useful. While I experienced some problems with DMS, I received first-class technical support from a friendly staff and they are even willing to attempt a Tandy 2000 version of the package.

All new software has problems and DMS is no exception. I put it through its paces on some of the most fragmented disks in existence. Most of the problems I experienced were typographical errors or minor cosmetic glitches. I could not get DMS to put EXE files in the proper location when performing a by-type alignment. I also experienced difficulty when attempting to pack a directory that contained 309 files (three clusters in length).

Another minor annoyance occurred after performing an align operation. I couldn't access any files until I rebooted the system. This was baffling. DOS buffers disk input and output according to the number of buffers allocated in your configuration file. I had a lot, and apparently DOS was maintaining its own copy of the file-allocation table (FAT) in memory after DMS had changed the real copy

on the disk. Rebooting loaded the permanent copy from the disk and everything was fine.

Even with these minor problems, I found DMS intriguing. I recommend it, particularly if you are an experienced user. The align and pack functions are valuable in themselves; some dedicated utilities cost as much as DMS and perform only these functions.

Brown Bag File Recovery System

The File Recovery System (FRS) comes in a brown bag with an operator's manual and a single copy-protected disk. The disk contains the file-recovery software, a batch file that executes the system, and a hard-disk installation program. You get one opportunity to load the software to the hard disk. After loading, it still executes from the floppy disk, preventing problems if your hard disk fails.

FRS consists of three programs that are linked by a batch file. The first program displays a title screen and a menu selection for browsing through the disk or recovering files—the other two main programs on the disk. The title program sets the DOS error level properly so that the batch file can run the appropriate main program.

When you select the browse mode, the Disk Editor menu appears. Most of the features function like the other utilities I've discussed, but there are differences.

First, the text search limits string length. You also can't insert hex characters into the string, unlike other systems that allow toggling between hex and ASCII entry modes. Text searches on files are limited to one file in the currently logged directory.

The Find File option is limited to wildcard searches on the file extension only. For example, you can find all the files on a disk that have the name File with other extensions by typing the search argument File.*. You can't, however, locate all the backup files by typing in the wildcard specification *.BAK.

FRS's disk-allocation map is unique. Most other utilities compress the display to show the entire disk map on the screen at one time. FRS doesn't. It accurately displays the entire disk map in segments organized by track number and disk head. You use the arrow keys to move around in the disk map and view other areas. One disadvantage to this technique is that FRS rereads the entire directory when you move the map window.

FRS also lets you modify the disk-access parameters. It provides a means to describe a non-MS-DOS-format disk and then access it. You can, say, move data from a damaged CP/M disk to an MS-DOS disk—data you may not be able to

retrieve otherwise. The other utilities reviewed don't have this ability. This isn't a technique that a neophyte disk user can effectively employ.

FRS has other unique capabilities. It allows full control of the screen colors. If you don't like the default display colors, you can change any of them to suit your preferences. FRS doesn't handle this attribute change fully and there are screen areas that retain other colors. Menus and selection fields typically default to white letters on black.

FRS performed exactly as described in the operator's manual. It also works well on the Tandy 2000—a surprise considering the copy protection. I think that \$69.95 is too much for the copy-protected version. An unprotected version costs an additional \$40, placing it outside the reasonably priced range.

Super Utility/PC

PowerSoft has made innumerable contributions to microcomputer software. Most notable is the venerable Super Utility program for the TRS-80 Models I, III, and 4. Super Utility/PC (SU/PC) is not a transfer of this software to the IBM PC and compatibles. It has been totally rewritten.

SU/PC is little more than a fancy disk editor and file-recovery system. SU/PC supports directory displays and rapid movement between directories. It also supports file or disk-sector editing and automatic or semi-automatic file recovery.

The file-recovery mode is excellent. You can selectively restore clusters automatically or semi-automatically by viewing the sector data prior to restoring the file. This is SU/PC's strongest feature.

Compared to the other utilities, the volume graphic display is limited. You get a graphic display only of space used; no mapping or actual cluster display is shown. Also, SU/PC doesn't support graphic file mapping in any fashion.

SU/PC allows you to search for information in either the sector mode or in a file. Unfortunately, the package limits the search argument to text, omitting a way to intersperse hex data. The documentation states that you can enter data outside of the normal character range using the Alt key and the keypad. This is unsatisfactory because you must remember the hex bytes you are searching for and convert each to decimal for use with the keypad.

This means that you can't locate segments of a program by searching for the proper bytes—a useful technique when modifying a program-disk file. Also, the search mode doesn't update the sector display to the location of the found data. You must remember the sector number and data offset and make a second entry to view the data.

I found serious deficiencies in this util-

ity. First, display updating and initial setup slow the program. When it loads, SU/PC scans all volumes indicated in the equipment configuration to detect the presence of media. This scan takes an inordinate amount of time to detect empty disk drives.

Second, SU/PC is distributed with two main programs: one that uses BIOS functions and a generic version using the ANSI.SYS extended-video-and-keyboard driver. The BIOS version did not work properly on my IBM PC because PowerSoft claims that ANSI.SYS interferes with the BIOS. This forced me to use the ANSI version—a process that slows screen update to a crawl. Even on the Tandy 2000 with its faster processor speed, the delay is hard to accept.

I have written several programs in C and Turbo Pascal that manipulate the video screen in monochrome and in color using BIOS calls and I haven't experienced these problems running them on the IBM PC. Furthermore, the Tandy 2000's BIOS code closely emulates that of the IBM PC in most respects, and these same programs work fine on the Tandy 2000.

Considering the quality of the earlier TRS-80 version of Super Utility, I am disappointed with SU/PC, which sells at virtually the same price. The differences in capability are tremendous. I can't recommend this utility as a disk-maintenance tool. It is too limited; much better alternatives exist.

Conclusion

My overwhelming choice based on versatility, ease of use, and cost is PC Tools. They are outstanding utilities and have many features that anyone can use. And the on-screen instructions are remarkably clear and concise.

For the advanced user, The Norton Utilities and The Disk Management System are excellent choices. The Norton Utilities are solid and well behaved, and they provide an incredible amount of power. The DMS package has equal versatility in its own right. Its packing and compression functions alone are worth owning.

A&T Systems has corrected all the minor deficiencies noted and has enhanced the performance in the critical area of disk alignment. The company has also added more error checking to the package. If it does make the changes necessary for DMS to run on the Tandy 2000, it would be an outstanding choice for 2000 users.

The remaining two packages, Brown Bag File Recovery System and Super Utility/PC, are too limited and too expensive for the functions offered. In addition, Super Utility/PC has problems that hamper its performance. ■

For the Hex Of It

by Hardin Brothers

★★★★

Insights runs on the Model 4 (64K) and requires one disk drive. The Alternate Source, 704 North Pennsylvania Ave., Lansing, MI 48906, 517-482-8270. \$19.95

★

RAM Trek IV runs on the Model 4 (64K) and requires one disk drive. En Fleur Corp., 2494 Sun Valley Circle, Silver Spring, MD 20906, 301-598-4532. \$29.95.

Disassemblers generally appeal to a limited number of users: experienced Assembly-language programmers or those trying to learn Assembly language by studying others' programs. Though some excellent Model 4 disassemblers already exist, I was interested in what these two new ones had to offer.

The differences between **Insights** and **RAM Trek IV** prove that an application can be programmed in many different ways. In fact, they are so dissimilar that it is difficult to compare them. While **Insights** is generally useful, **Ram Trek IV** is almost unworkable due to its buggy nature.

Insights

Insights looks and works like many other disassemblers. The entire program is command driven and the accompanying manual clearly explains each command and how to use it.

Some of **Insights'** commands are simple and expected. It outputs an ASCII or hexadecimal (hex) memory dump, clears the screen, sends a "soft" form feed to the printer, clears all user memory, and performs any TRSDOS library command without leaving the program. If you patch the TRSDOS Help program with a short patch file on the **Insights** disk, you can view a list of **Insights** commands and parameters at any time.

One of **Insights'** more interesting commands is its ability to relocate itself anywhere in memory. It always disassembles a program in memory instead of from a disk file like other disassemblers.

However, its process of loading a program into memory can still lead to problems. For example, it uses the area below 3000 hex for stack space. It is therefore impossible to disassemble any medium-sized or large program (either a TRSDOS library file or a utility program) that also loads into that area.

TRSDOS stores /CMD programs on disk with added bytes that tell the program loader the memory location for each block

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of the program. A block, in the TRSDOS system, can be from 1 to 256 bytes long. After each block, there are additional bytes on disk that tell the loader where the next block should go. At the end of the program, there are special blocks that load patches into place and a final information set that tells TRSDOS the program's starting address.

As Insights loads a program from disk, it displays the loader information. When you want to disassemble a program, this information tells you where the program is in memory and the address where the program begins. TRSDOS uses a value of 00 to indicate that the following block is 256 bytes long. Unfortunately, Insights reports that length as being unchanged. At first, I thought that nothing was being loaded because each section of the program appeared to have no length at all.

Insights' parameters allow you to create an output file that is compatible with almost any assembler available for the Model 4. The parameters also determine whether screen output pauses after every 23 lines (you can also single-step output and pause at anytime) and whether disassembled code should be sent to the screen, printer, or a disk file.

You can also specify the length of a printed page, the number of lines to skip between pages, and the maximum disk-file size to hold disassembled code. If you are disassembling a long program, it can break up the code into sections.

Additional programs and data files on the Insights disk report the size and type of each load block in the program, add symbolic labels to a disassembly, and provide simple macro commands for adding to Model 4 programs if you have a macroassembler.

In general, Insights worked well, but I ran into a couple things that bothered me. First, there is no error trapping for syntax, which can lead to some real headaches. Second, Insights is incapable of loading any patches that have been applied to a program. Those patches are contained in special blocks near the end of a program file, and as soon as Insights reads a patch block, it stops and reports that the program was not saved in proper format.

RAM Trek IV

RAM Trek IV (which I'll call Trek) is based on some interesting ideas, but it has so many bugs that I found it completely unusable.

Trek's strength is its video display, which uses a windowing technique. Each time you ask for new information, it appears in a window on top of whatever else is on the screen. Unfortunately, Trek windows are much slower than other Model 4 windowing programs. I be-

come irritated at having to wait for information to slowly scroll into view.

When you run Trek, the first window you see is a command menu. Three commands are visible at once and you scroll through the menu with the arrow keys. To select any option, you must scroll until it is in the middle of the window and then press the enter key.

The second menu option displays the user's manual in a window. While it is displayed, the up- and down-arrow keys page through the manual.

The main menu's final option, Return to TRSDOS, doesn't work. Every time I selected that option, the computer locked up and I had to reboot.

I decided to test Trek's disassembly functions on a program, called Park/CMD, that I recently wrote for The Next Step (June 1986, p. 110). From the main menu I selected a function called Load Program. A small window appeared and I assumed the program was asking for a file name. I started to type Park and suddenly my printer leaped into action. Trek copies the screen display to the printer anytime you press the letter P.

So it was time to reboot, rename the program, load Trek, and try again. This time Trek loaded my program successfully and a four-digit number appeared in a window on the screen. I returned to the main menu and selected an option called Disassemble to ASCII Code. A new window opened and I was prompted for an address. I typed in the four-digit number I had seen earlier and an ASCII memory dump appeared at the bottom of the window and began to slowly scroll up.

I returned to the main menu once again and selected Disassemble to Hex Code. Another new window appeared, again I was asked for an address. This time, a hex dump appeared (slowly) at the bottom of the new window.

I returned to the main menu and decided to get rid of the windows that were open. The first option in the menu says Remove Last Window. I selected that, and suddenly my screen filled with an amazing display of garbage.

Once again I rebooted, renamed the file, and called Trek. This time, I selected Read Disk Sectors from the menu and decided to try to read a sector from my hard disk. Trek prompted me for a disk number, cylinder number, and sector number. Among my hard disk, floppies, RAM disk, and logical-disk disks, I always have eight logical drives available. Trek, however, insists that disks are numbered from zero to 3, that cylinders are numbered from zero to 39, and that sectors are numbered from zero to 17. As far as Trek is concerned, most of a hard drive and the whole second side of double-sided drives doesn't even exist.

I decided to have Trek read one of the low-numbered sectors from my RAM disk. I asked Trek to display the sector in hex format and watched lazily as it took 15 seconds to show the entire 256 bytes on the screen. Then I reloaded the renamed Park/CMD program and asked Trek to Disassemble to Symbolic Code.

I had the program's source listing beside me to compare with Trek's display. By this time, it didn't surprise me that the disassembly bore no resemblance to the program. I finally realized that Trek had loaded (and was disassembling) the TRSDOS loading codes as well as the program. After a couple dozen lines of gibberish, Trek finally started displaying what I had written. And then it started disassembling the next piece of loader code.

The program I was disassembling, along with almost every other Model 4 Assembly-language program (including Trek), is loaded at 3000 hex and starts executing near there. Trek, however, loads a program into memory above itself and does nothing to resolve the changes in memory address. Relative jumps are disassembled correctly, but calls, absolute jumps, and references to data are not. If the program you are disassembling has a Call 3780H instruction, but Trek loads the program at 5940 hex, you will have no idea of where to look for the subroutine.

You can, of course, guess where to look by subtracting 3000 hex from the routine address, adding the result to Trek's load address, guessing how many bytes of loader code come between the beginning of the disk file and the subroutine, and adding that number.

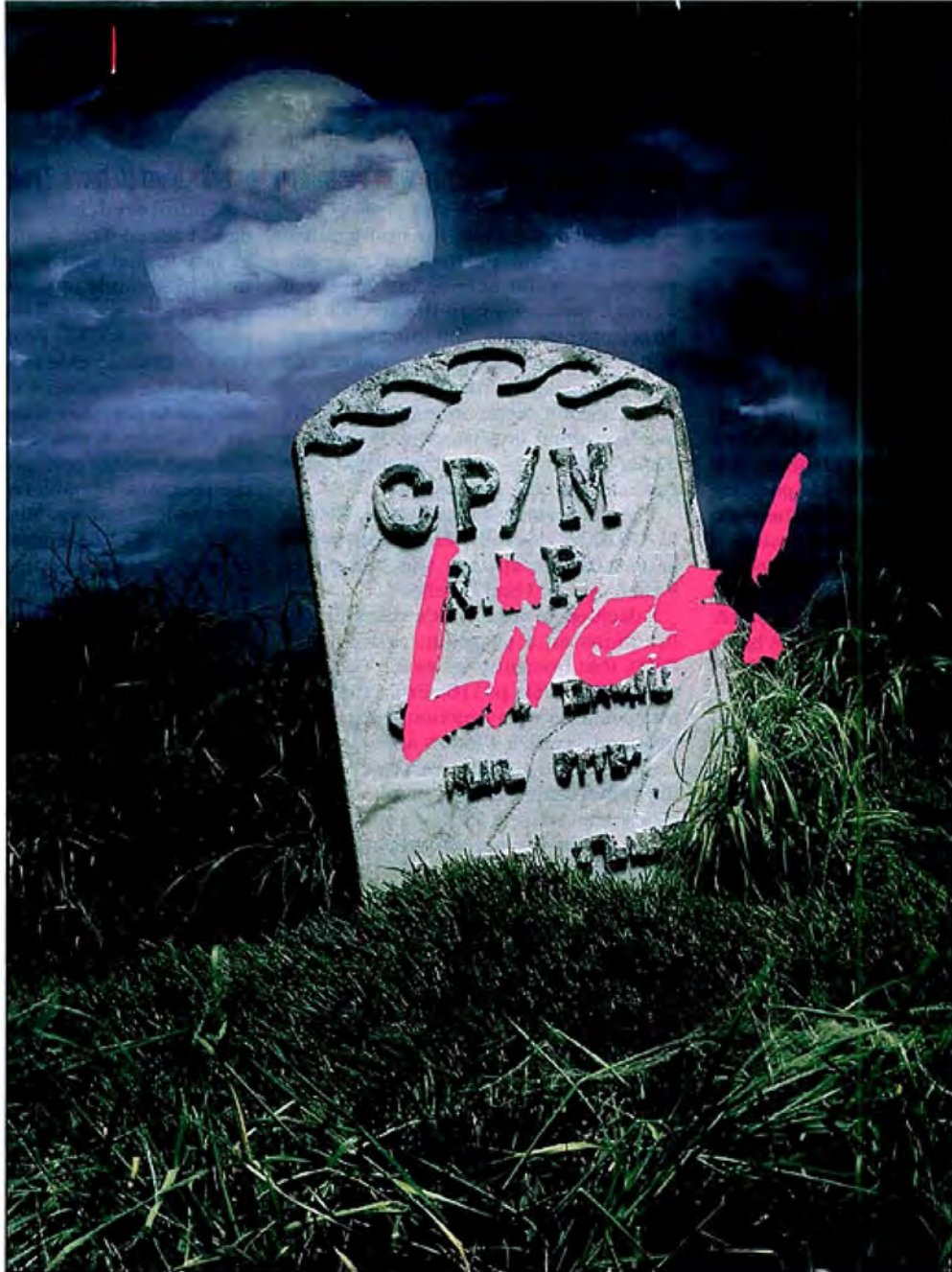
I did some calculations and used Trek to trace a subroutine. When it was time to go back to the main program, I asked Trek to close the subroutine's window so I could see the main program "beneath" it. As soon as I pushed the enter key to select Remove a Window, I realized what was going to happen. As the screen filled once again with random garbage, I reached for the reset button with one hand and tossed the Trek disk at the wastebasket with the other.

Conclusion

It's hard for me to imagine Trek as a useful tool for anyone. With a great deal of debugging and some recoding to speed things up, it could be an interesting disassembler. But my advice is to save your money and stay away from RAM Trek IV in its present form.

Despite Insights' minor flaws, it's a useful disassembler. I appreciated the flexibility of its parameter structure. It is a good value for its modest price. ■

Continued on p. 106



by
Ed Joyce

In terms of computer technology, 1976 was cons ago. If you wanted a microcomputer that year, you bought a Southwest Technical Products 6800, an Altair 8800, or an IMSAI 8080 kit. For the latter, you could get CP/M, a software operating environment developed by Digital Research Inc.

Today, the computing hardware of the mid-1970s has long since been retired to Boston Harbor's Computer Museum, but CP/M still controls the flow of electrons through hundreds of thousands of computers, and the venerable operating system shows no signs of retiring.

Story of a Survivor

That CP/M thrives amidst a torrent of hardware alien to its 8-bit nature is a blessing for Tandy Model 4 owners, who have the option of running CP/M. After IBM introduced its 16-bit PC in 1981, the software industry shifted resources to the PC's MS-DOS operating system. New software offerings for the Commodore, Apple II, TRS-80, and other 8-bit machines dried up virtually overnight. The only broad-based 8-bit environment left was CP/M, a fact quickly recognized by software entrepreneurs.

How broad is the CP/M base? It includes 1.1 million users who have about 5,000 commercial software packages to choose from. If you're running CP/M, you're speaking a computing *lingua franca* understood by Kaypro, CompuPro, Osborne, Heath/Zenith, NorthStar, DEC, Xerox, and others. There are even ways to execute CP/M programs on MS-DOS and Apple II computers (see the sidebar on p. 36). The installed base of these diverse machines accounts for 99 percent of existing computers.

Lately, there's been a resurgent interest in CP/M among software developers. The renewed interest is tied, ironically, to the current recession in the computer industry, which has taken the steam out of the steady progression of MS-DOS development. Programmers who have burned

The venerable operating system stages a comeback as the alternative to Model 4 TRSDOS.

the midnight oil for five years while hand-crafting MS-DOS software are now looking for new markets, and CP/M often proves to be an attractive alternative.

CP/M programs can be converted with minimum effort because MS-DOS is based on the older system. Furthermore, CP/M still serves a sizable body of users. The net result is a rash of new products for CP/M at a time when the system should be fading into the sunset.

The mnemonic CP/M (Control Program for Microcomputers) covers an entire family of operating systems. For 8-bit computers, there are CP/M-80 versions 1.4, 2.0, 2.2, and 3.0 (also called CP/M Plus). For IBM PCs and compatibles, Digital Research offers CP/M-86 and Concurrent CP/M. For 68000-based computers, it's CP/M-68K. The list goes on.

In common practice, however, CP/M refers to CP/M-80 version 2.2, the most popular rendition of the operating system and the one that runs on the Model 4. CP/M Plus is also implemented on the Model 4; it's the version officially sold by Tandy. (For an update on CP/M Plus, see the sidebar, CP/M Plus: The Saga Continues.)

CP/M to the 4

There are essentially two vendors offering implementations of CP/M 2.2 for the Model 4: Total Access and Montezuma Micro, two Dallas-based companies owned by John Lancione. The Total Access price is \$69, versus \$169 from Montezuma Micro, but the differences between the two systems extend far beyond the price tag.

Total Access offers a bare-bones package. The display drivers emulate a Lear-Siegler ADM-3A terminal, a common feature among CP/M implementations. But the ADM's primitive "dumb terminal" functions fall far short of the display sophistication of the Model 4.

Total Access CP/M can handle disk formats from 45 different manufacturers, opening doors to other CP/M systems. Although CP/M is regarded as a universal operating system, there are incompatibilities in floppy-disk formats. A Model 4 will likely need a special program to read a CP/M 5¼-inch disk from a Xerox system. Total Access has such a program for 45 formats.

Overall, Total Access provides a low-cost, no-frills implementation of CP/M that may meet your needs if you only run CP/M

occasionally and top-notch performance isn't a primary concern.

You'll find the latest and greatest in CP/M in Montezuma Micro's \$169 package. Like Total Access CP/M, it supports alien floppy-disk formats—85 at last count. An optional hard-disk support module (\$30) handles processing chores on fixed storage.

The Montezuma software is tailored to the Model 4's hardware and will emulate several terminals besides the ADM-3A. You can program nine function keys for one-touch typing of commands. A communications program, Modem7, gives easy access to CompuServe. The Source, and other telecommunications services. Although Modem7 is a public-domain program, it can be a challenge to configure it for some hardware; Montezuma delivers it already set up for the Model 4.

Another component called Monte's Window (see the Photo) is an MS-DOS idea applied to CP/M. This optional program was inspired, according to its developers, by Borland International's SideKick. If you touch both shift keys while executing Monte's Window on the Model 4, a menu pops up in a highlighted frame on screen, showing selections for a notepad, calendar, calculator, and mini data base. The Model 4 is the first CP/M computer to support such a desktop-management tool.

The trait that sets Montezuma Micro's product apart from most CP/M 2.2 implementations is its RAM disk. Unlike many Z80 microprocessor systems, the Model 4 can be configured with 128K even though the Z80 is designed to address only 64K. (The additional memory is accessed through a bank-switching scheme.)

Montezuma's CP/M takes advantage of the extra 64K to set up a RAM disk for system overlays, programs, and data. When the operating system calls for often-used files, input/output (I/O) drivers pluck them directly from RAM instead of issuing slow-as-molasses restore, seek, and read commands to the disk controller. With the RAM disk, users often see a tenfold performance increase over conventional disks.

The RAM-disk concept in CP/M has a precedent: Digital Research's CP/M Plus, which was designed to supplant CP/M 2.2. By the time the new version was completed, CP/M 2.2 had found a permanent home in legions of personal computers. But MS-DOS debuted at the same time, and interest in CP/M waned.

CP/M Plus, like Montezuma Micro CP/M, promises better performance than "vanilla" CP/M by relying on a RAM disk. Digital Research lists more than a half-dozen other improvements in the system, including automatic date and time stamps on files and file password protection.

The fact that CP/M Plus never took off on other types of equipment speaks for itself. CP/M 2.2 adequately handles processing requirements for most 8-bit machines. Throw in a RAM disk and you're riding in luxury.

Unexpected Riches

To deride CP/M as ancient would be to ignore its maturity. Software that has remained relatively stable for more than a decade provides a solid foundation for developing applications programs.

If you peruse a catalog of CP/M software, you'll see that the system offers highly polished tools to meet most needs. Keyboard jockeys over the years have logged thousands of hours on these programs, validating them as legitimate, bug-free software.

Newcomers to computing are often unaware that many best-selling MS-DOS software packages trace their roots to CP/M. Take MicroPro's WordStar, for example. The best measure of the success of this CP/M-bred program is the dozens of software products that use WordStar-type editing commands. Even Borland International's SideKick and Turbo Pascal mirror WordStar menus, and WordStar remains the word processor of choice in the CP/M arena.

MicroPro hasn't done as well with a spelling checker, but others have surfaced to fill the void, the most notable of which is the Random House Proofreader. For \$50, Proofreader gives you an electronic version of the Random House Dictionary ranging in size from 21,000 to 80,000 words, depending on your disk's storage capacity. The spelling checker shows errors in context for immediate editing without invoking a separate word processor. Proofreader also helps correct spelling by recommending up to 20 words that are alphabetically closest to the misspelled one.

For information management, CP/M users typically turn to Ashton-Tate's dBase II. The easily written dBase code has been responsible for drawing more doctors, bankers, brokers, entrepreneurs, and other noncomputer-types into pro-

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CP/M Plus: The Saga Continues

Many people are wondering these days about the status of Radio Shack's CP/M Plus operating system for the Model 4. The troubled product is hard to find and its demise is widely rumored.

CP/M Plus has never had many fans, partly because it is sometimes incompatible with other CP/M operating systems and programs accommodating its idiosyncracies have been few. Its programming flaws include erasing the system disk if certain commands are given incorrectly, a paltry 18K of memory left for Basic after the language has been loaded, and only 52K of transient programming area.

Another deficiency—the availability of a mere 160K on formatted disks—prompted Radio Shack to send CP/M Plus back to the manufacturer, Digital Research Inc. (DRI), in January 1985. The product was repaired and returned to Radio Shack a year later, only to be

sent back. At this writing, CP/M Plus remains at DRI in Monterey, CA, waiting to be debugged and returned to the warehouses and shelves of Radio Shack Computer Centers.

CP/M Plus hasn't been discontinued, according to Vern Vartdal, software buyer at Radio Shack headquarters in Fort Worth, TX, and the company is giving the fix its highest priority. Vartdal says Radio Shack will "do whatever it takes to fix it." But the ball is no longer in Radio Shack's court; DRI has had more than a year and a half to remove the bugs.

One wonders how much interest DRI still has in CP/M Plus. They have committed much of the company's resources to establishing their GEM operating environment in the MS-DOS market. In fact, sources say DRI employs a third party for CP/M product support.

DRI officials say they're as frustrated with Radio Shack as the Shack is with

them. John Norcross, the CP/M Plus product manager at DRI, says Radio Shack sent him a memo indicating that CP/M Plus "was not worth pursuing" if the bugs couldn't be quickly eradicated. Nonetheless, DRI insists it is working to get CP/M Plus into shape so Radio Shack can accept it and begin filling back orders.

It isn't hard to see why Model 4 owners are grumbling about CP/M Plus, yet all is not lost. Other CP/M operating systems have a much better reputation than the Radio Shack product. Montezuma Micro's CP/M 2.2 is a staple among CP/M enthusiasts using Radio Shack machines, a tried-and-true product that CP/M Plus once hoped to eclipse.

Model 4 users shouldn't expect to see a CP/M operating system from Radio Shack for some time. It's an unfortunate situation that will only change when the finger pointing stops. ■

—Bradford N. Dixon

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Scotts Valley, CA 95066
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Computer Associates International Inc.

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San Jose, CA 95131
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Digital Marketing

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Hochstrasser Computing AG

Chrutzstrasse 14
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Modula-2 for Z80 CP/M, \$165.
Distributed in the U.S. by The Alternate Source, 704 N. Pennsylvania Ave., Lansing, MI 48906.

Intersecting Concepts

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Software Toolworks

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Media Master Plus CP/M Emulator
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Acceler 8/16 CP/M Emulator for
MS-DOS plus a V20 NEC speed-up
chip, \$99.95.

Kamasoft Inc.

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Multiplan electronic spreadsheet, \$195.

Montezuma Micro

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Dallas, TX 75232
CP/M 2.2, \$169.

Palantir Software

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SLR Systems

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Z80ASM Assembler, \$49.95.

Spite Software

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EM80/86 CP/M Emulator for
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System Facilities Inc.

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Workman and Associates

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Other Sources

Computer Helper Industries

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Parkchester Station
New York, NY 10462
ConIX operating system.

CP/M User Group

1651 Third Ave.
New York, NY 10028
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Destek Group

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Earth Computers

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Programmer's Connection

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Programmer's Shop

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21st Century Data Inc.

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CP/M disk zapper.

SoftAid Inc.

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Columbia, MD 21045-1412
MTBASIC Basic compiler.

Software Commodities

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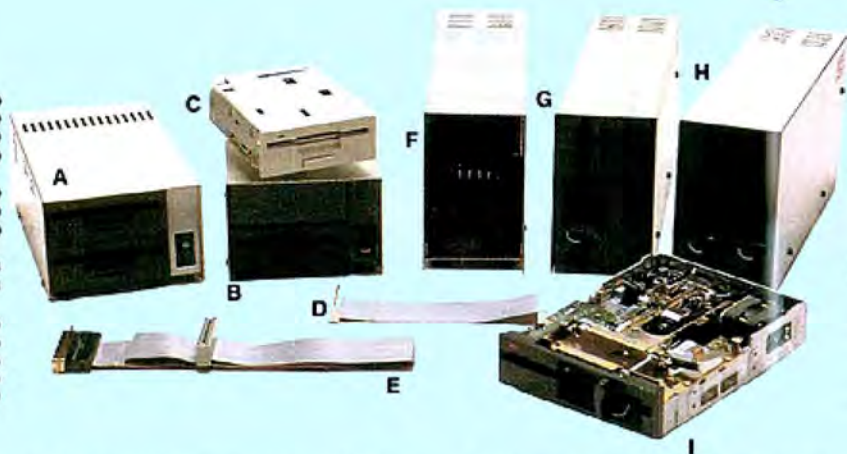
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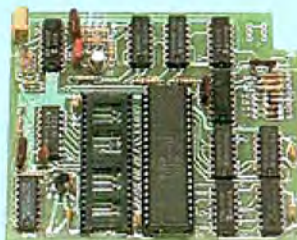
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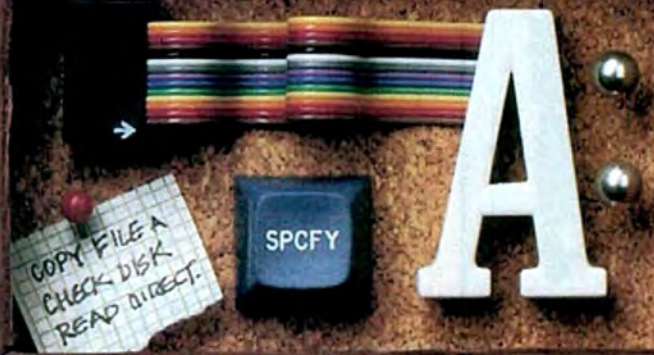
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```
10 CHECKSUM=0 : SUM=0
20 PRINT "Checking data integrity ..."
30 FOR I=1 TO 146
40 READ A : SUM=SUM+A
50 NEXT I: READ CHECKSUM
60 IF CHECKSUM=SUM THEN 100
70 PRINT "Error in DATA statements."
80 END
100 OPEN "R",1,"WAIT.COM",1
110 FIELD 1,1 AS X$
120 RESTORE :PRINT "Creating WAIT.COM..."
130 FOR I=1 TO 146
```



SET

8 CA 38-725
9 C. WALKER - 9:15
10 DR. COHN
11 CHRIS P.
12



Environmental Controls

by Renato Reyes

B

Enhance the utility
of your batch files
by learning to
manipulate the
MS-DOS environment.

atch files are powerful tools for automating routine programming tasks. In the May 1986 issue of *80 Micro*, I described the procedure for using MS-DOS commands to perform conditional branching and simple repetition in batch files (see "Step Up to .BAT," p. 54).

A less well-known method for controlling batch-file program flow is through the use of the MS-DOS environment space. In this article, I'll give some background on the MS-DOS environment and demonstrate a way in which you can store return addresses in it to create the equivalent of subroutines in your batch files.

RAM Detail

The MS-DOS environment is a portion of main memory that the operating system reserves for storing a variety of system details. Each detail listed in the environment is called an "environment string." One string that always appears in the environment space is the command-processor specification (COMSPEC). It tells DOS where to look for the Command.COM file so it can be reloaded, if necessary, when the current applications program terminates.

You can read the current contents of the environment space by using the MS-DOS Set command. If you boot MS-DOS from drive A and type SET at the A > prompt, you'll see the following line displayed on the screen:

```
COMSPEC = A:\COMMAND.COM
```

The Set command also lets you modify strings in the environment. For example, to change the command-processor specification you might type:

```
SET COMSPEC = B:\COMMAND.COM
```

at the A > prompt. Then when you type

System Requirements

Tandy 1000, 1200,
2000, or 3000

SET, DOS will display the recently modified version.

Another string that DOS places in the environment space is the current path setting (if you have set it). If you type:

```
PATH = A::B:
```

at the A > prompt and then type SET to display the environment, DOS will display the lines:

```
COMSPEC = A:\COMMAND.COM  
PATH = A::B:
```

If you change your prompt string, the new prompt will also appear in the environment.

You can define new environment strings with the Set command, as well. If you type the following:

```
SET MYNAME = JERRY
```

at the A > prompt, DOS will save the string "MYNAME = JERRY" in its environment. To clear the string, all you need to do is reset it to a null value (MY NAME =).

MS-DOS passes a copy of its environment to child processes, such as an applications program or Basic. It's one way of passing parameters to a program. The child process can modify the copy but doesn't change the original environment. Thus, if you modify the environment space by invoking Basic's Environ command, the changes remain in effect only while Basic is active. When you return control to DOS, the operating system reinstates the original environment.

Branching Out

Although you can set and access environment strings from DOS, most programmers place a great deal of importance on convenience, so they automate the process with a batch file. The Set command executes in a batch file the same as it does from the A > prompt. For example, to change the path setting, you might write this simple batch file:

```
ECHO OFF  
SET PATH = B:
```

To access an environment string from a batch file, enclose its name in percent (%) signs. Thus, to change the path setting to B: and echo the current path on screen, you might write your batch file like this:

```
ECHO OFF
SET PATH=B:
ECHO The current path is %PATH%
```

You can use the ability to set and access environment strings to advantage. A common application is for passing information between batch files.

Two other useful applications are for conditionally directing program flow and for holding default values, which you can change by specifying parameters in the command line.

The batch file in Program Listing 1 illustrates the latter applications. I wrote Autocall.BAT to run a communications program, COMSH, at a particular time every day. COMSH (COMmunications SHell) is a public-domain program that you can obtain from the data libraries of the Programmer's SIG (PCS-158) on CompuServe. The program executes a "script" of commands, which you prepare and save on disk. It can log on, travel from place to place within a system like CompuServe, download messages and programs, and log off again. Its ability to exit back to MS-DOS automatically makes it ideal to use

Program Listing 1. Autocall.BAT.

```
ECHO OFF
SET WHERE=LOOP1
IF NOT %1==X GOTO LOOP1
SET WHERE=LOOP2
SET WHEN=00:00
GOTO LOOP2
:LOOP1
SHIFT
IF %1==X GOTO END
SET WHEN=%1
:LOOP2
CLS
WAIT %WHEN%
COMSH (parameters)
GOTO %WHERE%
:END
SET WHERE=
SET WHEN=
```

End

Program Listing 2. Source code for Wait.COM. The syntax is "WAIT hh:mm" where the argument must always be two digits for hours and two digits for minutes in 24-hour format.

```
;WAIT.COM
wait segment
assume cs:wait,ds:wait
org 0100h
progr: jmp start
;some data storage
errmsg db 'Invalid argument',13,10,'$'
hour db 0 ;binary hours value here
minute db 0 ;binary minutes here
;
;main program begins
;
start:
mov ax,3301h ;ctrl-C check
mov dl,01
int 21h
call setup ;parse the argument
cmp al,-1 ;check for error condition
```

Listing 2 continued

When you boot MS-DOS, it automatically allocates 160 bytes for the environment space.

with Autocall.BAT. You can, however, substitute any other self-executing communications program.

I execute Autocall.BAT whenever I'm going to be away from the computer for several days. It comes in handy when I'm out of town and want to keep in touch with what's happening in CompuServe's TRS-80 Professional Forum. I've set the default parameters to log on every midnight, but you can change that by specifying times in the command line that invokes the program.

The Wait program (see Program Listings 2 and 3) invoked in line 13 takes a starting time as a command-line argument, and the program waits until that time before proceeding.

If I don't specify a time in the command line, Autocall sets a default value of 00:00 (midnight) for the two environment strings Where and When; it then sets the variable Where to Loop 2. The Where string specifies the starting point of the main program loop; When specifies the starting time for COMSH.

If I do specify a time in the command line, Autocall changes the Where and When strings. The new label for Where (Loop 1) includes instructions for picking up replaceable parameters in the command line and setting them to the time specified by When. The contents of When are then passed to Wait.

At the specified time, Autocall invokes COMSH. The communications program then automatically calls CompuServe, logs onto the system, and retrieves any waiting messages from the TRS-80 Professional Forum.

When the communications program ends, control passes to GOTO %WHERE%, which directs the batch file back to the appropriate label, causing the loop to repeat.

If the command line contains a string of times, the program executes them in order. When it has processed the last time, the batch file branches to the :END label, which clears the Where and When strings from the environment.

If no time is specified in the command line, the batch file goes into an endless loop, loading and running the communications program every midnight until I halt it by pressing Ctrl-C.

You might think of the environment variable Where as the return address for a subroutine. The series of instructions following Loop 2 is used repeatedly by two different processes.

Gaining Space

When you boot MS-DOS, the operating system initially allocates 160 bytes for use by the environment space. If necessary, DOS will expand the space dynamically to accommodate new strings. It might not be able to do so, however, if a memory-resident program is present, as the environment space must be a contiguous region of memory. DOS displays the message "Unable to expand environment" when this happens.

If you anticipate needing more room than the default space provides, set your environment strings before loading in a memory-resident program or GW-Basic, which counts as a memory-resident program as long as you're in it. Another common trick is to set long nonsense strings, MYNAME=XXXXXXXXXXXXXXXX for example. This forces DOS to allocate more space. You can type in as many nonsense characters as will fit in the command line. When you redefine the string, replacing it with its real value, DOS frees the unneeded space for additional strings.

If you try this, be sure that you use up more than the initial space allocated by DOS, as the operating system won't expand the environment until all 160 bytes have been filled. In practice, this means that you often must set several nonsense strings to gain the extra space you anticipate needing. ■

Renato Reyes is a freelance programmer, technical writer, and system operator (sysop) on CompuServe's TRS-80 Professional Forum. You can write to him at 11621 Dennis Road #5, Dallas, TX 75229. Enclose a self-addressed, stamped envelope for a reply.

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Listing 2 continued

```

jz      abort          ;if ax returns nonzero, error occurred
call   checktime     ;now await the appointed time
mov    ax,4c00h       ;exit with ERRORLEVEL=00
int    21h
abort:  mov    dx,offset errmsg ;display error message
mov    ah,09
int    21h
abort2: mov    ax,4c01h       ;exit with ERRORLEVEL=01
int    21h
;
setup  proc  near          ;the parser
mov    al,';'          ;check for correct format hh:mm
cmp    al,[cs:0004h]   ;format must be correct
jne    error          ;or we declare an error
mov    ax,[cs:0002h]   ;get hours into AX
call   convert        ;convert to binary value
cmp    al,0           ;range test for hours
jl     error          ;valid range is 0-23
cmp    al,23
jg     error
mov    [hour],al      ;if okay, store it.
mov    ax,[cs:0005h]   ;now grab the minutes
call   convert        ;convert
cmp    al,0           ;range test for minutes
jl     error          ;valid range is 0-59
cmp    al,59
jg     error
mov    [minute],al   ;store if okay
mov    ax,00          ;ax=00 indicates no error
jmp    exit
error: mov    ax,-1    ;ax=-1 means error on convert (bad argument)
exit:  ret
setup  endp
;
convert proc near        ;ASCII to binary conversion: assumes digits!!!
sub    ax,3030h        ;convert both digits to binary
mov    bh,ah           ;keep units value for now
xor    cx,cx           ;zero cx
mov    cx,0ah         ;tens multiplier
cbw                    ;clean out AH register
mul    cx              ;this creates the tens digit
add    al,bh           ;add units and we have binary value in al
ret
convert endp
;
checktime proc  near
mov    ah,2ch         ;get time
int    21h
cmp    ch,[hour]     ;check hours
jnz    checktime     ;not there yet, so keep looping
cmp    cl,[minute]   ;if hours correct, check minutes
jnz    checktime     ;keep looping till you get it right
ret
checktime endp
wait   ends
end    prog

```

End

Program Listing 3. Basic program to create WAIT.COM.

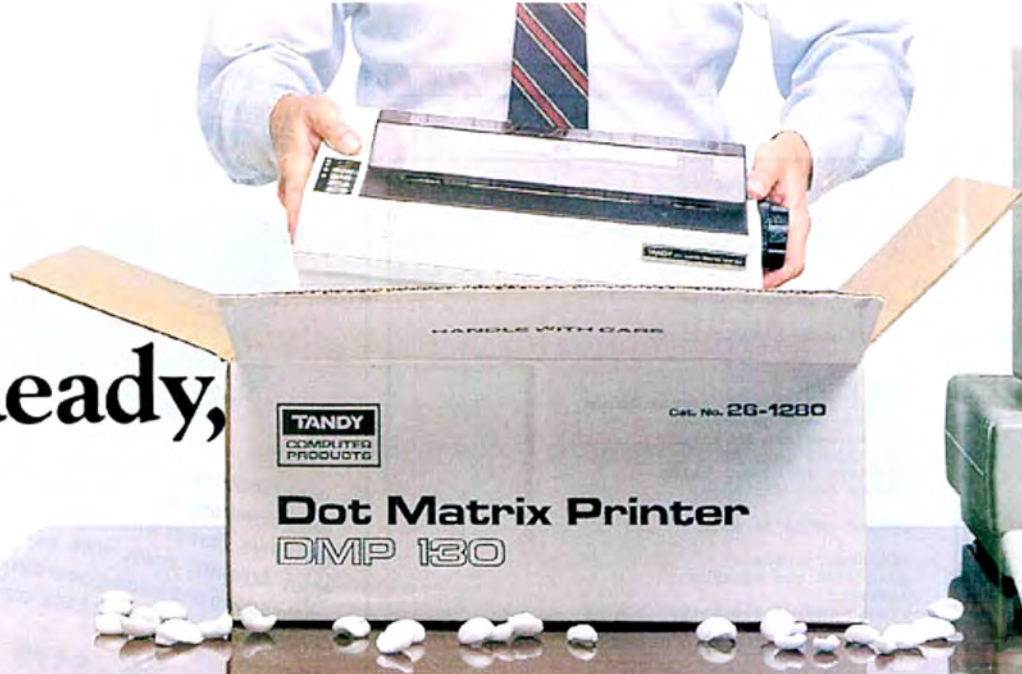
```

10 CHECKSUM=0 : SUM=0
20 PRINT "Checking data integrity ..."
30 FOR I=1 TO 146
40 READ A : SUM=SUM+A
50 NEXT I: READ CHECKSUM
60 IF CHECKSUM=SUM THEN 100
70 PRINT "Error in DATA statements."
80 END
100 OPEN "R",1,"WAIT.COM",1
110 FIELD 1,1 AS X$
120 RESTORE :PRINT "Creating WAIT.COM..."
130 FOR I=1 TO 146
140 READ X
150 LSET X$=CHR$(X)
160 PUT 1
170 NEXT I
180 CLOSE
190 PRINT "WAIT.COM has been created."
200 END
1000 DATA 235, 22, 144, 73, 110, 118, 97, 108, 185, 100
1010 DATA 32, 97, 114, 183, 117, 109, 101, 110, 116, 13
1020 DATA 10, 36, 0, 0, 184, 1, 51, 178, 1, 205
1030 DATA 33, 232, 24, 0, 60, 255, 116, 8, 232, 88
1040 DATA 0, 184, 0, 76, 205, 33, 186, 3, 1, 180
1050 DATA 9, 205, 33, 184, 1, 76, 205, 33, 176, 58
1060 DATA 46, 58, 6, 132, 0, 117, 42, 46, 161, 130
1070 DATA 0, 232, 39, 0, 60, 0, 124, 31, 60, 23
1080 DATA 127, 27, 162, 22, 1, 46, 161, 133, 0, 232
1090 DATA 21, 0, 60, 0, 124, 13, 60, 59, 127, 9
1100 DATA 162, 23, 1, 184, 0, 0, 235, 4, 144, 184
1110 DATA 255, 255, 195, 45, 48, 48, 138, 252, 51, 201
1120 DATA 185, 10, 0, 152, 246, 225, 2, 199, 195, 180
1130 DATA 44, 205, 33, 58, 46, 22, 1, 117, 246, 58
1140 DATA 14, 23, 1, 117, 240, 195, 13516

```

End

Ready,



Set,



Print!



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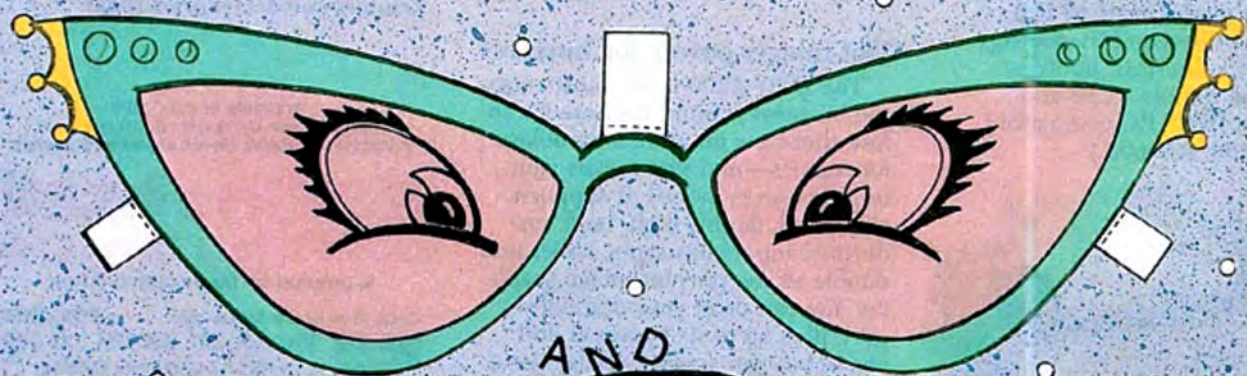
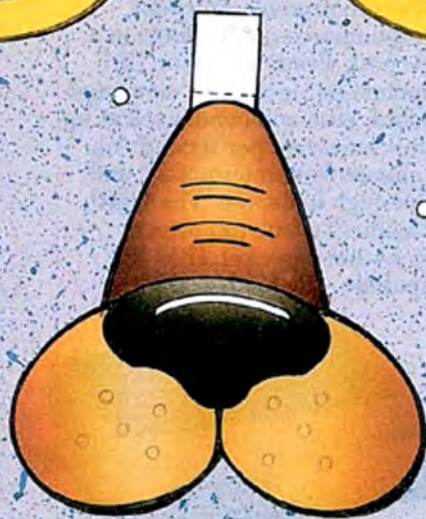
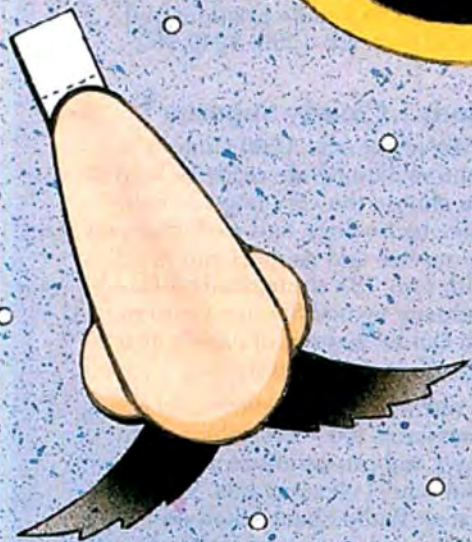
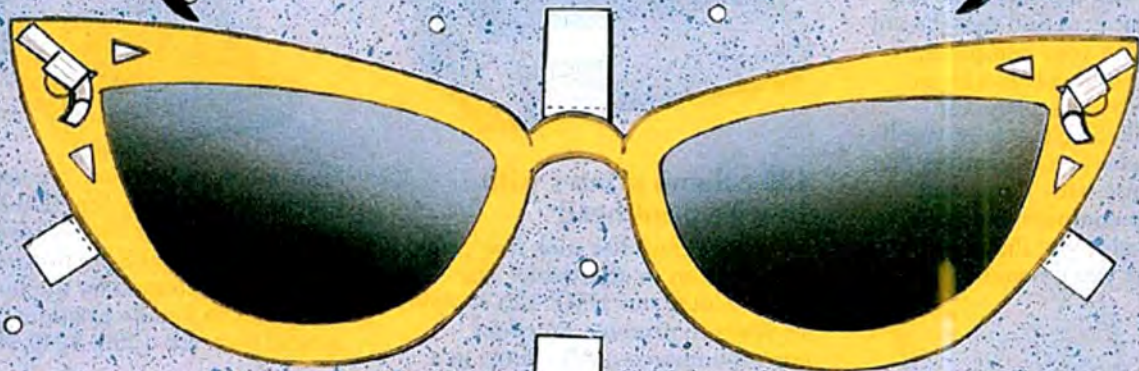
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by Thomas W. Higginbotham



ars and international intrigue aren't the only arenas for secret-code making and breaking. If you use a computer to communicate electronically, you may have wished for an inexpensive way to safeguard messages.

CRYPTSYS/BAS is a Basic utility program that quickly transforms ASCII text files into a code that is intelligible only to someone possessing the encryption key (see the Program Listing on p. 52). It runs on the Tandy Model 4 and with modifications on the Models III, 1000, 1200, and 3000.

The program expands on a centuries-old system that is one of the most cryptographically secure ever devised. I'll explain the encryption process and tell you how to run the program.

Immaculate Encryption

The simplest form of such an encryption system is a 26- by 26-letter box in which the entire alphabet is repeated horizontally for 26 rows, with each alphabet offset one letter to the left of the one above it (see the Table).

Each letter in the original text is sequentially matched with the letters in a predetermined word or phrase that is repeated as many times as needed. Let's say you want to encipher the phrase "Fourscore and seven years ago our fathers" and that the key is the word "understudy." Run down the left side of the table and find the first letter of the original, or plaintext (F); then, referring to the top line, find the column headed by the first letter of the key. The letter appearing at the intersection of the two lines is Z, the first letter of our ciphertext. The next letter of the plaintext (O), paired the same way with the next letter in the key (N), yields B, and so on until all the key letters have been used. Then start again from the beginning.

The enciphered message will thus read:

```
ZBXVJUHLH YHQ VIMWG SHYLF DKF
GNL IYNUHVJ
```

To decipher it, follow the column headed by the corresponding key letter down to

the ciphertext letter to find the original letter in the far-left column.

CRYPTSYS/BAS goes beyond this simple formula by basing its encryption matrix on ASCII characters 33-126 and by daily generating a new random-character key word that is exactly as long as the plaintext file.

Cryptologist-in-the-Box

While the program will run as is on the Model 4, you must change a few lines for it to run on the Model III. Remove ERASE A,V: from lines 280 and 870, and ERASE R: from line 640. Be forewarned that removing these statements causes problems if you try to input from the keyboard or write a new number file twice in the same run. Furthermore, the running time is very slow on the Model III; it takes more than 30 minutes to write a 5,000-character key-letter file.

Changes for the Models 1000, 1200, and 3000 are shown in the Figure. Lines 210, 212, and 9000-9020 establish a backspace and erase routine for keyboard input. Lines 460 and 970-1000 put file names in the correct format and correct variables O and U to adjust for different LOF formats. Lines 470-474 and 610-622 take care of differences between the Random and RND functions.

CRYPTSYS/BAS depends on three data files you should keep on the same disk as the program.

CRYPTSYS/KEY holds the 94 ASCII characters that comprise the key-word random string; its normal default length is 12,000 characters. The other two files are optional and can be replaced by defaults that are already in the program. They're intended only as stopgap mea-



System Requirements

Model 4
Models III, 1000, 1200,
3000 with changes
64K RAM
Basic

Key word letter

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
B	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a
C	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b
D	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c
E	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d
F	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e
G	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f
H	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g
I	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h
J	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i
K	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j
L	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k
M	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l
N	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m
O	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n
P	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
Q	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
R	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q
S	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
T	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
U	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t
V	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u
W	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v
X	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
Y	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x
Z	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y

Table. Grid for matching a key word with the original to create ciphertext.

CRYPTSYS/KNF contains 366 key numbers, one for each day of the year.

decrypt without creating the key-number file (assuming the key-letter file is there).

You can't use the main program routines, functions 1 and 2, without setting the other values in advance. The program displays the options under each function; a few need further explanation.

Annotations

Function 3's option 3 lets you send converted text to its own disk file. If you set it to "Yes," you'll be prompted to name the output file before beginning the operation.

Option 7 is for changing the space equivalent, currently ASCII 126 (~), which was chosen because it appears infrequently in English text. Any character in the ASCII range 33-126 is interpreted as ASCII 32, the blank-space character. Since CRYPTSYS/BAS removes blanks from the final ciphertext, it's a good idea not to change the space equivalent to an important letter or character because it will be missing from the text after your code is deciphered.

Option 8 lets you decrypt a text known to have been written on a different day.

Function 4 of the main menu lets you change the contents of the key-letter file, CRYPTSYS/KEY, as a further safeguard against a cryptologist discovering patterns in your code. You should think twice before changing this file: The contents of the old file will be wiped out, and thereafter text files encrypted with the old letter file will be undecipherable, regardless of which key number you use. As a precaution, either save the old file on another disk, convert encrypted text files back to plaintext, or give all your correspondents a copy of the new key-letter file.

If you answer yes at the prompt asking if the current default for the key-letter file is okay, you must go to the Change Defaults menu to make the change. It's not necessary to store the change in the default file.

In function 5, you can examine or alter the key-number file, CRYPTSYS/KNF. There's a three-option menu for viewing all the key-number files or one from a specific date and for writing a year's worth of numbers to a disk file. An error message will alert you if a key-number file doesn't yet exist.

There are two ways to enter the text to be converted: via the keyboard, where there is a 2,000-character limit, and from

```

210 I=INKEY$: IF I="" THEN GOTO 210 ELSE IF I=CHR$(8) THEN GOTO
9000
212 ON V(ASC(I)) COSUB 810, 820, 830, 860, 870: IF I=CHR$(13) TH
EN A(N-1)=RIGHT$(STR$(NB),LEN(STR$(NB))-1)+"\ "+A(N-1): NB=0
460 GOSUB 970: IF LOP(3)>T(6) THEN CLOSE: KILL "CRYPTSYS.KEY": G
OTO 460
470 FOR X=1 TO T(6): RANDOMIZE TIMER:NK=INT(RND(0)*100)
472 IF NK>94 THEN NK=NK-(INT(RND(1)*10+6))
474 LSET K=CHR$(NK+32): PUT 3,X: NEXT X
610 PRINT "Generating new key-numbers in the range 1-9999: DIM
R(366): FOR X=1 TO 366
620 RANDOMIZE TIMER:R=INT(RND(0)*10000)
622 FOR Y=0 TO X-1: IF R(Y)=R THEN GOTO 620 ELSE NEXT Y
970 OPEN "R", 3, "CRYPTSYS.KEY", 1: FIELD 3, 1 AS K: T=LOP(3): R
ETURN
980 OPEN "R", 1, "CRYPTSYS.DEF", 2: FIELD 1, 2 AS D: O=LOP(1)/2:
RETURN
1000 OPEN "R", 2, "CRYPTSYS.KNF", 2: FIELD 2, 2 AS J: U=LOP(2)/2
:RETURN
9000 ROW=CSRLIN:COLMN=POS(0):IF COLMN>1 THEN COLMN=COLMN-1 ELSE
COLMN=80:ROW=(ROW-1)
9010 N=N-1:NB=NB-1
9020 LOCATE ROW, COLMN:PRINT " ";LOCATE ROW,COLMN:GOTO 210

```

Figure. Replacement lines for CRYPTSYS.BAS run on Models 1000, 1200, and 3000.

sures until you customize the system to your needs.

CRYPTSYS/DEF contains the values corresponding to the function default settings used by the program. Setting these values and storing them in CRYPTSYS/DEF lets you call specific functions automatically each time you run the program.

CRYPTSYS/KNF contains 366 key numbers, one for each day of the year.

Before calling the program, you must tell Basic to reserve three file buffers. After the screen clears, six program functions appear

in the main menu: encipher, decipher, view/change program defaults, change/write key-letter file on disk, view/change key numbers for one year, and end session.

If the key-letter file doesn't already exist, or if the number of characters it contains doesn't match what was established in the defaults file, the additional message, "Key-letter file error! Select functions 3-6 only!" appears.

If there's no key-number file, the message, "Key-number file error! Defaulted to 500" appears. You can still encrypt and

an ASCII text file created with your word processor or received by modem.

In functions 1 and 2 of the main menu, the first message prompts you to name the output file if your default is set to create one for the converted text. Pressing enter will abort this function. If later in the same session you want to reset the default, you must do it from the defaults menu.

The next prompt asks whether you will enter text from the keyboard or from an ASCII text file. Enter A or K as appropriate; pressing any other key will return you to the main menu.

Bear in mind several things when entering text from the keyboard. You can abort by pressing Ctrl-D followed by any key, and everything typed until then will be lost (shift, down arrow, and D on the Model III). The escape (break) key, on the other hand, sends you to the encryption or decryption routines (shift plus up arrow on Models III and 4). Finally, a warning message will alert you when you're near the limit of the 2,000-character text buffer; you must either encipher or decipher what you have, start over, or abort.

Remember that an ASCII file containing text to be encrypted or decrypted can't be longer than 32,767 characters. Also, if you're entering a file for transmission, you may have to embed carriage returns at the increments required by host systems that have line-length limitations.

Some control codes allowed by word processors (for underlining, indenting, changing type fonts, and so on) may throw off your character count and sabotage the whole process. Delete them from the plaintext before encryption. The same goes for the code headers that some host systems tack onto electronic mail.

Security Risks

Properly used, CRYPTSYS/BAS affords a high level of cryptographic security for most legitimate purposes. To use it effectively, however, you must understand how changing the system's defaults affects the security of your ciphertext.

To crack ciphertexts, cryptanalysts have computers perform the laborious task of looking for repeating patterns in the code. Trying out hypothetical key formulas on an encrypted text is done faster than ever before.

Communications security is therefore dependent on the steps taken to suppress repeating patterns in the ciphertext. Changing the contents of the key-number or key-letter files or altering the length of the latter will help. You should make these changes according to a regular schedule and inform your correspondents of them. ■

Thomas W. Higginbotham can be reached at 3712 Tulsa Way, Apt. C, Fort Worth, TX 76107, or through Compu-Serve (75706,3556).

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Program Listing. CRYPTSYS/BAS. (See p. 112 for information on using the checksums in this listing.)

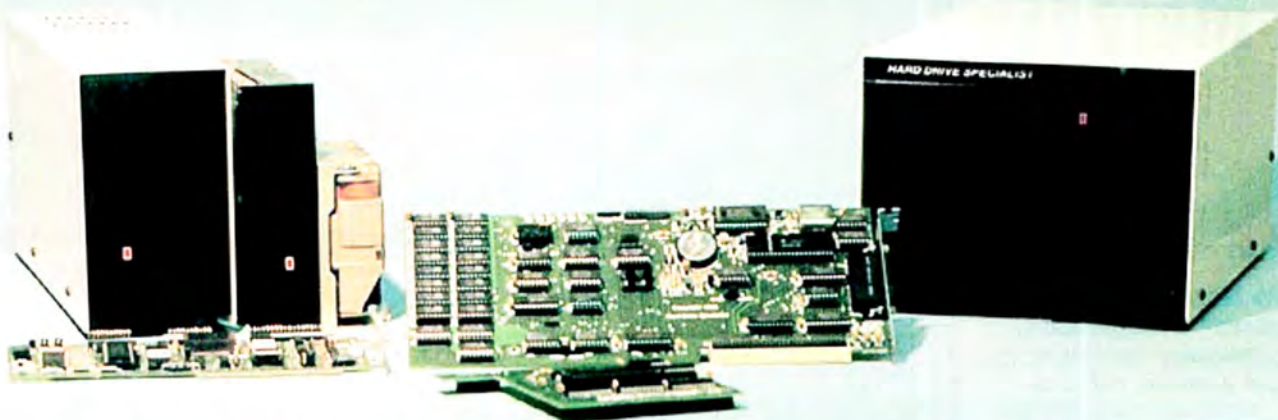
```

10 CLS: CLEAR 10000: DEFSTR A-M: DEFINT N-Z: CR=STRING$(2,13): D
IM T(8), D(8), B(6), M(12), N(12)
20 FOR X=1 TO 6: READ B(X): NEXT X: FOR X=1 TO 8: READ D(X): NEX
T X
30 FOR X=1 TO 12: READ M(X), N(X): NEXT X
40 GOSUB 970: GOSUB 980: IF O<>7 THEN GOTO 50 ELSE FOR X=1 TO 7:
READ Y: GET 1,X:T(X)=CVI(D): NEXT X: GOTO 60
50 FOR X=1 TO 7: READ T(X): NEXT X
60 E="Type number of selection: ": AK="Press any key to continue
.": EL=CR+"Operation complete!"+CR+AK: KN="KEY-NUMBER FILE ERR
OR!"
70 KE="KEY-LETTER FILE ERROR! ": AO="NO output file will be crea
ted!": EN="Enter name for output file of ": ON ERROR GOTO 115
0
80 GOSUB 920: GOSUB 930: GOSUB 1000: IF U<>366 THEN READ T(8): G
OTO 100
90 GET 2,Q: T(8)=CVI(J)
100 CLOSE: GOSUB 920: FOR X=1 TO 6: PRINT B(X);CR: NEXT X: IF T
<>T(6) THEN PRINT KE;"Select functions 3-6 ONLY!"
110 IF U<>366 THEN PRINT KN: " Defaulted to" T(8)
120 PRINT E: GOSUB 800: V=VAL(I): IF V<1 OR V>6 THEN GOTO 100 E
LSE IF V<3 AND T<>T(6) THEN GOTO 100
130 CLS: ON V GOTO 140, 140, 320, 420, 510, 660
140 R=T(8): IF V=1 THEN J="en" ELSE IF V=2 THEN J="de"
150 IF T(3) THEN PRINT EN;J;"ciphered text---> ": GOSUB 900: FO
=F: IF FO="" THEN T(3)=0: PRINT AO
160 PRINT "Will text for "J"cipherment be entered from:" PRINT "
(K)eyboard or (A)SCII text file (K or A)---> ": GOSUB 800:
IF I="K" OR I="A" THEN UK=1 ELSE IF I="A" OR I="a" THEN UK=
2 ELSE GOSUB 910: GOTO 100
170 PRINT I: IF UK=2 THEN GOTO 290
180 PRINT "Keyboard entry routine!": DIM A(2000), V(127): FOR X=
0 TO 31: V(X)=1: NEXT X: FOR X=32 TO 127: V(X)=2: NEXT X: V(
4)=5: V(8)=3: V(13)=2: V(27)=4
190 IF T(4) THEN PRINT EN;"text entered from keyboard---> ": GO
SUB 900: FT=F: IF FT="" THEN T(4)=0: PRINT AO
200 NB=0: NT=1: N=1: PRINT "Type text; type <ESC> when complete
(2000 characters max.) or <D> to abort"
210 I=INKEY$: IF I="" THEN GOTO 210 ELSE ON V(ASC(I)) GOSUB 810,
820, 830, 860, 870: IF I=CHR$(13) THEN A(N-1)=RIGHT$(STR$(N
B),LEN(STR$(NB))-1)+"\ "+A(N-1): NB=0
220 IF N=2001 THEN GOSUB 880: IF Z=27 THEN GOTO 240 ELSE IF Z=13
THEN CLS: GOTO 200 ELSE GOSUB 870
230 ON NT GOTO 210, 240, 100
240 CLS: GOSUB 970: IF T(3) THEN GOSUB 990
250 IF T(4) THEN OPEN "R", 1, FT, 1: FIELD 1, 1 AS D
260 FOR X=1 TO N-1: IF LEN(A(X))>1 THEN A(X)=RIGHT$(A(X),1)
270 L=A(X): GOSUB 670: NEXT X: CLOSE: IF T(5) THEN LPRINT STRING
$(5,13): FOR X=1 TO N-1: LPRINT A(X): NEXT X
280 ERASE A,V: PRINT E1: GOSUB 800: GOTO 100
290 PRINT "Enter name of text file for "J"cipherment---> ": GOS
UB 900: IF F="" THEN GOSUB 910: GOTO 100
300 OPEN "R", 1, F, 1: GOSUB 970: IF T(3) THEN GOSUB 990
310 FOR X=1 TO LOP(1): FIELD 1, 1 AS L: GET 1,X: GOSUB 670: NEXT
X: CLOSE: PRINT E1: GOSUB 800: GOTO 100
320 CLS: PRINT "CRYPTSYS Program Defaults:";CR: FOR X=1 TO 8: P
RINT X;"- Option to ";D(X);", currently: ("; IF X<6 THEN IF
T(X) THEN PRINT "Yes" ELSE PRINT "No"
330 IF X=7 THEN PRINT T(X);) (";CHR$(T(X));)" ELSE IF X>5 THE
N PRINT T(X);)"
340 NEXT X: PRINT " 9 - Save settings 1 - 7 to program defaults
file on disk": PRINT "Any other key returns to main menu": P
RINT E1: GOSUB 800: V=VAL(I)
350 IF V=0 THEN GOTO 100
360 IF V<6 THEN IF T(V) THEN T(V)=0 ELSE T(V)=1
370 IF V=6 THEN PRINT "Enter a number between 5000 and 32
766 --> ": GOSUB 960: IF Y>4999 AND Y<32767 THEN T(6)=Y
380 IF V=7 THEN PRINT "Enter ASCII decimal number for the space-
equivalent character": PRINT "in the range 33-126 --> ": GOS
UB 960: IF Y>32 AND Y<127 THEN T(7)=Y
390 IF V=8 THEN PRINT "Enter key number in the range 1 - "
;T(6)--->": GOSUB 960: IF Y>0 AND Y<T(6) THEN T(8)=Y
400 IF V=9 THEN GOSUB 980: FOR X=1 TO 7: LSET D=MKI$(T(X)): PUT
1,X: NEXT X: CLOSE
410 GOTO 320
420 PRINT "Key being changed": CR: "Current length of key-letter
file is "T"characters"
430 PRINT "Current default length is" T(6)--- is this O.K.? (Y/N)
": GOSUB 800: IF I="Y" OR I="y" THEN GOTO 450
440 PRINT "N": PRINT "Change this setting from the Program Defau
lts Listing menu ONLY!": PRINT "Returning to main menu": GOS
UB 910: GOTO 100
450 PRINT I: PRINT "New key-letter file being written to disk!"
460 GOSUB 970: IF LOP(3)>T(6) THEN CLOSE: KILL "CRYPTSYS/KEY": G
OTO 460
470 FOR X=1 TO T(6): RANDOM: LSET K=CHR$(RND(94)+32): PUT 3,X: N
EXT X
480 PRINT "New key-file established, ";T(6);" characters in leng
th"
490 GOSUB 980: GET 1,6: IF T(6)<>CVI(D) THEN LSET D=MKI$(T(6)):
PUT 1,6
500 CLOSE: T=T(6): PRINT CR;E1: GOSUB 800: GOTO 100
510 PRINT "1. View key-number for a specific date": PRINT "2. Vi
ew ALL key-numbers": PRINT "3. Write 1 year's worth of key-n
": GOSUB 910: GOTO 100
520 IF T<>T(6) THEN PRINT KE; "Cannot perform any operation here
!": GOSUB 910: GOTO 100
530 IF U<>366 THEN PRINT KN; "Option 3 MUST be selected first!"
540 PRINT E; STRING$(2,8); ", or <ESC> to return to main menu ";

```

Listing continued

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Listing continued

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: GOSUB 800: IF I=CHR$(27) THEN GOTO 100          ** 6937
550 V=VAL(I): IF V<1 OR V>3 OR U<>366 AND V<>3 THEN PRINT: GOTO          ** 4075
540          ** 1772
560 CLS: ON V GOTO 570, 590, 610
570 GOSUB 930: CLS: GOSUB 1000: GET 2,Q: PRINT "The key-number f          ** 12288
or "M(R);W;" is"CVI(J): PRINT "Store this for immediate use          ** 689
(Y/N)? ";GOSUB 800: IF I="Y" OR I="y" THEN T(8)=CVI(J)
580 GOTO 650
590 PRINT "Output to printer? (Y/N) "; GOSUB 800: PRINT I: CLS:
GOSUB 1000: Q=1: FOR X=1 TO 12: FOR Y=1 TO N(X): GET 2,Q: P          ** 11991
RINT M(X);Y,CVI(J): IF I="Y" OR I="y" THEN LPRINT M(X);Y,CVI          ** 2146
(J)
600 Q=Q+1: NEXT Y: NEXT X: GOTO 650
610 PRINT "Generating new key-numbers in the range 1 -"T(6); DI          ** 6432
M R(366): FOR X=1 TO 366
620 RANDOM: R=RND(T(6)): FOR Y=0 TO X-1: IF R(Y)=R THEN GOTO 620          ** 4679
ELSE NEXT Y
630 R(X)=R: PRINT ". "; NEXT X: PRINT: PRINT "Writing numbers to          ** 11435
new disk file"; GOSUB 1000: FOR X=1 TO 366: LSET J=MKI$(R(X          ** 1592
)): PUT 2,X: PRINT ". "; IF X=Q THEN T(8)=R(X)          ** 2703
640 NEXT X: ERASE R: U=366          ** 719
650 CLOSE: PRINT CR;EL: GOSUB 800: GOTO 100          ** 2134
660 CLS: END          ** 2950
670 IF V=1 AND L=" " THEN L=CHR$(T(7))          ** 2699
680 S=ASC(L)-32: IF S<1 OR S>94 THEN C=L: GOTO 750          ** 2196
690 GET 3,R: P=ASC(X)-32: IF V=2 THEN GOTO 720          ** 683
700 S=S-95: P=S+P: IF P<1 THEN P=P+94          ** 2262
710 GOTO 730          ** 2335
720 S=S+95: P=S-P: IF P>94 THEN P=P-94          ** 2115
730 C=CHR$(P+32): R=R+1: IF R>T THEN R=1          ** 1499
740 IF V=2 AND C=CHR$(T(7)) THEN C=" "          ** 1577
750 IF T(1) THEN PRINT C;          ** 2044
760 IF T(2) THEN LPRINT C;          ** 2863
770 IF T(3) THEN LSET G=C: PUT 2,X          ** 672
780 IF UK=1 THEN IF T(4) THEN LSET D=L: PUT 1,X          ** 2069
790 RETURN          ** 665
800 I=INKEY$: IF I="" THEN GOTO 800          ** 2695
810 RETURN          ** 2689
820 PRINT I;: A(N)=I: N=N+1: NB=NB+1: RETURN
830 PRINT I;: N=N-1: NB=NB-1: IF N<1 THEN N=1
840 IF LEN(A(N))>1 THEN PRINT STRING$(80-((VAL(LEFT$(A(N),LEN(A          ** 4863
(N))-2))) MOD 80),8);          ** 669
850 RETURN          ** 1033
860 NT=2: RETURN          ** 2412
870 ERASE A, V: NT=3: GOSUB 910: RETURN
880 PRINT "KEYBOARD TEXT BUFFER FULL!": PRINT "Press <ESC> to "J          ** 9395
"cipher as is, <ENTER> to start over!": PRINT "Or <D> to ab          ** 4793
ort"          ** 1585
890 GOSUB 800: Z=ASC(I): IF Z<>27 AND Z<>13 AND Z<>4 THEN GOTO 8          ** 3928
90 ELSE RETURN
900 LINE INPUT F: RETURN
910 PRINT: PRINT "OPERATION ABORTED! "; AK: GOSUB 800: RETURN
920 CLS: PRINT TAB(25) "CRYPTSYS";CR;"Polyalphabetic multi-subst          ** 13308
itution text file encryption and decryption";CR: TAB(20) " by          ** 7863
Thomas W. Higginbotham";CR: RETURN
930 FOR X=1 TO 12: PRINT X, M(X): NEXT X: PRINT "Enter number of          ** 4803
month ( 1-12 ) ";INPUT R: IF R<1 OR R>12 THEN GOTO 930          ** 3478
940 PRINT "Enter date ( 1-"N(R)");": INPUT W: IF W<1 OR W>N(R) T          ** 1282
HEN GOTO 940
950 Q=0: FOR X=0 TO R-1: Q=Q+N(X): NEXT X: Q=Q+W: RETURN          ** 4116
960 INPUT Y: RETURN          ** 4075
970 OPEN "R", 3, "CRYPTSYS/KEY", 1: FIELD 3, 1 AS K: T=LOF(3): R          ** 2664
ETURN          ** 4138
980 OPEN "R", 1, "CRYPTSYS/DEF", 2: FIELD 1, 2 AS D: O=LOF(1): R          ** 5586
ETURN          ** 4145
990 OPEN "R", 2, FO, 1: FIELD 2, 1 AS G: RETURN          ** 5215
1000 OPEN "R", 2, "CRYPTSYS/KMP", 2: FIELD 2, 2 AS J: U=LOF(2):          ** 3473
RETURN          ** 3606
1010 DATA "1. Encipher","2. Decipher","3. View/change program de          ** 3955
faults"          ** 4623
1020 DATA "4. Change/write key-letter file on disk"          ** 4521
1030 DATA "5. View/change key-numbers for 1 year","6. End sessio          ** 4434
n"          ** 3530
1040 DATA "list converted text to screen"          ** 1766
1050 DATA "list converted text to printer"          ** 4885
1060 DATA "output converted text to disk file"          ** 5952
1070 DATA "output keyboard-entered text to disk file"          ** 1640
1080 DATA "output keyboard-entered text to printer"          ** 3425
1090 DATA "set number of letters in key-letter file"
1100 DATA "set or change space-equivalent"
1110 DATA "change today's key number"
1120 DATA January,31,February,29,March,31,April,30,May,31,June,3          ** 4885
0
1130 DATA July,31,August,31,September,30,October,31,November,30,          ** 5952
December,31          ** 1640
1140 DATA 1,0,1,1,0,12000,126,500
1150 PRINT "Error "ERR" in line "ERL: CLOSE: STOP          ** 3425

```

End





Rose

QUALITY DISK DRIVES

These drives are complete with power supply, cover and external drive connector. For TRS-80 Model I, III, 4, IBM PC and others. All drives are Double Density and step at 6ms or less. SS means single head, DS is double head. Specify white or silver color cover for no additional charge or my beautiful new Stainless Steel cover for only \$9 additional. Add \$5 per drive shipping unless otherwise specified. All drives have a one year warranty on parts and labor. Bare drives, that is, just the drives themselves are also available for those of you who don't need or want one of my power supplies.

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2ea. 80tk DS TEAC FD-35F in a dual case	285
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40tk DS Tandon TM100-2	157
1ea. 40tk SS TEAC FD-55A in dual case	\$ 127
2ea. 40tk SS TEAC FD-55A in dual case	217
1ea. 40tk DS TEAC FD-55B in dual case	137
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1ea. 80tk DS TEAC FD-55F in dual case	157
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80tk DS, Half-High, TEAC FD55-F	129
8" SS, Thinline, Tandon TM848-1E	259
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TRS-80 MODEL III/4 DISK DRIVE KITS

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Internal drive kit complete with disk controller, power supply, mounting brackets, cables and all hardware plus step-by-step instructions. This kit contains everything you need (except the Disk Operating System, drive and a screwdriver) to convert your cassette Model III or 4 to fast reliable disk operation. Don't confuse this quality kit with the high-priced ripoffs. Thousands of satisfied customers cannot be wrong. You can join them for only \$ 189
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Complete with Manual

Rose has latched onto this slick version of CP/M 2.2 that allows you to run most of your favorite CP/M programs with ease. It even lets you read and write other manufacturers' disk formats. What could be nicer? They are in stock ready for you to use and enjoy.

TRS-80 SPECIAL EQUIPMENT

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dBASE II™ Complete With Disk Tutorial	345
Super Utility Plus 3.2 by Kim Watt	59
CP/M 2.2 for Model 4 by Monte Zuma	169
Turbo PASCAL by Bor Land. Requires CP/M	44
Turbo Toolbox by Bor Land	45
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Pickles & Trout CP/M 2.2m for the Model 2-12-16, Floppy Version	179
Same thing but the Radio Shack Hard Disk	219

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No need to buy a new computer when you can use the Holmes VID-80 modification and get CP/M 2.2, 64K RAM and 80 column video. This kit is easy to install and requires no soldering. Even a dolt like you can end up with a complete 64K CP/M computer with an 80 column screen that is still able to run all your existing Model III software. For the first time you will be able to use CP/M programs that normal people do, such as dBASE II and WordStar. The regular price of this kit is \$524. Now Rose will get you going for only Add \$5 shipping **\$ 299**
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Name That Computer

The Answers

Here, in their original order, are the correct names and photographs of the mystery computers:



1. IBM 5100 Portable Computer. This 64K computer was marketed from 1975 to 1982 as a problem-solver with business and scientific applications. It came with Basic, APL, or both, and could be hooked up to a printer, an auxiliary tape unit, and a black-and-white monitor. The 240,000-character data cartridges (pictured) were later replaced by third-party floppy disks.



2. Tandy 10. An experimental retail store (now defunct) at Tandy Center in Fort Worth was the only place you could buy this \$9,950 business system. The Tandy 10 was a complete work station employing 256K disks, a 60-character-per-second printer, a standard keyboard with 15 function keys, a video display, and Extended Basic. A Tandy spokesperson says the machine, manufactured by a third party, "was not a big seller."

The Winners

"Thanks for letting me remember." That's how Richard Washburn of Cliffside Park, NJ, ended his three-page letter, helping us to remember the early days of personal computing and, in the process, winning *80 Micro's* Name That Computer contest (April 1986, p. 52).

Richard's entry contained accurate and amusing write-ups of the 10 obsolete microcomputers pictured in the April issue. It didn't win for superior effort alone, however, but was chosen in a random drawing of eight correct entries from the 51 submitted. As promised, Richard will receive a Radio Shack Model I complete with Expansion Interface, two disk drives, and a monitor. The seven consolation winners get "I Break for *80 Micro*" bumper stickers.

The seven runners-up were Jay J. Hokanson, Grand Island, NE; Larry Rossiter, Victoria, British Columbia; Craig E. Henrikson, Delmar, NY; Ron Kolarik, Lincoln, NE; Harry S. Yoshida, Oxnard, CA; Joseph Kingsley, Southampton, MA; and Jim Laughrey, Sheridan, WY.

Several other contestants came close but fell short for a variety of reasons. The IBM 5100 in Photo 1 was commonly misidentified as a Hewlett-Packard, less commonly as an Osborne or a Kobe. The Findex 128 in Photo 3 was often mistaken for a Rockwell AIM-65.



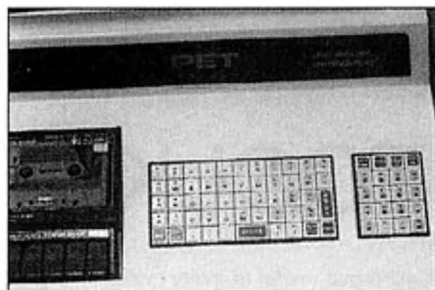
3. Findex System 128. As Richard put it, "...128K bubble memory; a floppy disk; 48K ROM; a five-slot S-100 bus; a flat-panel; six-row 40-character display; and a cash-register printer, all for \$5,000. How could it not overwhelm the industry?"



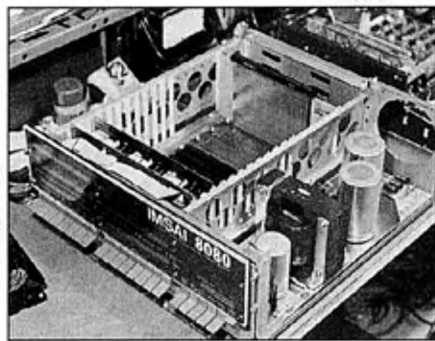
4. PolyMorphic System 8813. An early MITS clone, the System 8813 sold for \$3,250 when it was introduced in mid-1977. It offered a double-sided disk option that allowed up to 1 megabyte of storage on three drives.



5. MITS Altair 8800A. This computer was a slightly spruced-up version of the MITS Altair 8800, which "set the world on fire" when it appeared on the cover of the January 1975 *Popular Electronics*. Built around the Intel 8800 chip, the original Altair had only a 256-bit memory and no keyboard or monitor, but 4,000 units sold in the first three months as Ed Roberts and his Albuquerque, NM, company rushed to fill back orders. The Altair spawned the first computer store, the first computer newsletter, and the first PC version of Basic. Its unexpected success proved there was a large market for home computers.



6. Commodore PET 2001. After micro-computer pioneers MITS and Altair faltered, Radio Shack, Commodore, and Apple all tried in 1977 to make a big splash with mass-market PCs of their own. Commodore's entry was the PET (Personal Electronic Transactor, sometimes with the 2001 suffix), which took advantage of the 6502 chip made by MOS Technology, a recent Commodore acquisition. The PET 2001 had up to 32K RAM, a built-in cassette drive, and a 9-inch screen, and was first priced at \$600. By 1980, 107,000 units had been sold.



7. IMSAI 8080. You entered programs by flipping switches on the front panel of this open-chassis system, which had 22 slots for modules. In the two years after its release in 1975, the IMSAI 8080 was an early favorite of hobbyists anxious to get their hands on the latest technology. It was a close imitator of the Altair. IMSAI's unsuccessful attempts to market it as a business tool ended in bankruptcy in 1979.



8. REX. Realistic Controls Corporation's 24K Z80 machine contained an S-100 motherboard housed in a walnut cabinet. It featured a double-sided disk drive with space for a second, plus five slots for S-100 bus options.



9. Apple I. A long-haired Steve Wozniak (whom most contestants identified in the tie-breaker) hovered over his 6502-based garage creation, "a complete system on a board," as one reviewer called it, priced at \$666.66. You had to separately buy an ASCII keyboard, monitor, and two transformers.



10. PMC-80. Manufactured in Hong Kong by ECCA International, this Radio Shack Model I clone was called the TRZ-80 in South Africa, the Video Genie in England, and the Dick Smith System 80 in Australia. ■



MONTEZUMA MICRO

WOW!
ANOTHER
NEW
PRODUCT
FROM
MONTE

PRESENTS

MONTE'S TOOLKIT

\$49

REQUIRES: Montezuma Micro CP/M® 2.2 version 2.21+

Monte's Toolkit is a collection of utilities that will prove useful to every owner of Montezuma Micro CP/M (you all are owners, aren't you?). It's a disk full of programs that perform functions that are difficult, cumbersome or expensive to do any other way. Monte has tried, in his own way, to briefly explain each function for you below. Read on and be saved.

DOUBLECROSS™ allows unlimited file transfers between CP/M™, IBM-DOS and Model 3/4 LDOS™ /TRSDOS™ with unsurpassed ease and speed. In fact, you can move just about anything from any disk to any other disk but you might have to make changes for program operation. Lotus 123™ just flat won't run on your Model 3 and I doubt that you could ever modify Scripsit™ enough to run on the IBM. Simple menu guide you through the operation with minimal keystrokes. Just tag the files you want in the directory display and go. You won't get doublecrossed with **DBLCROSS**.

FREEFORM™ formats and backs up Model 3/4 LDOS/TRSDOS and IBM MS & PC-DOS (versions 1.x, 2.x and 3.x), both single side and double side plus there is a special "clone" copy when you just don't know or care what you have. Just insert a disk and copy away. All you have to know about the disk is how to get it into the drive. The Analysis feature lets you look at and print the actual structure of a disk - even the ones with "funny" formats.

WSPR lets you print to almost any printer using almost any control code. It's nearly magic and does a whole lot more than I can talk about here including letting you print *anything* your printer can print.

FILEFIX™ gives you the ability to "fix" your "files" by adding line-feeds when your files are going from CP/M or IBM-DOS to LDOS/TRSDOS or take them away if you are transferring the other way. You can remove the control codes from a WordStar™ document thereby converting it to a non-document file. The fix will also fix up Scripsit files so they can be used by CP/M and IBM-DOS based wordprocessors (you know - the real ones). All this is accomplished with the use of simple menus and boy, it is fast.

SYS2M requires 128K and our CP/M. The CCP and the BDOS are moved to drive M and the BIOS is modified to allow a Warm Boot from Drive M. So what you say. Well, you still have to have a disk in drive A but it no longer has to have the CP/M system resident. It can be anything. This little jewel copies frequently used programs to drive M and searches there first for all program requests resulting in much faster program loading. Slick isn't it?

AUTO is a little goodie that lets you issue multiple commands from the command line. Eliminates the *pain* of Submit. As in all the other parts of **MONTE'S TOOLBOX**, complete and comprehensive instructions are included and it's available right now.



MONTEZUMA MICRO

PRESENTS

MONTE'S WINDOW™

NOTEPAD



WINDOWS ON
YOUR MODEL 4!



CALENDAR



TAKES NO
USER RAM!



CALCULATOR

Pop Up Menus!

INDEX
CARD FILE

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Easy to Use!

REQUIREMENTS

Montezuma Micro CP/M
2.2 version 2.21+
128K RAM
Model 3 or 4P
3.5" 5 1/4" drive



A touch of the keyboard opens a window in your screen for - a Note Pad, an Appointment Calendar, a Calculator, even a Mini Data Base. All yours for just \$49! Need RAM? Monte's Christmas gift to you - 64K and the window, both for \$99!

Once Upon A Time,

Monte Zuma, our Founder, President and King, has always had trouble keeping his desk organized. The Sidekick™ from Boriand International would solve the problem, but alas, it was not available for CP/M™. So Monte asked his favorite nephew, the legendary LaMont E. Zuma (distant cousin to Rondo Talbot, a direct descendant of Monte Zuma himself) to work on the problem as best he could during recess at the home. LaMont, a true legend in his own time, really outdid himself this time. A touch of both shift keys halts your application program in its tracks and up pops **Monte's Window™** ready to use. What could be simpler? Put an end to the tumbling and pawing around the pile of papers on your desk. You will find **Monte's Window™** indispensable. When you are finished, break back to your application program and it resumes without error. **Monte's Window™** is truly a breakthrough. See for yourself - Look through **Monte's Window™** on your Model 4. How did you ever get along without it? See the page opposite for order information. **Monte's Window™** is available right now.



MONTEZUMA MICRO

PRESENTS

MONTE'S BASIC

Your TRSDOS BASIC (01.01.00) will work the same, for the most part, under CP/M as it does under TRSDOS. However, for the most part isn't good enough. But, with some changes provided by our **BASCON™** program, you can be 100% compatible with the standard BASIC used with CP/M. True, you lose some of the TRSDOS BASIC features while gaining new features such as FILES, NULL, RESET, etc. **BASCON** alters your TRSDOS BASIC, which was included with your Model 4 when you bought it, so that it will function under CP/M. You must have the unaltered original TRSDOS BASIC as above in order to convert with **BASCON**. The program operation is fully automatic and quick. The resulting BASIC runs any CP/M 2.2 BASIC program that previously required MBASIC™. Programs written for TRSDOS BASIC may require modification to run correctly under the converted BASIC. Fully compatible with MBASIC. We even provide for additional documentation that is keyed by page number to your TRSDOS BASIC manual. **MONTE'S BASIC** is available right now.

\$49

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Can we talk? CP/M vs TRSDOS

By moving to CP/M on your Model 4 you achieve two things. First you open the door to a wealth of existing software. More 8-bit software runs under CP/M than any other operating system. This includes virtually all of the "big name" programs which have set the standards by which all others are measured. Programs like **WordStar**, **dBASE II**, and **Turbo Pascal** are available for CP/M, but not TRSDOS. Public domain software, almost unknown under TRSDOS, fills hundreds of megabytes of disk space. Valuable public domain programs like the **Small C Compiler** are just a toll-free phone call away. Most importantly, hundreds of applications programs are available from a multitude of vendors. Many include the source code. Wouldn't you like to be able to choose from scores of Accounts Receivable or General Ledger programs, instead of the meager selection you now have? Circle our special Reader Service number 600 on the Reader Service Card to receive our comprehensive free listing of suppliers of application programs that run under CP/M.

What about the future?

When the time comes to move up to another computer it will almost certainly use MS-DOS. That's when CP/M users get a pleasant surprise. Since MS-DOS was a derivative of CP/M it operates in almost the same manner. Even better, most of the same software packages are available in 16-bit form and they operate in virtually the same way that they did under CP/M.

Is it easy to use?

Montezuma Micro's CP/M has been carefully crafted to present a maximum of features while taking a minimum of memory. It supports all of the standard features of the Model 4/4P/4D computers, as well as most of the optional ones. Our CP/M has been consistently been awarded the highest ratings in industry magazines. It is version 2.2, the most popular and reliable of all the versions of CP/M produced. Our CP/M has been made as easy to use as possible. All customer-selected features are chosen from simple menus in our CONFIG utility. This includes the ability to configure a disk drive to run like that of scores of other CP/M com-

puters for maximum ease of software portability. Using the unique DBLCROSS program in our Monte's Toolkit utility package you can move files back and forth between CP/M, TRSDOS (1.3 and 6.x), and MS-DOS.

Why use Montezuma CP/M?

We have already told you why our CP/M is the best for the Radio Shack Model 4 computer. The only question left to answer is "Why buy CP/M at all?" Radio Shack has abandoned TRSDOS — all of their new machines use MS-DOS. Most of the software producers have followed, leaving no new software development and saddling the TRSDOS user with whatever software "left-overs" he can find. Which DOS do you want to head into the future with: the one originally written for the Model I or the one that served as the basis for MS-DOS? Make the right choice right now for just \$169.

If I need support?

We don't forget you after the sale. If you have a problem you will find our phones are answered by people, not answering machines or hold buttons. Our philosophy is very simple — we want you to be happy and satisfied with your purchase. If you have a problem then we have a problem, and we'll do whatever we can to resolve it.

Cost to update?

Our owners are protected against instant obsolescence by our lifetime upgrade policy. At any time you can return your original CP/M disk to be upgraded to the latest version free of charge, except for a small shipping and handling fee. Periodically we publish **NEW STUFF**, a newsletter for registered users of Montezuma Micro CP/M. This publication carries news about new products, tips for getting more out of CP/M, and other valuable information for our users. It is sent free of charge to registered owners.

Can I use a hard disk drive?

CP/M hard disk drivers are available for Radio Shack, Aerocomp, and most other popular brands of hard disk drives. These drivers allow the hard drive to be partitioned into one to four logical drives of varying sizes.

These drives may all be used by CP/M, or may be divided between CP/M and TRSDOS. A head-parking utility is included on the driver disk to minimize the risk of damage when the hard disk drive is not in use. Also included at no charge is a utility which will copy, compress, list, print, and delete files with ease. There isn't much you can say about a driver. It either works or it doesn't. Ours works supremely and it only costs \$30.

Hard disk backup?

Unlike the high-priced, underpowered backup utilities available for backup of TRSDOS hard drives, our CP/M **HARDBACK** utility makes the backup of a hard disk to floppies quick and painless. Only **HARDBACK** gives you the choice of backing up the entire drive or only those files which it knows have been changed since the last backup. Daily backup is no longer a chore, since only new data must be copied. With **HARDBACK** you can quickly restore an entire drive, or only a single file if necessary. Only **HARDBACK** will perform a complete check of the hard disk drive and lock out tracks which have become flawed to prevent the use of those tracks for later data storage. Add this supreme program to your hard disk for just \$49. Isn't your time and data worth it?

Specs?

Size of Transient Program Area (TPA): 56,070 bytes in a 64k system. 55,046 bytes in a 63k system (with optional hard disk driver). **CP/M IOBYTE:** Fully implemented. **Device Drivers:** Disk (35, 40, 77, & 80 track, single/double density single/double sided, 3, 5, or 8 inch. (More than 85 disk formats supported)) **Maximum Disk Capacity:** 40T SS=220k, 40T DS=440k, 80T DS=880k **RS-232:** All word lengths, parity, & baud rates. **Parallel Printer:** With or without line-feed and/or formfeed. **Video:** 24 by 80 with reverse video. **Keyboard:** Full ASCII with 9 function keys. **RAM Disk:** 64k, automatic on 128k systems. **Hard Disk:** Optional drivers available at extra cost for most popular models. Standard CP/M programs included: **ASM, DDT, DUMP, ED, LOAD, MOVCPM, PIP, STAT, SUBMIT, SYSGEN, and XSUB.**

Order Information

Give us a call now with your order and we will ship immediately. Prices include delivery to your door in the lower 48 States including APO/FPO. All others please add an amount commensurate to shipping requested. Any excess will be refunded. Credit cards will not be charged before we ship your order. The suitability of software selected is the responsibility of the purchaser as there are **NO REFUNDS ON SOFTWARE**. Defective software will be replaced upon it's return, postpaid.

The toll-free lines are for orders only.
Specifications/prices are subject to change without notice.

Montezuma CP/M: Model 4 version 2.30 \$ 169

The following items require Montezuma CP/M 2.2 version 2.20 or later.

Optional Hard Disk Driver (specify exact hard drive) \$ 30
HARDBACK \$ 49



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Good Filekeeping

A TRSDOS utility to help you create master directories on the Model 4.

Anyone who has spent hours searching through disks for a misplaced file probably wishes TRSDOS had a method for creating master directories. I've written a Model 4 TRSDOS utility that makes this possible. Filekeep (see the Program Listing) is a Basic program that lets you keep 35 directories, or fileboxes, on one disk. You can catalog as many as 800 file names in a filebox and reference them from a master directory. You can update the master directory whenever you make changes to your data disks and print out master lists so that you don't have to run Filekeep every time you want to find a file.

File It Away

To use Filekeep, you must first create one or more fileboxes from your disk directories. The program keeps a master filebox list called Filebox/M0. The first time you run Filekeep, the program tells you that Filebox/M0 doesn't exist and asks if you want to continue. Answer yes. Filekeep then asks what filebox you want to load and prompts you for a label, which can be a number from 1-9 or a letter of the alphabet. When you press a key (A, for example), the program searches for the filebox with that name (Filebox/MA). You'll receive the message "Filebox doesn't exist" on the first program run. Again, answer yes to the continue prompt.

Filekeep opens a directory and asks if you want to add the file names from the disk in drive 1. (See the changes at the end of this article if you have a single-drive system.) If you answer yes, the program reads the file names and accumulates them in a filebox. If you answer no, you'll be prompted for another disk.

When Filekeep has read all the disk directories you want stored in the filebox, press the enter key. (Make sure that drive 1 contains a disk that the program has read.) This brings up a filebox menu (see

Program Listing. Filekeep. (See p. 112 for information on using the checksum in this listing.)

```

20 CLEAR,610001:DEFINT I-N:DEFPTR B-H:DIM B(800)          ** 2877
30 S4PTR1=653041                                          ** 897
40 DATA 213,221,225,221,102,2,221,110,1,78,35,70,237,67,-229,35,
78,35,70,237,67,-227,237,67,-217,237,75,-217,203,56,203,25,12
0,177,200,237,67,-217,33,1,0,34,-225,42,-227,183,237,66,34,-2
23,42,-225,34,-221,237,75,-217,9,34                    ** 10904
50 DATA -219,42,-221,205,-184,229,221,225,42,-219,205,-184,229,2
53,225,221,126,0,183,40,98,253,126,0,183,40,40,221,190,0,56,7
2,221,70,0,175,50,-231,253,102,2,253,110,1,221,86,2,221,94,1,
26,190,56,64,32,10,19,35,16,246,58                    ** 10825
60 DATA -231,183,40,52,221,229,225,253,229,209,6,3,78,26,119,121
18,35,19,16,247,42,-221,237,75,-217,183,237,66,250,-194,40,2
0,34,-221,24,141,71,62,1,24,183,229,209,25,25,237,91,-229,25,
201,42,-225,35,34,-225,237,75,-223,183
70 DATA 237,66,250,-58,202,-58,195,-28                ** 11069
80 DEFINT S:S4PTRMSB=FIX(S4PTR1/256):S4PTRLSB=S4PTR1-S4PTRMSB*25
6                                                         ** 4339
90 FOR S4INDEX=0 TO 216                                  ** 1400
100 READ S4BYTE:IF S4BYTE>0 THEN POKE S4PTR1+S4INDEX, S4BYTE:GO
TO 150                                                    ** 4525
110 S4LSB=S4PTRLSB+ANS(S4BYTE):S4MSB=S4PTRMSB           ** 3073
120 IF S4LSB>255 THEN S4LSB=S4LSB-256:S4MSB=S4MSB+1    ** 3208
130 POKE S4PTR1+S4INDEX, S4LSB:POKE S4PTR1+S4INDEX+1, S4MSB
140 S4INDEX=S4INDEX+1                                    ** 3809
150 NEXT S4INDEX:DEF USRO=S4PTR1                          ** 1356
160 DEF FN SOKT4$(X$)=USRO(MKI$(VARPTR(B(X$))-X$*3)+MKI$(X$))
170 KO=80*20+5:CD="n":DL="", press ENTER--:PRINT CHR$(15):DK=
CHR$(21)+CHR$(244)+CHR$(245)+CHR$(246)+CHR$(21):Q$=CHR$(34)
180 GOSUB 1700:PRINT@432, CHR$(23) "Filekeep":PRINT@982, "David
L. Kuzminski":PRINT@1067, "P.O. Box 2740":PRINT@1134, "Pe
tersburg, Virginia 23804" CHR$(28):
190 FB="filebox/m0":GOSUB 970:FB="":GOSUB 1630           ** 2114
200 'file selection                                       ** 3611
210 H=INKEY$:GOSUB 1680:PRINT@KO, "Which filebox do you want (0
-9, a-z)?":GOSUB 1490:IF H<>" " THEN 230                ** 7166
220 H=INKEY$:GOSUB 1680:PRINT@KO,DK:FOR I=2 TO NE:PRINT@KO+5, L
EFT$(B(I),11):PRINT "is available. ":GOSUB 1490:NEXT:IF H=
" " THEN 210                                           ** 10901
230 IF INSTR("0123456789abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMN
OPQRSTUVWXYZ",H)=0 THEN 220                             ** 3033
240 ERASE B:DIM B(800):NE=0:PRINT@KO+45, H:FB="filebox/m"+H:CLS
250 DLBL="DIR/SYS:1":IF FB="filebox/m0" THEN DLBL="DIR/SYS"
260 GOSUB 970:IF NE>0 THEN 1100                          ** 146
270 'disk identification
280 L=NE+1:ON ERROR GOTO 940:OPEN "R",1,DLBL:GET 1, 1
290 FIELD 1, 80 AS GA, 16 AS GB, 80 AS GC, 32 AS GD, 16 AS GE:ON
ERROR GOTO 0                                           ** 1811
300 DT=LEFT$(GE,8):DY=RIGHT$(GE,8):DN=MID$(GE,5,4)      ** 153
310 GF="<+DN+>"+"DT"+"DY"                                ** 3194
320 PRINT "checking for disk " GF ".":GG="":IF NE=0 THEN 550
330 FOR I=1 TO NE:IF INSTR(B(I),GF)<>0 THEN CD="y":GG=B(I):I=NE
340 PRINT ".":NEXT I:IF CD="y" THEN PRINT:GOTO 360
350 SOUND 2,0:PRINT "disk " DN " is not on file.":GOTO 550
360 CD="n":PRINT "disk is on file as " GG:GOSUB 1630
370 'function selection
380 PRINT "<u>update this disk <u>ancel and enter new di
sk":PRINT "<d>delete a disk by number <a>dd without deletin
g":PRINT "<q>quit, sort and save index":PRINT "<":CHR$(14)
** 14503
390 GOSUB 1610:ON INSTR("CcDdQqUuAa",H)/2 GOTO 400, 420, 850, 41
0, 550:GOTO 390
400 PRINT "<c>ancelling...":GOTO 830
410 PRINT "<u>pdating...":GOTO 470
420 PRINT "<d>delete routine...":XF=1:PRINT
430 'disk delete
440 LINE INPUT "enter disk ID to be deleted:":DN:FOR JA=1 TO LE
N(DN):JB=ASC(MID$(DN,JA,1)):IF JB>96 THEN MID$(DN,JA,1)=CHR$(
JB-32)
450 NEXT JA
460 IF LEN(DN)<4 THEN PRINT "disk ID must be four characters...
":GOSUB 1630:GOTO 380
470 KT=1:PRINT "deleting entries..."
480 FOR I=1 TO NE:IF LEFT$(B(I),1)<>"<" THEN 510
490 IF MID$(B(I),2,4)=DN THEN PRINT CHR$(10): B(I):GOTO 530
500 GOTO 520
510 IF MID$(B(I),14,4)=DN THEN PRINT CHR$(10): B(I):GOTO 530
520 B(KT)=B(I):PRINT ".":KT=KT+1
530 NEXT I:NE=KT-1:L=KT:PRINT:IF XF=1 THEN XF=0:PRINT "disk " GF
" was mounted...":GOTO 380

```

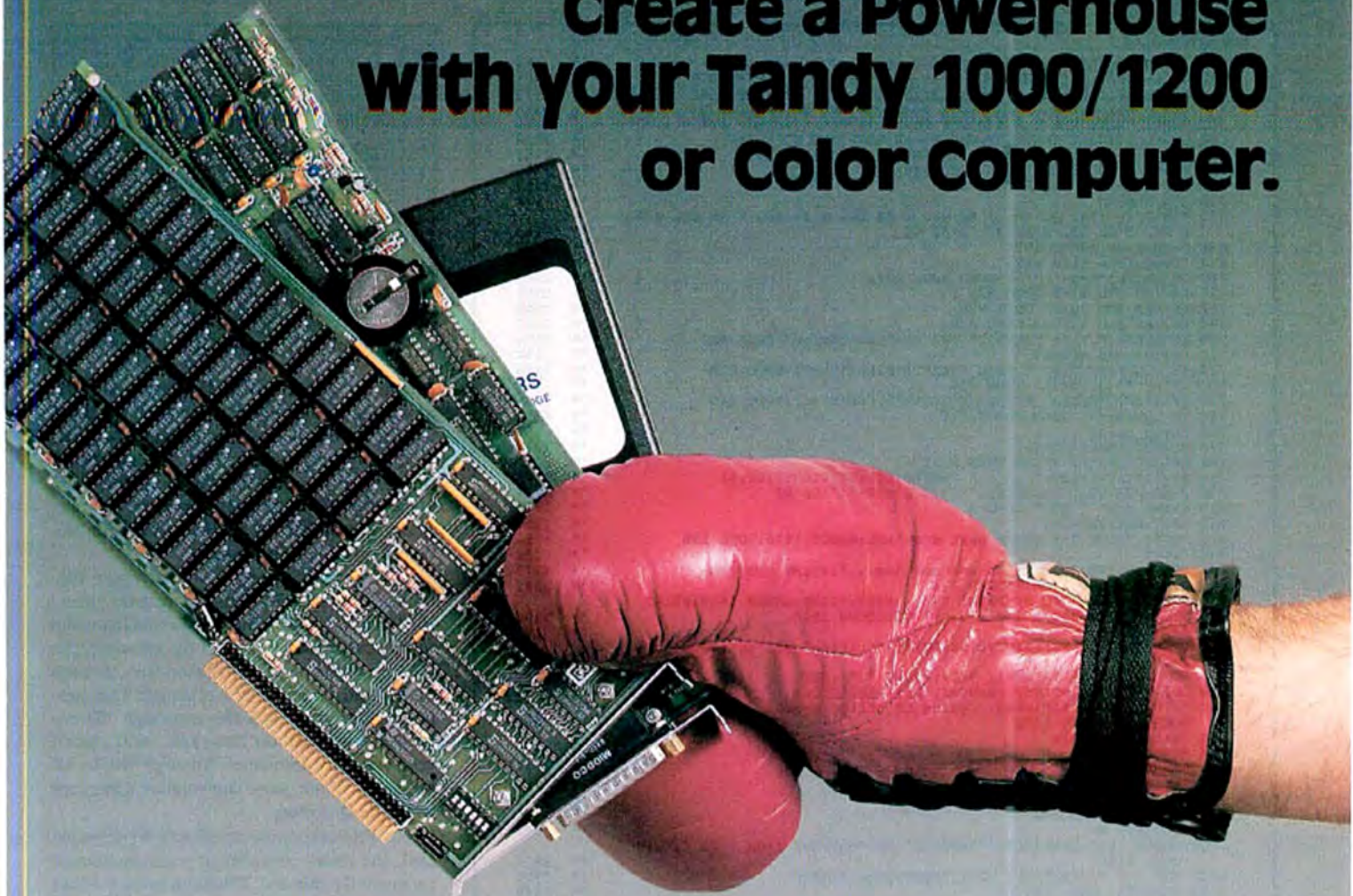
Listing continued

**LOAD
80**

System Requirements

Model 4 with 64K RAM
Disk Basic
Printer optional

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Listing continued

```

540 'disk addition
550 B(L)=GP+*":PRINT "add this disk (Y-N)? ";SOUND 0,0
560 GOSUB 1610:ON INSTR("YnN",H)/2 GOTO 570, 830:GOTO 560
570 PRINT "search for invisible files (Y-N)? ";SOUND 1,0
580 GOSUB 1610:IF INSTR("YnN",H)<>0 THEN 590 ELSE 580
590 PRINT "adding entries...":PRINT:PRINT B(L):L=L+1
600 FOR I=1 TO 18:ON ERROR GOTO 940
610 GET 1,1+2:ON ERROR GOTO 0
620 FOR K=0 TO 7
630 FIELD 1, K*32 AS GH, 1 AS CI, 2 AS GJ, 1 AS GK, 1 AS GL, 8 A
    S GM, 3 AS GN, 4 AS GP, 2 AS GQ
640 F=GM:E=GN:K8=ASC(GI)
650 'invisible file skip
660 ON INSTR("YnN",H)/2 GOTO 680, 670
670 IF (K8 AND 8)=8 GOTO 820
680 IF (K8 AND 16)=0 GOTO 820
690 IF (K8 AND 64)=64 GOTO 820
700 IF LEFT$(F,7)<>"FILEBOX" AND FB="filebox/m0" THEN 820
710 'eliminate spaces
720 IF RIGHT$(F,1)=" " THEN F=LEFT$(F,LEN(F)-1):GOTO 720
730 IF LEFT$(F,1)<"A" THEN 820
740 IF RIGHT$(E,1)=" " THEN E=LEFT$(E,LEN(E)-1):GOTO 740
750 IF LEN(E)>0 THEN F=F+*"+E
760 'byte count
770 R1=ASC(LEFT$(GQ,1))
780 XN=ASC(CK):IF XN<>0 THEN R1=R1-1
790 XT=R1*256+XN:BT=" "+STR$(XT):BT=RIGHT$(BT,6)
800 FD=F+STRING$(12-LEN(F)," ") :D(L)=FD+*"+DN+BT
810 PRINT B(L) " Bys",L=L+1
820 NEXT:NE=L-1
830 PRINT:PRINT "----mount next disk"+DL:GOSUB 1610:GOTO 280
840 'sort
850 CLOSE:PRINT "q"quitting and sorting...":PRINT CHR$(15)
860 DUMMY=FNSORT4$(NE):SOUND 0,0
870 PRINT:FOR I=1 TO NE:PRINT B(I):NEXT:PRINT:GOSUB 1630:PRINT
    SPC(10) "----mount index disk"+DL:GOSUB 1610
880 'save file
890 OPEN "O", 1, FB:PRINT#1,NE:PRINT "writing" NE "entries to fi
    le.";
900 FOR I=1 TO NE:PRINT#1, B(I):PRINT ".":NEXT
910 DK1=DATE$:DK2=TIME$:PRINT#1, DK1; DK2:CLOSE
920 PRINT:PRINT "finished...going to string search routine...":G
    OSUB 1490:GOTO 1100
930 'error controls
940 RESUME NEXT
950 RESUME 1050
960 'file input
970 ON ERROR GOTO 950:OPEN "I",2,FB
980 ON ERROR GOTO 940
990 INPUT#2, NE
1000 GOSUB 1680:PRINT#KO, "Reading" NE "entries from " FB ".":G
    OSUB 1630
1010 FOR I=1 TO NE:PRINT ">";:INPUT#2,B(I):NEXT
1020 INPUT#2, DK1, DK2
1030 CLOSE:RETURN
1040 'first run
1050 CLS:PRINT "There is no "; FB; " file on this disk. If this
    is your first run," "note that all disks must have a uniqu
    e code (0000 to 9999 or AAAA to ZZZZ) as the last four ch
    aracters of the diskette name."
1060 PRINT:PRINT "Use ATTRIB or DEBUG to do this.":PRINT:PRINT,
    "continue program Y/N?"
1070 GOSUB 1610:ON INSTR("YnN",H)/2 GOTO 1030, 1080:GOTO 1070
1080 END
1090 'search
1100 GOSUB 1700:PRINT#0, "A search for string " Q$ "10" Q$ " wil
    l find all references to 10.";
1110 PRINT#405, "You are currently on "; FB; " ";
1120 PRINT#565, "Pressing [F1] will take you to index update rou
    tine.";
1130 PRINT#654, "{shift F1} will exit you to TRSDOS ready.";
1140 PRINT#734, "{F2} will take you to index selection.";
1150 PRINT#814, "{shift F2} will show the current Drive 1 disk d
    irectory.";
1160 PRINT#894, "{F3} will take you to the index print routine."
    ;
1170 PRINT#974, "{shift F3} to receive help instructions.";
1180 PRINT#1054, "{ENTER} key only will return this screen.";
1190 PRINT#1214, FB " was last updated on " DK1 " at " DK2;
1200 PRINT#1849, "search string: ";:GOSUB 1610:DR=H:PRINT#1865,
    DR " ";
1210 DS="":IF DR=CHR$(13) THEN 1100
1220 XH=1:ON INSTR("XXXXXX",DR) GOTO 1720, 1730, 280, 1400, 170,
    1520
1230 GOSUB 1610:IF H<>CHR$(13) AND H<>CHR$(8) THEN DR=DR+H:PRINT
    #1865, DR " ";:GOTO 1230
1240 IF LEN(DR)<1 THEN 1230
1250 IF H=CHR$(8) THEN DR=LEFT$(DR,LEN(DR)-1):PRINT#1865, DR "
    ";:GOTO 1230
1260 FOR I=1 TO LEN(DR):TH=ASC(MID$(DR,I,1)):IF TH>96 THEN TH=TH
    -32
1270 DS=DS+CHR$(TH):NEXT
1280 DR=" "
1290 GOSUB 1700:GOSUB 1650:KT=0:L=0:KP=525
1300 FOR I=1 TO NE:IF INSTR(B(I),DS)=0 THEN 1340
1310 KT=KT+1:L=L+1:PRINT#KP+(40*L), "{ " CHR$(L+96) " } " B(I);
1320 'page numbers
1330 IF KT>1 THEN IF KT=INT(KT/26)*26 THEN GOSUB 1350:GOSUB 1700
    :GOSUB 1650
1340 NEXT:KT=0:PRINT#1840, DK " next ";:GOTO 1200
1350 PRINT#1850, "press [q] to escape -- page" (KT/26) "--
    press [t] to turn page";
1360 XH=2:GOSUB 1610:ON INSTR("TtQqXXXX",H)/2 GOTO 1380, 1390, 1
    520, 1730:GOTO 1360

```

Listing continued



Photo 1. The filebox menu.

Photo 1). Select option Q (quit, sort, and save index). The program quits the read function, sorts the file names in your newly created filebox, and displays them on screen. To save the filebox, press the enter key. (I recommend saving the program, the operating system, and your fileboxes on the same disk.)

After you've created one or more fileboxes, you should create a master directory (Filebox/M0). You can do this from the main menu (see Photo 2) by pressing the F2 key. Type in a zero after the "Which filebox do you want?" prompt. The program again displays the message "There is no Filebox/M0 on this disk" and asks if you want to continue. Answer yes to all prompts. Then save the master directory with the Q option.

For Filekeep to be an effective reference tool, the disks containing your data must be properly labeled. Filekeep uses the last four characters of the names under which you've formatted your disks as descriptors. You should be certain, therefore, to give your disks unique labels; otherwise you might not be able to tell which disk the program is referring to when it displays a directory. You can use the TRSDOS ATTRIB command or the Debug utility to change disk names, if necessary.

Master Plans

Once you create a master directory, Filekeep will display the fileboxes it has available in the lower-left corner of the opening screen whenever you start up the program. At the prompt, type in the letter or number of the filebox directory you want to scan. Filekeep then flashes the number of file names in the filebox and brings up the main menu. Using function keys, you can add disks or delete them from the filebox (F1), scan the filebox directory (also F1), print out the directory (F3), or select another filebox (F2). For help, press shift-F3. Shift-F1 exits to TRSDOS. (If you have SYSGENEd the function keys on your Model 4 disk, the program crashes. Be sure to use a clean Model 4 disk that you haven't SYSGENEd.)

When you press F1, the program loads drive 1's disk directory into memory. To check the disk directory first, press shift-F2. After the program reads the directory, press the enter key. This brings up the file-

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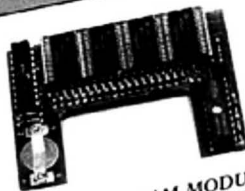
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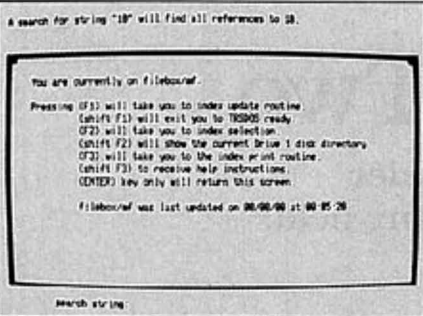


Photo 2. Filekeep's main menu.

box menu. With the U (update) option, you can make the filebox reflect changes to your disks. To delete a directory from the filebox, use the D option.

The A (add) option allows you to catalog a disk with the same name as one previously entered in the filebox. But be forewarned: If you use this option, you can't delete one disk directory without deleting the other.

You can search for a specific file from the main menu by entering a search string, or you can scan the entire filebox directory with the Q option. The program displays the sorted directory on screen, along with the four-character disk descriptor and the number of bytes taken up by each file. Press the enter key when you've finished. This saves the filebox and returns you to the main menu.

If you'd like a printout of the filebox directory, press the F3 key from the main menu. Filekeep prints 100 file names to a page, with the filebox name at the top of each page and the date and time of the printout at the top of the first page (see the Figure). If your printer doesn't recognize the CHR\$ string function in lines 1430 and 1440, remove or change them to suit your printer.

Minor Adjustments

As mentioned earlier, you'll need to edit the program slightly to make it work properly on a single-drive system. To use the DIR command, change the instruction:

```
SYSTEM"dir :1"
```

in line 1720 to read:

```
SYSTEM"dir"
```

You should also change line 250 to read:

```
DLBL="DIR/SYS"
```

When you examine the program, you might wonder why I included the X's in lines 1220 and 1360. They stand for special characters that wouldn't reproduce in the listing. You have to use the Model 4's function keys to type them in. In line 1220, the sequence is as follows: shift-F2, shift-F1, F1, F3, F2, shift-F3. The sequence in line 1360 is shift-F3, shift-F3, shift-F1, shift-F1. ■

Write to David L. Kuzminski at 2581 Pinehurst Drive, Petersburg, VA 23805.

Listing continued

```

1370 'flag set ** 203
1380 L=0:RETURN ** 959
1390 L=0:I=NE:RETURN ** 1299
1400 IF NE>0 THEN 1410 ELSE 1100 ** 1781
1410 GOSUB 1630:GOSUB 1750:IF FLAG="on" THEN 1100 ** 2953
1420 'line printer ** 199
1430 LPRINT STRING$(4,13); CHR$(27); CHR$(20); STRING$(5,32);DAT
E$, TIME$; CHR$(27); CHR$(19):Z=-99 ** 5692
1440 FOR I=1 TO ABS(INT(-NE/100)):LPRINT TAB(27) CHR$(27); CHR$(
14); FB; CHR$(27); CHR$(15); CHR$(27); CHR$(19):LPRINT STRI
NG$(33,32) "page" I:LPRINT:Z=Z+100 ** 9265
1450 FOR J=2 TO Z+49:LPRINT TAB(10) B(J) TAB(50) B(J+50):IF B(J)
=" " THEN GOSUB 1470:J=Z+49 ** 5231
1460 NEXT:LPRINT STRING$(12,13):NEXT:GOTO 1100 ** 2922
1470 LPRINT STRING$(Z+49-J,13):RETURN ** 2372
1480 'timer ** 205
1490 FOR S=1 TO 700:H=INKEY$:IF H<>" " THEN S=700 ** 2840
1500 NEXT:RETURN ** 1087
1510 'help ** 199
1520 FOR K1=1 TO 6:READ HQ, HM:IF INSTR("1234",MID$(HQ,XH,1))=XH
THEN GOSUB 1670:PRINT@1840, HM;:GOSUB 1490 ** 6473
1530 NEXT:RESTORE 1540:ON XH GOTO 1100, 1350 ** 2647
1540 DATA 1200, "Shift F1 will exit you to TRSDOS ready." ** 4256
1550 DATA 1200, "F1 will take you to index update." ** 3861
1560 DATA 1200, "Shift F2 will give you the directory for drive
1." ** 5285
1570 DATA 1200, "F2 will take you to index selection." ** 4187
1580 DATA 1200, "F3 will take you to index print routine." ** 4586
1590 DATA 1200, "ENTER key will return all instructions." ** 4567
1600 'keyboard scan ** 199
1610 H=INKEY$:IF H=" " THEN 1610 ELSE RETURN ** 2627
1620 'console alarm ** 201
1630 SOUND RND(7),0:RETURN ** 1653
1640 'graphic titles ** 203
1650 PRINT@22, "search string: " QS; DS; QS$:PRINT@330, "Title";
:PRINT@342, "Disk Bytes";:PRINT@369, "Title";:PRINT@382, "D
isk Bytes";:RETURN ** 9982
1660 'partial screen clear ** 205
1670 PRINT@1840, SPACE$(75);:RETURN ** 2166
1680 PRINT@KO, SPACE$(60);:RETURN ** 2110
1690 'graphic box ** 208
1700 CLS:PRINT@240, CHR$(191) CHR$(143) STRING$(76,131) CHR$(143
) CHR$(191);:FOR I=320 TO 1600 STEP 80:PRINT@I7, CHR$(191)
;:PRINT@I7+79, CHR$(191);:NEXT:PRINT CHR$(191) STRING$(78,1
76) CHR$(191);:RETURN ** 11932
1710 'commands ** 201
1720 CLS:SYSTEM"dir :1":PRINT:PRINT "Press any key to continue..
.":GOSUB 1610:GOTO 1100 ** 6354
1730 PRINT CHR$(14);:CLS:SYSTEM ** 1989
1740 'srpstat/a2 ** 204
1750 FLAG="":IF (INP(248) AND 240)=48 THEN RETURN ** 2873
1760 GOSUB 1630:PRINT@1760, "Printer is not ready...put printer o
nline or...":GOSUB 1800:IF H=" " THEN 1770 ELSE ON INSTR("Q
qii",H)/2 GOTO 1790, 1800 ** 10267
1770 PRINT@1760, "Press [Q] to quit or [I] to ignore printer sta
tus...":GOSUB 1800:IF H=" " THEN 1780 ELSE ON INSTR("Qqii",
H)/2 GOTO 1790, 1800 ** 10035
1780 GOTO 1750 ** 790
1790 FLAG="on":PRINT@1760, "Printout has been quit..."; ** 4081
1800 GOSUB 1490 ** 855
1810 PRINT@1760, SPC(75);:RETURN ** 1993

```

End

```

<DISK DATADISK 00/00/00 HELPMATE/BAS<DISK 19483
<OLIC SYMBOLIC 02/20/86 HPU/BAS <DISK 19483
<OS60 TRSDOS60 03/08/84 HOOP/BAS <DISK 1280
<TEXT WORDTEXT 11/18/84 HOOP4/BAS <DISK 27538
BACKUP/CMD <OS60 6425 KSM/FLT <TEXT 812
BACKUP/CMD <TEXT 6142 LABEL/DOC <OLIC 5825
BASIC/CMD <OS60 21584 LABEL/MO <OLIC 2928
BASIC/CMD <TEXT 21324 LABEL/R6 <OLIC 5650
BASIC/OV1 <OS60 2604 LABELHLP/MO <OLIC 1121
BASIC/OV1 <TEXT 2604 LOG/CMD <TEXT 351
BEVE/DAT <DISK 420 MSOREPLY/LTR<OLIC 1028
BEVE/DEF <DISK 183 MEMDISK/DCT <OS60 3005
BEVE/INP <DISK 127 MEMDISK/DCT <TEXT 2924
BEVE/KFK <OS60 37 MERGER/ASC <DISK 1613
BEVE/RPT <DISK 168 MICRO80/LTR <OLIC 1768
CLICK/PLT <TEXT 427 MICROTAB/BAS<DISK 11435
COM/DVR <TEXT 910 MODELA/III <TEXT 14592
COMM/CMD <TEXT 2835 NO/REF <OS60 1372
CONV/CMD <OS60 1574 PATCH/CMD <OS60 2681
CONV/CMD <TEXT 1575 PATCH/CMD <TEXT 2667
CONV3T04/CMD<TEXT 2358 PF/FLT <OS60 1353
CRYPTBAK/ASC <DISK 8019 PRINT/JCL <OS60 105
DATASORT <DISK 4559 PRINT/JCL <TEXT 112
DEMO2/BAS <DISK 0 REPAIR/CMD <TEXT 889
DEMO3/BAS <DISK 759 SCRIPT/CMD<TEXT 10747
DRAW/BAS <DISK 2560 SORT4/ASC <DISK 1542
DRAW/CMD <DISK 369 SPRX/DAT <OS60 5376
EDAS/CMD <OS60 13388 SX4/CMD <OS60 18688
EDAS/CMD <TEXT 13388 SYSTEM/JCL <OS60 105
ETIM/SRC <DISK 12135 TAPE100/CMD <TEXT 2076
ETIMBEVE/CMD<DISK 957 TEST <DISK 22035
EY4S0RT/BAS<DISK 4373 TEST/ENC <DISK 1465
FILEBOX/MO <OLIC 240 TESTO <TEXT 16384
FILEBOX/MO <OS60 96 TEST2 <DISK 3840
FILEBOX/M1 <OS60 601 TRY <DISK 3612
FILEBOX/M2 <OS60 961 WRITEST/SRT <DISK 650

```

Figure. A filebox printout.

Easydata, Take Two

Put your Easydata records in order
with a routine that lets you sort by any field.

Alain Cirkovic's Easydata data-base manager (see "Little Wonder," December 1984, p. 72) truly is a "little wonder" of efficiency and speed. The memory-resident program lets you create, extend, edit, search, print, display, and format files containing as many as 200 records. It gives you easy access to anything from phone numbers to addresses to a catalog of your stamp collection. The only missing feature is a sort routine that allows you to list records in alphabetical order.

I've written a program that adds this capability to Easydata by taking advantage of the Model III's CMD"O" sort feature. Ezydata/SRT (see the Program Listing) sorts a two-dimensional string array on any field created with Easydata/BAS. Because it is a separate program, the sort routine detracts minimally from the data-base manager's memory.

The Long and Sort of It

Like its predecessor, Ezydata/SRT is quite simple to use. To call the routine, I've added option A (alphanumeric sort) to the Easydata extended main menu. (This change and other enhancements are contained in a revised version of the program, which is included in this month's Load 80 package. For cassette or disk ordering information, turn to p. 6.)

When called by option A, Ezydata opens a temporary disk file and writes the Easydata records to it. Ezydata/SRT then reads the temporary file and displays the records sequentially on screen. Press H to kill the display and then the enter key to continue with the program.

The program then displays your field names (name, address, city, state, and zip code, for example) and prompts you to select one as the sort key. When you type in your response, Ezydata/SRT creates and displays a one-dimensional string array that contains the data in the key field, plus

Program Listing. Ezydata/SRT. (See p. 112 for information on using the checksums in this listing.)

```

100 CLEAR 20000:DEFINT A-Z:DIM A$(9,200):T=1:MD=1      ** 2844
110 POKE 16409,1:CLS:PRINT TAB(18)"EASYDATA Sort Program":PRINT:
PRINT "Read file from which drive?"                    ** 7412
120 GOSUB 130:GOTO 410                                  ** 1295
130 D$=INKEY$:IF D$="" THEN 130                         ** 1746
140 IF ASC(D$)>51 THEN 110                               ** 1433
150 D=VAL(D$):IF D>MD THEN 110                          ** 1744
160 IF D=0 THEN 170 ELSE 190                            ** 1601
170 CMD "D:0"                                           ** 670
180 GOTO 200                                            ** 676
190 CMD "D:1"                                           ** 673
200 IF PEEK(15375)=68 AND PEEK(15376)=105 THEN 110     ** 2794
210 PRINT:IF T=1 THEN PRINT "Read "; ELSE PRINT "Save ";
220 LINE INPUT "Filename: ";FL$:IF FL$="" THEN 110      ** 3197
230 DF$=MID$(STR$(D),2,1)                               ** 1372
240 IF INSTR(FL$,".")<>0 THEN DNS=RIGHT$(FL$,1):FL$=LEFT$(FL$,LE
N(FL$)-2) ELSE DNS=DF$                                ** 5046
250 IF INSTR(FL$,"/")=0 THEN FL$=FL$+"/SRT"           ** 2488
260 FL$=FL$+"."+DNS                                     ** 1003
270 POKE 16409,0                                       ** 872
280 PRINT "Filename: ";FL$                              ** 1815
290 FOR J=1 TO LEN(FL$):IF MID$(FL$,J,1)="/" AND J>9 THEN PRINT
"filename too long.":GOTO 110 ELSE NEXT J              ** 6832
300 FOR J=1 TO LEN(FL$)                                 ** 1339
310 FC=ASC(MID$(FL$,J,1))                               ** 1402
320 IF J=1 AND FC<65 THEN 420                          ** 1636
330 IF FC<47 OR FC>90 GOTO 420                         ** 1717
340 IF FC=59 OR FC=60 OR FC=61 OR FC=62 OR FC=63 OR FC=64 THEN 4
20                                                       ** 3818
350 IF FC=47 THEN J=J+1:IF ASC(MID$(FL$,J,1))<65 THEN 420
360 IF FC=58 THEN J=J+1:IF MID$(FL$,J,1)>"1" THEN 420
370 NEXT J                                              ** 611
380 PRINT:PRINT "Is this filename correct (Y/N)?"      ** 3808
390 AN$=INKEY$:IF AN$="" THEN 390                     ** 1912
400 IF AN$="N" OR AN$="n" THEN 110                     ** 1897
410 IF T=1 THEN 500 ELSE 1240                          ** 1626
420 PRINT "illegal character in filename.":GOTO 110    ** 4025
500 OPEN "I",1,FL$                                     ** 979
510 INPUT #1,L0$                                       ** 939
520 F=0:Y=0                                           ** 618
530 INPUT #1,NI,W                                       ** 1026
540 FOR X=1 TO NI                                       ** 1024
550 INPUT #1,J(X)                                       ** 989
560 NEXT X                                             ** 626
570 FOR X=1 TO NI                                       ** 1027
580 IF EOP(1) THEN X=NI:F=1:GOTO 600                  ** 2170
590 LINE INPUT #1,A$(X,Y)                              ** 1481
600 NEXT X                                             ** 621
610 Y=Y+1                                              ** 514
620 IF F=0 THEN 570                                    ** 1061
630 CLOSE                                             ** 559
700 MAX=Y-2                                           ** 658
710 DIM B$(MAX),N(MAX),L(NI,MAX),D(2,NI,MAX)         ** 2618
720 CLS:PRINT:PRINT "Do you want to retain an array headin
g"                                                       ** 5410
730 AN$=INKEY$:IF AN$="" THEN 730                    ** 1908
740 IF AN$="Y" OR AN$="y" THEN POKE 16916,1:H1=1      ** 2760
750 CLS:PRINT @0,"";:FOR Y=1 TO MAX:FOR X=1 TO NI:IF X=1 THEN TB
=0 ELSE TB=TB+J(X)-1+2                                ** 5310
760 PRINT TAB(TB)A$(X,Y):NEXT X:PRINT                ** 2478
770 M$=INKEY$:IF M$="H" OR M$="h" THEN PRINT:PRINT:PRINT TAB(24)
"Display halted.":PRINT:GOTO 790                      ** 6522
780 NEXT Y                                             ** 631
790 POKE 16916,0:PRINT @979,"Press <ENTER> to continue":LINE IN
PUT X$                                                 ** 4936
800 CLS:PRINT "These are the fields:":PRINT          ** 3343
810 FOR X=1 TO NI:PRINT X:A$(X,0):NEXT:PRINT         ** 2852
820 INPUT "Field # to be sorted":F                   ** 2545
830 IF F<1 OR F>NI THEN PRINT:GOTO 820              ** 2370
840 L=J(F):'Max field length                          ** 2163
850 S=1:INPUT "Starting record # (1 or 2)":S         ** 3165
860 IF S<1 OR S>2 THEN PRINT:GOTO 850               ** 2301
900 CLS:PRINT @464,"This is field string":F          ** 3232
910 FOR Y=1 TO MAX                                     ** 1105
920 B$(Y)=A$(F,Y)+ " "+STR$(Y)                       ** 1578
930 PRINT B$(Y):" " ;                                ** 1139
940 NEXT Y                                             ** 629
950 PRINT:REM LINEINPUTX$                             ** 1725

```

Listing continued

**LOAD
80**

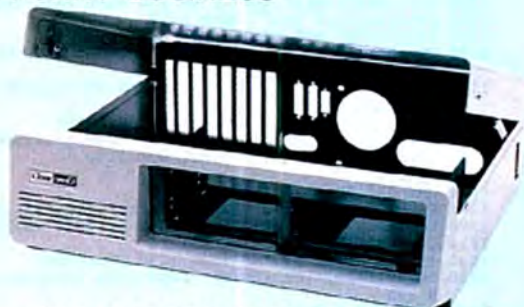
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Basic

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Listing continued

```

960 N%=MAX:CMD "O", N%, B$(S)
970 PRINT:PRINT TAB(16)"This is sorted field string";P
980 FOR Y=1 TO MAX:PRINT B$(Y); " ";:NEXT:PRINT
990 PRINT @979,"Press <ENTER> to continue";:LINE INPUT X$
1000 FOR Y=1 TO MAX
1010 N(Y)=VAL(RIGHT$(B$(Y),3))
1020 NEXT Y
1100 CLS:PRINT:PRINT TAB(7)"Do you want hard copy (Y/N)?:PRINT
1110 Q$=INKEY$:IF Q$="" THEN 1110
1120 IF Q$<>"Y" AND Q$<>"N" THEN 1140
1130 IF PEEK(14312)=61 THEN CMD "Z","ON" ELSE CLS:PRINT TAB(20)"
Printer not ready!":GOTO 1100
1140 CLS:PRINT @0,"";:FOR Y=1 TO MAX:FOR X=1 TO NI:IF X=1 THEN T
B=0 ELSE TB=TB+J(X-1)+2
1150 PRINT TAB(TB)A$(X,N(Y));:NEXT X:PRINT
1160 M$=INKEY$:IF M$="H" OR M$="h" THEN PRINT:PRINT:PRINT TAB(24
)"Display halted.":PRINT:GOTO 1180
1170 NEXT Y
1180 CMD "Z","OFF":POKE 16916,0
1190 PRINT @979,"Press <ENTER> to continue";:LINE INPUT X$
1200 CLS:PRINT @384,"Write to disk or Quit (W,Q)"
1210 Q$=INKEY$:IF Q$="" THEN 1210
1220 IF Q$="W" OR Q$="w" THEN 1230 ELSE END
1230 POKE 16409,1:CLS:PRINT "Save file on which drive?":T=0:GOSUB
R 130
1240 OPEN "O",1,FL$
1250 PRINT #1,LU$
1260 PRINT #1,NI;W
1270 FOR X=1 TO NI
1280 PRINT #1,J(X)
1290 NEXT X
1300 FOR Y=0 TO MAX
1310 IF A$(0,N(Y))="X" THEN 1350
1320 FOR X=1 TO NI
1330 PRINT #1,A$(X,N(Y))
1340 NEXT X
1350 NEXT Y
1360 CLOSE
1400 CLS:PRINT "File has been saved as ";FL$
1410 PRINT:INPUT "Do you want to return to EASYDATA (Y/N)";X$
1420 IF X$="H" OR X$="h" THEN END
1430 IF X$="Y" OR X$="y" THEN 1450
1440 GOTO 1400
1450 DO$="BASIC EASYDATA/BAS -P:1"
1460 CMD "I",DO$

```

```

** 1579
** 4232
** 2953
** 4190
** 1144
** 1709
** 667
** 4614
** 1866
** 2067
** 6071
** 5352
** 2679
** 6606
** 673
** 1715
** 4231
** 3549
** 1868
** 2468
** 4926
** 1035
** 986
** 1087
** 1073
** 1035
** 675
** 1146
** 1711
** 1069
** 1350
** 671
** 673
** 608
** 3264
** 4571
** 1907
** 1917
** 775
** 2035
** 847
** 49

```

End

```

0 REM Line 1, S4PTR1=65304 indicates start of reserved area (232
bytes) for SORT4 code; must load BASIC via "BASIC (M=65303)".
This is highest possible location, but can be lowered, as
SORT4 is fully relocatable.
1 S4PTR1 = 65304
2 DATA 213,221,225,221,102,2,221,110,1,70,35,70,237,67,-229,35,7
8,35,70,237,67,-227,237,67,-217,237,75,-217,203,56,203,25,120,
177,200,237,67,-217,33,1,0,34,-225,42,-227,183,237,66,34,-223,
42,-225,34,-221,237,75,-217,9,34
3 DATA -219,42,-221,205,-184,229,221,225,42,-219,205,-184,229,25
3,225,221,126,0,183,40,98,253,126,0,183,40,40,221,190,0,56,72,
221,70,0,175,50,-231,253,102,2,253,110,1,221,86,2,221,94,1,26,
190,56,64,32,10,19,35,16,246,58
4 DATA -231,183,40,52,221,229,225,253,229,209,6,3,78,26,119,121,
10,35,19,16,247,42,-221,237,75,-217,103,237,66,250,-194,40,20,
34,-221,24,141,71,62,1,24,183,229,209,25,25,237,91,-229,25,201
,42,-225,35,34,-225,237,75,-223,183
5 DATA 237,66,250,-58,202,-58,195,-28
6 DEFINT S: S4PTRMSB = PIX(S4PTR1/256): S4PTRLSB = S4PTR1 - S4PT
RMSB*256
7 FOR S4INDEX = 0 TO 216
8 READ S4BYTE: IF S4BYTE =>0 THEN POKE S4PTR1+S4INDEX,S4BYTE: GO
TO 13
9 S4LSB = S4PTRLSB + ABS(S4BYTE): S4MSB = S4PTRMSB
10 IF S4LSB > 255 THEN S4LSB = S4LSB - 256: S4MSB = S4MSB + 1
11 POKE S4PTR1+S4INDEX,S4LSB: POKE S4PTR1+S4INDEX+1,S4MSB
12 S4INDEX = S4INDEX + 1
13 NEXT S4INDEX: DEFUSR 0 = S4PTR1
14 DEF FN SORT4$(X$) = USR 0(MKIS(VARPTR(B$(X$))-X$*3) + MKIS(X$
))
100 DEFINT A-Z: DIM A$(9,200): T=1: MD=1
110 CLS:PRINT TAB(10)"EASYDATA Sort Program":PRINT:PRINT "Read f
ile from which drive?"
170 SYSTEM "DIR :0"
190 SYSTEM "DIR :1"
740 IF AN$="Y" OR AN$="y" THEN POKE 2964,1:H1=1
790 POKE 2964,0:PRINT @1700,"Press <ENTER> to continue";:LINE IN
PUT X$
910 FOR Y=S TO MAX
960 DUMMY$=FN SORT4$(MAX)
990 PRINT @1700,"Press <ENTER> to continue";:LINE INPUT X$
1160 M$=INKEY$:IF M$="H" OR M$="h" THEN PRINT:PRINT:PRINT TAB(24
)"Display halted.":PRINT:GOTO 1190
1230 CLS:PRINT "Save file on which drive?":T=0:GOSUB 130
1450 RUN "EASYDATA/BAS

```

```

** 17493
** 878
** 10854
** 10775
** 11019
** 1808
** 4545
** 1414
** 4450
** 3208
** 3517
** 3727
** 1434
** 2192
** 3757
** 2153
** 6666
** 1130
** 1133
** 2710
** 4925
** 1139
** 1591
** 4229
** 6639
** 4244
** 1394

```

Figure. Add lines 1-14 from Alan Smith's Sort4 utility and change lines 100-1450 as indicated to run Ezydata/SRT on the Model 4. (See p. 112 for information on checksums.)

If you own a Model 4, don't despair: You can customize Ezydata/SRT using the Sort4 utility.

the concatenated record number. It then sorts the key-field array using TRSDOS 1.3's CMD"O" statement and displays the array on screen.

When you press the enter key, Ezydata/SRT retrieves the data from the concatenated record number and uses it to display a two-dimensional array in the same sequence as the sorted one-dimensional array. (This is not a true sort, as the routine relocates none of the strings or string pointers.) Press H to kill the display and the enter key to continue. Next, the program asks if you want to write the sorted data to disk or quit the routine. Selecting the write-to-disk option initiates a true sort of the two-dimensional array. When the sort is complete, the program asks if you want to quit or return to Easydata/BAS. If you ask to return, Easydata/BAS runs automatically.

On All 4's

For some reason, Tandy didn't give the Model 4 the same sort-handling capability that it gave the Model III. The CMD"O" statement that allows the Model III to sort string arrays doesn't exist in the Model 4's command file. But if you own a Model 4, don't despair: You can customize Ezydata/SRT for your computer using Alan Smith's Sort4 utility as a basis (see "A Sort Story," March 1985, p. 70). Here's what to do.

First, delete lines 200, 270, 1100-1130, 1180, and 1460 from the routine. Then add lines 1-14 from Alan Smith's Sort4 program as shown in the Figure. Also make the changes to lines 100-1450 as indicated. Then enter Basic and set memory at 65303, the highest possible location. (You can lower the setting, since the sort routine is relocatable.) Make sure you have depressed the Caps Lock key; then run the routine.

With the addition of the sort routine, Easydata gives you a complete data-base manager—one that is both easy to use and capable of storing a sizable amount of information. ■

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Unpatch

A time-saving program that takes the risk out of reversing patches.

The strong response to TRSDOS 1.3 patches recently published in *80 Micro* (see Related Articles) underscores the usefulness of the Patch command. But patches sometimes need to be undone. Unfortunately, reversing them is an error-prone process. To safely do the work for you, I've written a program called Unpatch (see the Program Listing).

Undoing the Unhandiwork

The Patch command has the following syntax:

```
PATCH file name:d(ADD =aaaa.FIND = ff,
CHG = cc)
```

in which d is the drive where the change will be made, aaaa is the hexadecimial (hex) data address in memory, ff is the hex-code sequence to be changed, and cc represents the new contents for the FIND = field (also a hex-code sequence).

To use Unpatch, save the patch to be reversed in an ASCII file. Also, since Unpatch creates a file called XXX/BLD to store the reversed data, make sure a file with that name isn't already on the disk.

The program lets you choose between temporary and permanent files. If you have many disks to unpatch, you'll probably need a permanent file. Answer the original and new file prompts, and relax while the computer does the rest.

The original and reversed patch are displayed on screen, and the program prompts you for which disk will get the reversed patch. Then it exits to DOS and installs the reversed patch.

If you requested a temporary file, the patch file (XXX/BLD) will be killed. If you asked for a permanent file, the request will be executed and you'll be left in DOS. You may then rerun the program by typing BASIC* and RUN.

The Secret

Unpatch's inner workings are simple. Lines 90-150 initialize the program and

Program Listing. Unpatch. (See p. 112 for information on using the checksums in this listing.)

```

10 '----- ** 97
20 'UNPATCH DO-FILE Reverser ** 98
30 'By Alex Roosakos ** 99
40 ' 1049 Springfield Dr. ** 100
50 ' Millbrae, CA 94030 ** 101
60 'REQUIRES TRSDOS 1.3 ** 102
70 '----- ** 103
80 ' INITIALIZE ** 104
90 CLEAR 2000:DEFINT B,I,L,X,T:DIM A$,B$,C$,D$,I$,Q$,S$ ** 3144
100 ON ERROR GOTO 690 ** 1296
110 L=0:X=1:B=0:S$=STRING$(64," ") ** 1920
120 CLS:PRINT STRING$(25,143);"PATCH REVERSER";STRING$(25,143); ** 3933
130 PRINT"This symbol represents the original patch: "CHR$(133) ** 5255
140 PRINT "This symbol represents the modified patch: " ** 4821
150 POKE 16916,3 ** 875
160 ' GET USER INFORMATION AND OPEN FILES ** 151
170 TP=0:PRINT:PRINT "What type of file:"; ** 3163
180 PRINT "(T)emporary or (P)ermanent? ";CHR$(14); ** 3686
190 I$=INKEY$:IF I$="" THEN 190 ** 1768
200 IF I$="T" OR I$="t" THEN PRINT "Temporary":TP=1:GOTO 220 ** 3964
210 IF I$="P" OR I$="p" THEN PRINT "Permanent" ELSE 190 ** 3564
220 PRINT CHR$(15); ** 1188
230 LINE INPUT "Please enter filename of PATCH file: ";FL$ ** 4474
240 IF FL$="" THEN 230 ** 1184
250 IF TP=1 THEN NF$="XXX/BLD":GOTO 280 ** 2398
260 PRINT "Enter filename of new file: "; ** 3268
270 LINE INPUT NF$ ** 1129
280 PRINT "Loading ==>";CHR$(34);FL$;CHR$(34) ** 2842
290 OPEN "I",1,FL$ ** 985
300 PRINT "Creating ->";CHR$(34);NF$;CHR$(34) ** 2887
310 OPEN "O",2,NF$ ** 987
320 IF EOF(1) THEN 630 ** 1224
330 ' READ ONE LINE AT A TIME ** 150
340 LINE INPUT #1,A$:N=LEN(A$) ** 1774
350 IF LEFT$(A$,1)<>"P" AND LEFT$(A$,1)<>"p" THEN 630 ** 2946
360 PRINT @960,"Reading line #";X; ** 2376
370 ' HOW MANY HEXADECIMAL CHARACTERS?: FIND OUT ** 154
380 FOR I=1 TO N ** 938
390 IF MID$(A$,I,5)<>"FIND=" THEN 430 ** 2071
400 'L=counter for # of characters in FIND=/check for comma ** 148
410 L=L+1:I=I+1:IF MID$(A$,I+5,1)<>" " THEN 410 ** 2568
420 I=N ** 394
430 NEXT I ** 607
440 ' USE THE SAME CHARACTERS IN B$ AS IN A$: UP TO FIND= ** 152
450 FOR I=1 TO N ** 936
460 B$=B$+MID$(A$,I,1) ** 1140
470 IF RIGHT$(B$,3)<>"ND=" THEN 490 ** 1979
480 B=I:I=N ** 658
490 NEXT I ** 613
500 ' REVERSE CHG= AND FIND= IN B$ ** 149
510 D$=MID$(A$,B+1,L) ** 1105
520 FOR I=B TO N ** 951
530 IF MID$(A$,I,4)<>"CHG=" THEN 550 ** 1998
540 I=I+4:C$=MID$(A$,I,L) ** 1382
550 NEXT I ** 610
560 B$=B$+C$+" "+CHG="+D$+" ** 1434
570 ' WRITE FILE TO DISK & SCREEN ** 156
580 PRINT @512,S$;@576,S$;@640,S$;@704,S$; ** 2385
590 PRINT @576,CHR$(133);A$:PRINT " ";B$; ** 2355
600 PRINT @960,"Writing line #";X; ** 2415
610 PRINT #2,B$ ** 843
620 A$="":B$="":I=0:D=0:L=0:X=X+1:GOTO 320 ** 2358
630 IF TP=1 THEN PRINT #2,"KILL XXX/BLD" ** 2488
640 CLOSE ** 560
650 Q$="when disk drive is ready":GOSUB 750 ** 3343
660 ' GO INTO DOS, AND INSTALL NEW PATCH ** 156
670 PRINT:PRINT "Exiting to DOS" ** 2538
680 CMD "I",DO *NF$ ** 1093
690 ' ERROR ROUTINE ** 159
700 PRINT "ERROR";ERR/2+1; ** 1614
710 IF ERR=106 THEN PRINT "=="> Probable cause: File Not Found" ** 4603
720 IF ERR=128 THEN PRINT "=="> Probable cause: Bad File Name" ** 4443
730 Q$="to continue":GOSUB 750:CLS:RESUME 170 ** 3181
740 ' SUBROUTINE: ENTER TO CONTINUE ** 155
750 PRINT @967," "; ** 1178
760 FOR X=1 TO 50:NEXT X ** 1475
770 PRINT @968,"Press <ENTER> ";Q$; ** 2282
780 FOR X=1 TO 50:NEXT X ** 1477
790 I$=INKEY$:IF I$<>CHR$(13) THEN 750 ** 2207
800 RETURN ** 664
End

```



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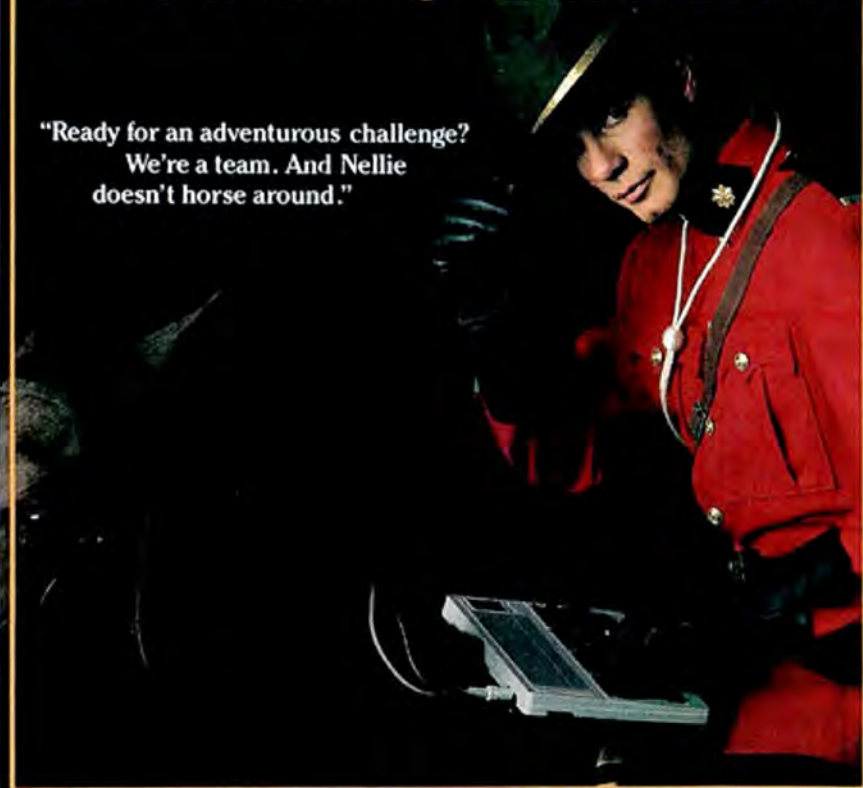
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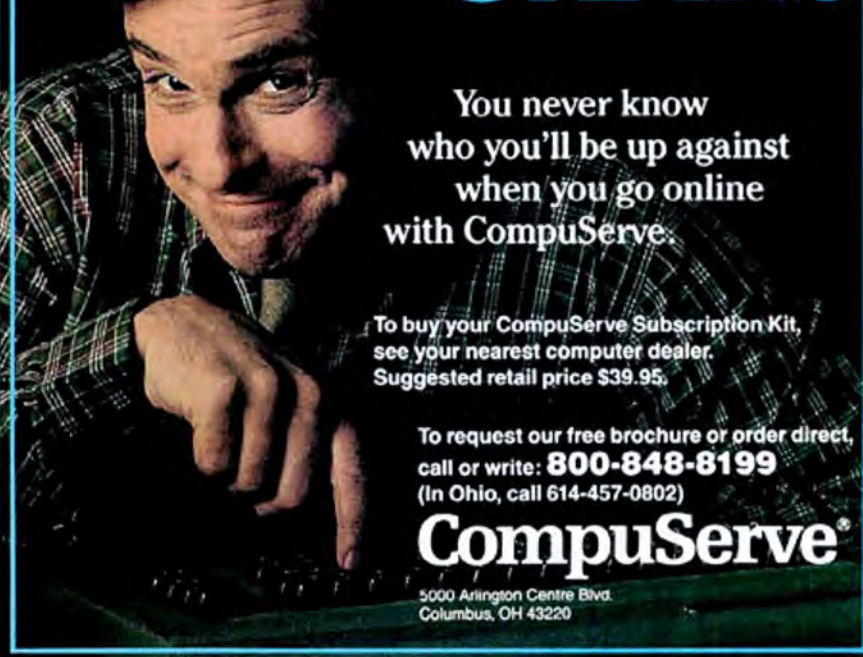
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prompt you for the file types and names of the original and new files. Lines 380-430 count the characters in the FIND = field and save the number in the variable L. Lines 450-490 check for the end of the FIND = field and copy the first characters (up to and including ADD = aaaa) of the original patch. AS, to the new patch, BS. Lines 500-560 exchange the FIND = characters of the original patch and the CHG = characters of the new patch.

Next, the end-of-file check (EOF) in line 320 checks for another patch in the file and reverses it. Otherwise, in line 630 EOF installs the Kill statement in the file. Lines 470-680 execute the file and install the patch using Disk Basic's CMD 'T'. ■

Alex Roosakos can be reached at 1049
Springfield Drive, Millbrae, CA 94030.

Related Articles

Levinson, Andy. "Patch Work," January 1985, p. 112. Thirteen patches for TRS-DOS 1.3.

"Patch Work II: The Sequel," August 1985, p. 72. Thirteen additional patches for TRSDOS 1.3.

Robinson, Sean E.P. "Patch Maker," October 1985, p. 76. Installing patches efficiently with Build files.

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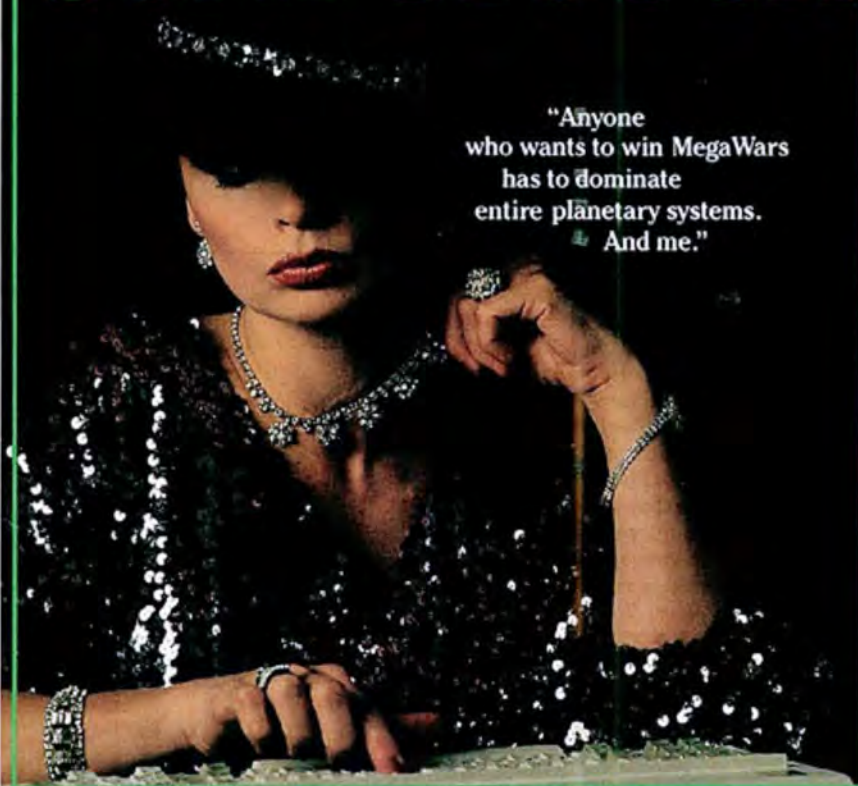
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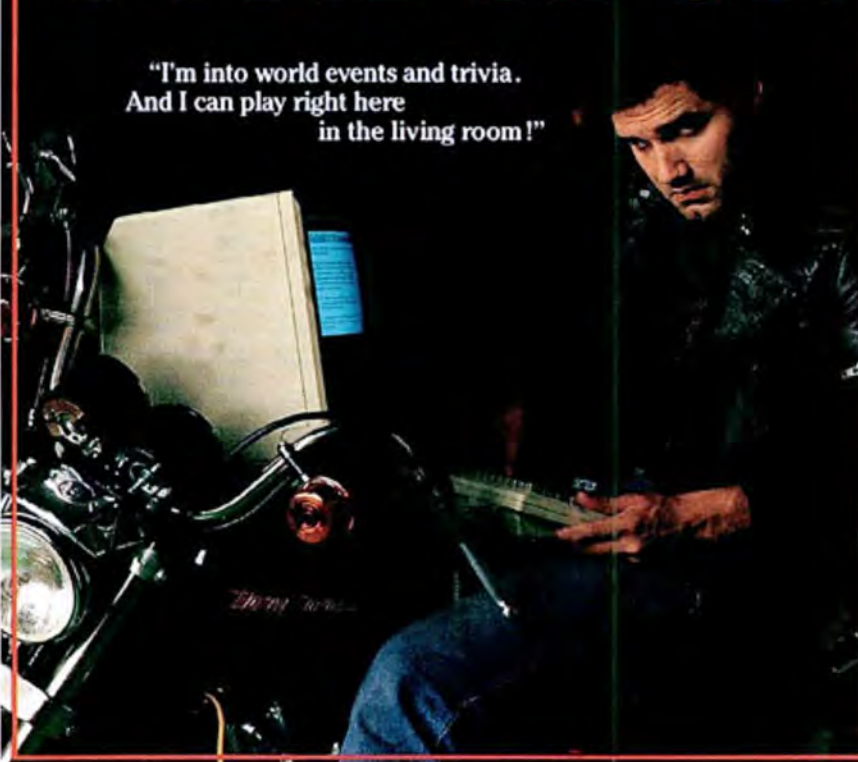


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I've written a protection program that gives you another option. Protect.ASM (see the Program Listing) password-protects each of your files, preventing them from being copied, deleted, or renamed while the protection is in place. You can, however, copy a disk containing protected files with the MS-DOS disk-copy command.

Here's what you do. First, type in and assemble Protect.ASM. Enter the EXE file's name at the MS-DOS command prompt. The program then asks if you want to protect or unprotect a file. Type a P for protect or a U for unprotect.

At the next prompt, type in the name of the file you want to protect or unprotect. You can use a standard file name, such as Program.BAS, or a wildcard name such as *.BAS. After you type in the file name, press the enter key. The program searches the directory for the appropriate file(s) and applies the password protection.

To create the password, the program adds a CHR\$(255) byte as the last letter of the file name. If the file name has 8 bytes, Protect overwrites the last letter. When the password is in place, you are returned to the MS-DOS command mode.

Once you have password-protected a file, neither you nor anyone else can copy, delete, or rename the affected file until you run the program again to unprotect it. As the CHR\$(255) byte is visible only to the computer, other users of your system won't be able to kill a protected file, even though they might be certain of the spelling. ■

You can write to Debbie Cooper at 2466 West 13th Ave., Vancouver, British Columbia V6K 2S8.

System Requirements

Model 1000/1200/3000
MS-DOS
Editor/Assembler

Program Listing. Protect.ASM.

```

;-----
;
;          PROTECT.ASM
;
;This program will protect a file from being
;inadvertently deleted, copied or renamed by
;unauthorized persons. It maybe also be re-
;verted back to its original state at a later
;time.
;
;          Written by Debbie Cooper
;
;-----
;
stacksg segment para stack 'stack'
db      64 dup(?)
stacksg ends
;
datasg segment para 'data'
fcb     37 dup(?)           ;fcb for filenames
msg1   db      13,10,'Enter filename (wildcards acceptable) > ','$'
msg3   db      13,10,'Protect File Utility'
       db      13,10,'Written by Debbie Cooper '
       db      13,10
msg4   db      13,10,'Do you wish to protect or un-protect a file (P/U) ?','$'
msg5   db      13,10,'File was protected successfully','$'
       db      13,10,'File was un-protected successfully','$'
inname label byte          ;parameter block
inlen  db      13          ;max length -1 for filename
inact  db      ?          ;actual length inputted
actnam db      12 dup (?)  ;buffer for filename
fname  db      12 dup (?)  ;for converted chr$(255) filespec
datasg ends
;
codesg segment para 'code'
start  proc far
       push ds             ;set up
       sub  ax,ax          ;a normal
       push ax             ;return
       mov ax,datasg       ;to
       mov ds,ax          ;DOS
       mov es,ax          ;now
       assume cs:codesg,ds:datasg,es:datasg
prom:  lea  dx,msg3         ;point to copyright notice and
       mov ah,09h         ;ask if file is to protected
       int 21h           ;or unprotected
inkey: mov ah,00h         ;wait for a keystroke
       int 16h           ;from him
       and al,5fh        ;make it uppercase
       cmp al,'P'        ;protect a file?
       je  prot          ;go if so
       cmp al,'U'        ;un-protect a file?
       je  uprot         ;go if so
       cmp al,0dh        ;just ENTER so abort?
       je  abort         ;go if so
       jmp inkey         ;else back if not valid
prot:  jmp  ask1          ;go protect a file
uprot: jmp  unprot        ;go un-protect a file
abort: mov ah,4ch        ;exit to MS-DOS
       int 21h           ;then
ask1:  lea dx,msg1         ;ask for old filename first
       mov ah,09h        ;display function
       int 21h           ;call DOS
       lea dx,inname      ;point to buffer
       mov ah,0ah        ;line input function
       int 21h           ;get name from user
       mov si,offset actnam ;point to fcb to parse
       mov di,offset fcb  ;save
       push es           ;the
       push ds           ;registers
       pop  es           ;parsing parameters
       mov al,0fh        ;parse function
       int 21h           ;call DOS
       pop  es           ;restore registers
       mov al,0dh        ;get a c/r
       mov ah,0eh        ;display function
       int 21h           ;page 0
       mov bx,00h

```

Listing continued

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Listing continued

```

int      10h          ;call DOS
mov      ah,0ah       ;get a linefeed
mov      ah,0eh       ;display function
mov      bx,00h       ;page #
int      10h         ;call DOS
ser:     cld          ;clear direction flag forward
mov      bx,offset actnam;point to original filespec
mov      di,offset fname;point to new filespec
mov      cx,12        ;maximum # bytes per filename
ser2:    mov      al,[bx] ;get the byte
        cmp      al,'.' ;is it beginning of extension?
        je      ser3    ;go if so
        mov      [di],al ;else just re-save this byte
        inc      bx     ;point to next
        inc      di     ;two places in buffers
        loop   ser2    ;and continue
ser3:    mov      al,255d ;get a chr$(255) to store
        mov      [di],al ;store in destination filespec
        inc      di     ;move over one
        mov      al,[bx] ;get period again
        mov      [di],al ;store it
        inc      bx     ;point past the extension now
        inc      di     ;here too
er4:     mov      cx,3   ;3 byte extension
ser5:    mov      al,[bx] ;get extension character
        mov      [di],al ;store it
        inc      bx     ;point to next
        inc      di     ;here also
        loop   ser5    ;til completed filename conversion
        lea     si,fname ;point to converted filespec
        lea     di,actnam ;point to destination
        mov     cx,12   ;max # bytes
        rep movsb    ;copy it out
        mov     si,offset actnam
        mov     di,offset [fcb+16]
        push  es       ;save
        push  ds       ;the
        pop   es       ;registers
        mov  al,0fh    ;parsing parameters
        mov  ah,29h   ;parse function
        int  21h      ;call DOS
        pop  es       ;restore registers
        mov  dx,offset fcb ;now rename the file
        mov  ah,17h   ;rename function
        int  21h      ;call DOS
        lea  dx,msg4   ;file was protected msg
        mov  ah,09h   ;display function
        int  21h      ;call DOS
        jmp  abort    ;exit to DOS now
;Un-Protect a file (remove CHR$(255) from filespec)
unprot:  lea  dx,msg1   ;ask for filename first
        mov  ah,09h   ;display function
        int  21h      ;call DOS
        lea  dx,inname ;point to buffer
        mov  ah,0ah   ;line input function
        int  21h      ;get name from user
pser:    cld          ;clear direction flag forward
        mov  bx,offset actnam;point to original filespec
        mov  di,offset fname;point to new filespec
        mov  cx,12    ;maximum # bytes per filename
pser2:   mov  al,[bx]  ;get the byte
        cmp  al,'.'  ;is it the extension delimiter?
        je  pser3    ;go if so
        mov  [di],al ;else just re-save this byte
        inc  bx      ;point to next
        inc  di      ;two places in buffers
        loop pser2  ;and continue
pser3:   mov  al,255d ;insert the chr$(255) first!
        mov  [di],al ;and store it
        inc  di      ;point to next place
        mov  al,'.'  ;store the delimiter now then
        mov  [di],al ;save it
        inc  di      ;move over one
        inc  bx      ;point past the extension now
pser4:   mov  cx,3    ;3 byte extension
pser5:   mov  al,[bx] ;get extension character
        mov  [di],al ;store it
        inc  bx      ;point to next
        inc  di      ;here also
        loop pser5  ;til completed filename conversion
        lea  si,fname ;point to converted filespec
        lea  di,actnam ;point to destination
        mov  cx,12   ;max # bytes
        rep movsb   ;copy it out
        mov  si,offset actnam
        mov  di,offset fcb ;point to fcb to parse
        push es      ;save
        push ds     ;the
        pop  es      ;registers
        mov  al,0fh  ;parsing parameters
        mov  ah,29h ;parse function
        int  21h    ;call DOS
        pop  es      ;restore registers
user:     cld       ;clear direction flag forward
        mov  bx,offset actnam;point to original filespec
        mov  di,offset fname;point to new filespec
        mov  cx,12  ;maximum # bytes per filename
user2:    mov  al,[bx] ;get the byte
        cmp  al,255d ;is it the extension delimiter?

```

Listing continued

Listing continued

```

je      user3      ;go if so
mov     [di],al    ;else just re-save this byte
inc     bx        ;point to next
inc     di        ;two places in buffers
loop   user2      ;and continue
user3:  mov     al,'.' ;store the delimiter now then
inc     [di],al   ;save it
inc     di        ;move over one
inc     bx        ;point past the extension now
inc     bx        ;do another for good measure
user4:  mov     cx,3 ;3 byte extension
user5:  mov     al,[bx] ;get extension character
mov     [di],al   ;store it
inc     bx        ;point to next
inc     di        ;here also
loop   user5      ;til completed filename conversion
lea     si,fname  ;point to converted filespec
lea     di,actnam ;point to destination
mov     cx,12     ;max # bytes
rep movsb ;copy it out
mov     si,offset actnam
mov     di,offset [fcb+16]
push   es        ;save
push   ds        ;the
pop     es       ;registers
mov     al,0fh   ;parsing parameters
mov     ah,29h   ;parse function
int     21h     ;call DOS
pop     es       ;restore registers
mov     dx,offset fcb ;now rename the file
mov     ah,17h   ;rename function
int     21h     ;call DOS
lea     dx,msg5  ;file was un-protected msg
mov     ah,09h   ;display function
int     21h     ;call dos
jmp     abort    ;exit to DOS now
start  code$g
ends
end      start

```

End

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1

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DOS Diversions

Pare seconds off the time it takes for DOS to load overlay routines and free drive zero.

Disk operating systems (DOSeS) are long programs—so long, in fact, that they frequently are broken into functional segments of code called overlays. If an operating system contains overlays, the computer loads only a small portion of the program, called the kernel, when you boot the system disk. The kernel consists of very general code, the sole purpose of which is to accept commands and execute requested overlays.

With the exception of CLS, commands entered from TRSDOS require the kernel to load at least one overlay. To do this, the kernel has to return to the disk, find the requested section of code, and then load it into memory. In TRSDOS 1.3, the operation takes about two seconds; I've written a utility called MEMSYS that allows TRSDOS to do it in less than half a second.

MEMSYS (see the Program Listing) loads all DOS overlays into memory and alters the overlay load routine so that requests are processed by copying the information from protected memory to the appropriate overlay region. (TRSDOS 1.3 consists of an ever-present DOS kernel, resident at locations 4000-4DFF hexadecimal, and 15 overlays, which reside at 4E00-7000 hexadecimal when loaded.)

Although the utility is intended for 128K Model 4 users, the code includes conversion information for 128K Model 4P, 64K Model 4, and 48K Model III users. The 128K Model 4/4P versions require fewer than 200 bytes of user RAM. The 64K Model 4 and 48K Model III versions require 16K and 32K, respectively.

A Systematic Approach

Once typed in and assembled, MEMSYS is installed by typing in its file name from TRSDOS. While the overlays are loading, graphics characters appear in the upper-right corner of the screen. The utility remains active until you reboot.

MEMSYS functions much like TRSDOS 6.2's System SYSRES command, which

Program Listing. MEMSYS.

```

00070 ;*** Constants ***
00090 PATCH EQU 4BCDH
00100 OVEXIT EQU 4BD7H
00110 OV EQU 4414H
00120 HIMEM EQU 4411H
00130 LOADER EQU 400DH
00140 ;
00150 BANRES EQU 00H ;All Machines except Model 4P
00160 ; ;128K Model 4P
00170 BANSEL EQU 63H ;128K Model 4 & 4P
00180 ; ;83H ;64K Model 4, 48K Model III
00190 LASTOV EQU 8FH ;Full DOS
00200 ; ;80H ;Half DOS (Add 40H to OFFSET,
00210 ; ; and save 16K RAM)
00220 OFFSET EQU 00H ;128K Model 4 & 4P
00230 ; ;0C0H ;64K Model 4
00240 ; ;80H ;48K Model III
00250 START EQU 0000H-160H ;128K Model 4 & 4P
00260 ; ;0C000H-160H ;64K Model 4
00270 ; ;00000H-160H ;48K Model III
00280 ;
00290 ORG START
00310 ;*** Initialization ***
00320 ;
00330 LD (STACK),SP ;Save Stack Pointer
00340 LD SP,START
00350 ;
00360 LD HL,PATCH ;Reroute Overlays
00370 LD DE,TEMP
00380 LD BC,3
00390 LDIR
00400 LD HL,NULL
00410 LD DE,PATCH
00420 LD C,3
00430 LDIR
00440 LD HL,NEXTOV
00450 LD (OVEXIT),HL
00470 ;*** Store Overlays in Alternate Memory ***
00480 ;
00490 LOOP LD A,(OVNUM)
00500 INC A
00510 LD (OVNUM),A
00520 LD (3C3FH),A
00530 CP LASTOV
00540 JR Z,EXIT
00550 RST 28H
00560 ;
00570 NEXTOV LD IX,(TABLOC) ;Get Overlay Parameters
00580 LD A,40H
00590 OUT (0ECH),A
00600 LD BC,5
00610 ADD IX,BC
00620 LD (TABLOC),IX
00630 LD HL,(EXEC)
00640 LD (IX+3),L
00650 LD (IX+4),H
00660 LD A,(IX+1)
00670 ADD A,OFFSET
00680 LD (IX+1),A
00690 XOR A
00700 LD L,A
00710 LD H,(IX+0)
00720 LD E,A
00730 LD D,(IX+1)
00740 LD C,A
00750 LD B,(IX+2)
00760 DI
00770 ;
00780 MOVDAT LD A,BANRES ;Move Overlay to Memory
00790 OUT (84H),A
00800 LD A,(HL)
00810 LD (DATA),A
00820 LD A,BANSEL
00830 OUT (84H),A
00840 LD A,(DATA)
00850 LD (DE),A
00860 INC HL
00870 INC DE
00880 DEC BC
00890 LD A,B
00900 OR C
00910 JR NZ,MOVDAT
00920 LD A,BANRES

```

Listing continued



System Requirements

Model III or Model 4
in III mode
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allows a limited set of DOS functions to execute without a system disk in drive zero. My utility is even more versatile than that: it allows all DOS functions to execute without a system disk in drive zero. For example, after installing MEMSYS, you could remove the system disk from drive zero, place a blank disk in drive 1, and then type in Format :1 to format it.

Besides speeding up disk input/output, MEMSYS frees a large quantity of disk space by allowing the operating system to be omitted from drive zero. An empty system disk contains 177 free granules; an empty data disk contains 233 free granules. Thus, using a data disk in drive zero frees 56 granules (42K) of on-line disk space.

MEMSYS is especially useful for single-drive machines. It also comes in handy if you use a disk gobbler like SuperScripsit on a two-drive machine. Unfortunately, the program suffers from a bug: One of the Basic-language overlays doesn't transfer in its entirety under MEMSYS. As a result, the Disk Basic commands CMD"X" and CMD"J" cause a return to DOS when executed. If you find a way to resolve this bug, I'd appreciate a letter stating the specifics so I can share them with other readers. ■

Craig Chatken is an instructor in the University of Hartford's Department of Engineering. You can write to him at 32 Beverly Drive, Avon, CT 06001.

TIDBIT #37

When you debug a Basic program under TRSDOS 1.3, the CMD"X" string-search command can be useful for tracking down suspect code. Assume that you have assigned an inappropriate value to the variable PE. You can type in CMD"X", "PE" and discover that the variable occurs 52 times. However, you want to find only occurrences in the form PE = X; those in the form X = PE don't matter.

If you type in CMD"X", "PE =", the computer won't find any occurrences because for Basic an equal sign within quotes isn't the same as an equal sign in your program. Within quotes, an equal sign exists as an ASCII byte of value 61 decimal. In the program, it's tokenized as 213 decimal. The correct search string is:

```
A$ = "PE" + CHR$(213);CMD"X",A$
```

Use this technique whenever you need to search for a combination of ASCII strings and tokenized commands. The token for GOSUB is 145. To find GOSUB1000, type in:

```
A$ = CHR$(145) + "1000";CMD"X",A$
```

A list of Basic tokens starts on p. 37 of the TRS-80 Model III Operation and Basic Language Reference Manual.

Kyle Ferris
Bay City, MD

Listing continued

```

00930      OUT      (84H),A
00940      XOR      A
00950      OUT      (0ECH),A
00960      JR       LOOP
00970      ;
00980 EXIT    LD      HL,TEMP      ;Install Overlay Handler
00990      LD      DE,PATCH
01000      LD      BC,3
01010      LDIR
01020      ;
01030      LD      HL,OVHAND
01040      LD      (LOADER),HL
01050      LD      L,0FFH
01060      DEC     B
01070      LD      (HIMEM),HL
01080      LD      (4415H),HL
01090      LD      SP,(STACK)
01100      RET
01110      ;
01120      ;*** New Overlay Handler ***
01140 OVHAND EXX
01150      LD      B,A
01160      AND     0FH
01170      CP     LASTOV-81H
01180      LD      A,B
01190      EXX
01200      JP     NC,4B82H
01210      EXX
01220      LD      (OV),A
01230      AND     0FH
01240      LD      B,5
01250      LD      D,0
01260      LD      E,A
01270      PUSH   IX
01280      LD      IX,TABLE
01290      LD      A,40H
01300      OUT     (0ECH),A
01310 LOOKUP ADD     IX,DE
01320      DJNZ  LOOKUP
01330      XOR     A
01340      LD      E,A
01350      LD      D,(IX+0)
01360      LD      L,A
01370      LD      H,(IX+1)
01380      LD      C,A
01390      LD      B,(IX+2)
01400      DI
01410      ;
01420 RESDAT LD      A,BANSEL      ;Load Overlay from Memory
01430      OUT     (84H),A
01440      LD      A,(HL)
01450      LD      (DATA),A
01460      LD      A,BANRES
01470      OUT     (84H),A
01480      LD      A,(DATA)
01490      LD      (DE),A
01500      INC     HL
01510      INC     DE
01520      DEC     BC
01530      LD      A,B
01540      OR     C
01550      JR     NZ,RESDAT
01560      LD      E,(IX+3)
01570      LD      D,(IX+4)
01580      LD      (OVEXIT),DE
01590      POP     IX
01600      EXX
01610      XOR     A
01620      OUT     (0ECH),A
01630      LD      A,(OV)
01640      JP     4B82H
01650      ;
01660      ;*** Tables and Buffers ***
01670      ;
01680 TEMP   DEFS   3
01690 NULL   LD      (EXEC),HL
01700 STACK DEFS   2
01710 OVNUM  DEFB   00H-1
01720 DATA  DEFB   0
01730 EXEC   DEFW   0
01740 TABLOC DEFW   TABLE-5
01750 TABLE DEFB   4EH,00H,04H,0,0 ;Overlay 0
01760      DEFB   4EH,04H,04H,0,0 ;1
01770      DEFB   4EH,08H,04H,0,0 ;2
01780      DEFB   4EH,0CH,03H,0,0 ;3
01790      DEFB   4EH,0FH,03H,0,0 ;4
01800      DEFB   4EH,12H,08H,0,0 ;5
01810      DEFB   52H,1AH,11H,0,0 ;6
01820      DEFB   4EH,2BH,10H,0,0 ;7
01830      DEFB   4EH,3BH,12H,0,0 ;8
01840      DEFB   52H,4DH,0FH,0,0 ;9
01850      DEFB   4EH,5CH,04H,0,0 ;10
01860      DEFB   52H,60H,0EH,0,0 ;11
01870      DEFB   4EH,6EH,04H,0,0 ;12
01880      DEFB   4EH,72H,0AH,0,0 ;13
01890      DEFB   4EH,7EH,02H,0,0 ;14
01900      ;
01910      END     START

```

End

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Psst...Printer Codes

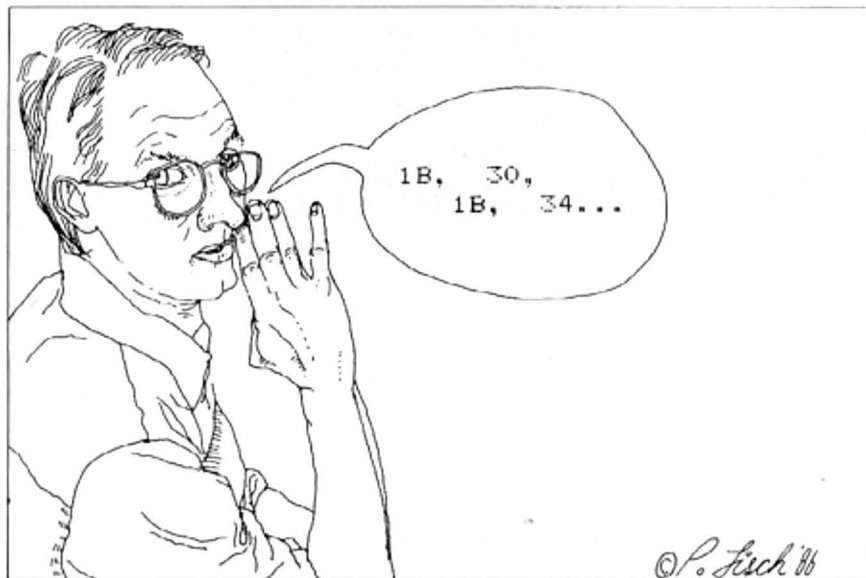
With a good word processor that's properly configured, you can make most printers do pretty tricks. Even without a suitable word processor or print formatter, you can direct your printer to perform useful chores, such as setting margins or skipping perforations during a program listing. With the right techniques and tools (provided herein) and a little experimenting with your printer's control features, you can produce the results you seek—from DOS, Basic, or Assembly language.

Into Control

If you're unfamiliar with ASCII codes, you might peruse the tables in the back of your MS-DOS or Basic reference manual. Notice that codes 32-127 represent the printable ASCII characters. Numbers below 32 represent the control codes. Horizontal tab (8), line feed (10), carriage return (13), and escape (27) are some important control codes.

Many printers use the escape code (27 decimal, 1B hexadecimal) to start a control sequence. I'll use Epson printer codes in my examples. (IBM made Epson a printer standard, and other printers—including recent units from Tandy—usually can or do emulate Epson printer codes.) To print a program listing as a background task with DOS's Print command, you might send the code sequence 27-78-6 to the printer, causing it to skip six lines at each page perforation. You might also send code 15 to put the printer in compressed mode for listings wider than 80 columns. If your codes go out of control, sending Esc-@ (27-64) returns an Epson clone to its default settings.

Because printer control codes aren't printable characters, they're a pain to represent from the keyboard, but you can usually find a way. One built-in method for typing any ASCII code is to hold down the Alt key while keying the code number (decimal form) on the numeric keypad of your MS-DOS computer. This method excels for the non-



ASCII codes 128-254 (the IBM graphics characters). It's also handy in the printable character range (32-127) when you haven't time to look up the character coded by decimal 90 (Z).

Alt-keypad codes can be used for many control codes, but not those that have editing functions in the program you're using. In DOS or in EDLIN, the MS-DOS editor program, you can use this method for all but codes 3 (Ctrl-C), 6, 8 (backspace), 10 (line feed), 13 (enter), 14, 16, 19, 26 (end of file) and 27 (tough luck). Codes 14 and 16 disable the 1000 when entered from DOS. Basic also has 10 control codes (mostly different) that you can't enter with the Alt-keypad trick. As we'll see, other tricks can handle control codes.

Echo Echo

I can think of two good methods for sending text directly to a printer from DOS. From the command line, or in a batch file, you can echo text verbatim to the printer using redirection. Typing:

```
ECHO Hello >PRN
```

directs the ASCII codes in "Hello" to the printer (device PRN). Your printer, if ready, should greet you. However, you can't represent crucial control codes from DOS, which means you can't effectively echo control codes on the com-

mand line. Echoing control codes from batch files works well because there's a way to type control codes in EDLIN.

The other DOS method is to create a file containing the desired text or control codes and direct it to the printer with the Copy or Type command. A file called Setup.TXT containing printer control codes could be sent to the printer by executing either:

```
COPY SETUP.TXT PRN
```

or:

```
TYPE SETUP.PRN >PRN
```

You can represent control codes in EDLIN thanks to an old ASCII convention. If you scan your ASCII table again, you'll observe that codes zero to 31 can be represented as ^X or Ctrl-X, where X is a printable character. Code zero is Ctrl-@, and codes 1-26 are Ctrl-A through Ctrl-Z. Control codes 27-31 use various punctuation marks; the all-important escape code (27) is Ctrl-[].

You type control characters in EDLIN by pressing Ctrl-V (pressing V while holding down the Ctrl key), then the key you want "controlled." To make an Epson-type printer skip six lines at the perforation (27-78-6) and print in condensed mode (15), you'd use the sequence Ctrl-[, N, Ctrl-F, Ctrl-zero. Program Listing 1 shows how you'd create a batch file to do it. Ctrl-C stops entry mode at line 2. I listed

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Program Listing 1. A batch file to skip six lines at the perforation and print in condensed mode.

```
A>edlin set.bat
New file
*!
  1:*ECHO ^V[N^VF^VO >PRN
  2:*^C

*L
  1: ECHO ^[N^F^O >PRN

*E
```

End

Program Listing 2. Debug script to assemble Printset.COM.

```
n printset.com
a
mov si,115 ;address of codes
; loop (103)
mov dl,[si] ;get next code
cmp dl,FF ;is it end (255)?
jnz 10E ;if not, continue
mov ah,4C ;end program function
int 21
; cont (10E)
mov ah,5 ;DOS print function
int 21 ;print code in dl
inc si ;point to next code
jmp 103 ;loop back
; data (115) hex code sequence to printer
; Use FF to mark end of data.
db 1B,4E,06,0F,FF ;substitute your codes
;next line must be blank to end assembly

rcx
100
w
q
```

End

line 1 to show that the V disappears from the control combinations. Running Set.BAT from the DOS prompt should configure your printer for printing program listings with the MS-DOS Print program. You could write a larger batch file with several control sequences selected with command-line parameters. (See "Step Up to .BAT," May 1986, p. 54.)

If you use EDLIN (or some other editor) to create text files containing printer control codes, remember that code 26 (Ctrl-Z) is off limits. Transmission of codes to the printer with the Copy or Type command will stop when 26, the MS-DOS end-of-file marker, is encountered. This isn't a major problem with Epson-type printers because 26 isn't used, unless a data field in one of the control codes requires a value of 26.

Basic LPRINT

If you work mostly from Basic, controlling printers is easy. All ASCII codes can be represented by the CHR\$() function and sent to the printer with the LPRINT statement. The following one-line program sets up an Epson clone for skipping perforations and condensed-print mode (again):

```
10 LPRINT CHR$(27);CHR$(78);CHR$(6);
CHR$(15);SYSTEM
```

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I added the trailing System statement so that you can run the program from DOS and have it return automatically. If you saved the program as Set.BAS, you'd run it from DOS by typing BASIC SET and pressing the enter key.

If you program in Assembly language, printer control codes are no different from any other code. You put the code in the appropriate 8-bit register and call a print routine. I suggest using the DOS printer function rather than the BIOS services. DOS function 5 uses the default printer and involves no setup. Program Listing 2 is a small program that sends out a fixed control sequence. The codes are contained in the DB assignment at the end. Put in your own hexadecimal (hex) code sequence using FF hex to signal the end.

Assemble the program with Debug. First create the listing as a text file (you can leave out the comments), then use redirection to input the file to Debug. If you named the listing file Printset.SRC, you'd type DEBUG <PRINTSET.SRC to create Printset.COM, the actual machine-language program. The program isn't flexible, and you'd have to create different versions for each printer control sequence you use, but it's convenient to run. Printset would be a good

way to send complex control sequences, such as Epson graphics codes necessary to print a letterhead.

Pop-Up Print Codes

If you use Borland International's SideKick, you have a pop-up ASCII table and a great way to send printer control codes. You can use Alt and the keypad numbers to enter codes above 32, but you must set graphics mode (Ctrl-Q-G) for codes above 127. You represent the control codes below 32 much as you would in EDLIN (escape is Ctrl-[, for example). Use the control-key function (Ctrl-P). Escape is entered Ctrl-P, Ctrl-[,

You can use SideKick to create control-code files to be sent from DOS, or to set up a file containing all your printer control sequences. Then use SideKick's block-print command (Ctrl-K-P) after selecting a particular sequence.

Dump Discovered

Tom Lake (Hartford, CT) posted a message on 80 Micro's bulletin board detailing an undocumented 1000 Basic statement—LCOPY—that dumps the screen to your printer. LCOPY was a reserved word in the original 1000 Basic, but it produced no action—not even an error message. On the newer version of GW-Basic

(Tandy version 1.01), LCOPY results in a screen dump, just as if you pressed shift-print. (LCOPY is a documented statement in the 3000's GW-Basic.)

You can use LCOPY in your programs to print graphs and tables or, if you've run Graphics.COM before running Basic, to send graphics displays to your printer. I set up Graphics.COM in PC mode, put an LCOPY statement in a Basic graphics program, and produced a nice high-resolution screen dump on a C. Itoh CI-3500 dot-matrix printer. A screen dump in graphics mode 6 prints out sideways.

Er-rat-a

In my June column, I sized the Microsoft Mouse driver at 72K, enough to run a rat or even a beaver. The driver is actually 7K. ■



Dave Rowell is an 80 Micro technical writer specializing in MS-DOS computing. Address correspondence to him to 80Micro, 80 Pine St., Peterborough, NH 03458.

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Sequential Files: Data All in a Row

Disk files are stumbling blocks for many Basic programmers. In this and my next two columns, I'll review techniques for handling sequential and random file input/output (I/O) and provide you with some tricks for solving common problems. I'll begin with sequential files, as they are generally easier to manage, and work in some examples that combine techniques for both types of files.

Data Streams

Sequential files store data in ASCII format in the exact order that you send it. You might think of a sequential file as a very long stream of data written on a single, long sheet of paper.

Before you can store data in a sequential file, however, you first have to open the file and give it a name with Basic's Open command. The command:

```
OPEN "O",N,"FILESPEC"
```

opens a disk file (number N) named "file-spec" for output (O).

Once you open a file for output, any data already stored in it disappears. The filespec can be any legal file name and can also include the file-type extension, password, and drive number. A TRS-DOS file name with all these options might look like this:

```
MYFILE/DAT.TEST:1
```

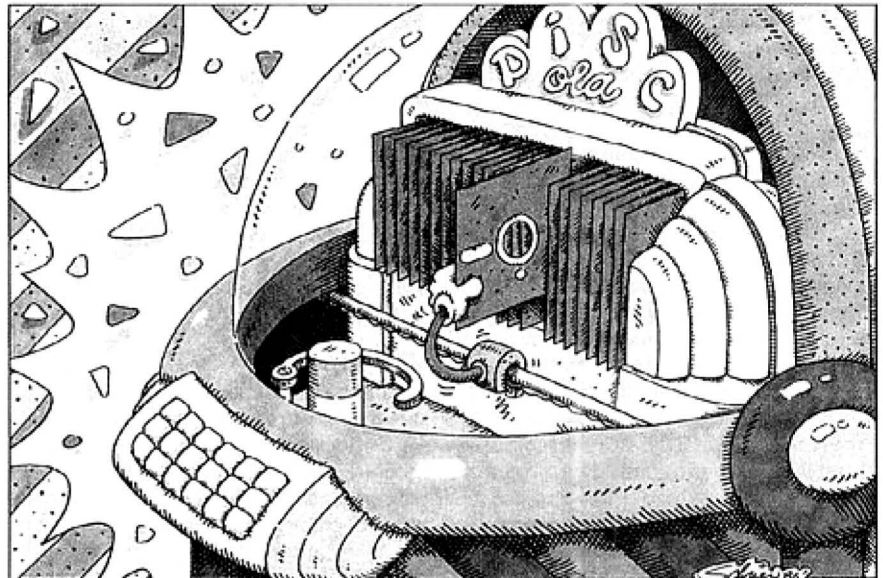
where the file name is Myfile, the file type is DAT, the password is Test, and the drive number is 1. Sequential files opened under CP/M cannot include a password, and the file-type extension follows a period, not a slash. Also, the drive letter precedes the file name. A file name opened on drive B under CP/M might look like this:

```
B:MYFILE.DAT
```

MS-DOS uses the same file-naming conventions that CP/M uses, except that it gives you the added option of including subdirectory information in the file name. A sequential file specification written

System Requirements

All systems
Basic



under MS-DOS might look like this:

```
B:\finance\data\myfile.dat
```

Whether you type uppercase or lowercase letters doesn't matter under MS-DOS, but it does under CP/M.

Printing data to a sequential file is like sending data to a screen or a printer. To print to the screen, you'd use the Print command; to send data to a printer, you'd type LPRINT. To print data to an opened file, you'd use the command:

```
PRINT #N
```

where N matches the number of the file opened for output.

Suppose you want to store *80 Micro's* name and address in a sequential file. To do so, you might use the command series in Program Listing 1. The resulting data file would look like this:

```
"80 MICRO","80 PINE STREET",  
"PETERBOROUGH","NH",03458
```

or like this if you left out the CHR\$(34):

```
80 MICRO,80 PINE STREET,  
PETERBOROUGH,NH,03458
```

When printing data to a sequential file, it's a good idea to separate data items with a combination of commas and quotation marks. Place quotation marks around fields and insert commas between fields. A carriage return marks the end of each record. (MS-DOS and CP/M use a carriage return and a line feed.)

If a field contains a comma, the quo-

tation marks allow the program reading the data to tell where one field ends and another begins. Suppose, for example, you want to print the address "80 Pine Street, Suite 3" to a sequential file. If you don't place quotation marks before the street name and after the suite number, the program will read Suite 3 as the city name. To save space, you could use the INSTR (Instring) function to check whether quotation marks are necessary. The set of statements in Program Listing 2 demonstrates this.

You don't have to place quotation marks around a data item if it doesn't contain a comma, but you can't go wrong if you do. Under no circumstances should you use quotation marks within a data item; if you do, Basic won't be able to tell where fields start and stop.

To read data from a sequential file, use the Input #N command. As when you print data to a sequential file, you have to open the file before you can read data from it. The command:

```
OPEN "I",N,"FILESPEC"
```

opens a disk file (number N) named "file-spec" for input (I). You can then read data from the opened file with the Input command. The command:

```
INPUT #1,AS
```

reads the first data item from the file and assigns it to AS. To read a whole record from the file (provided the length of the

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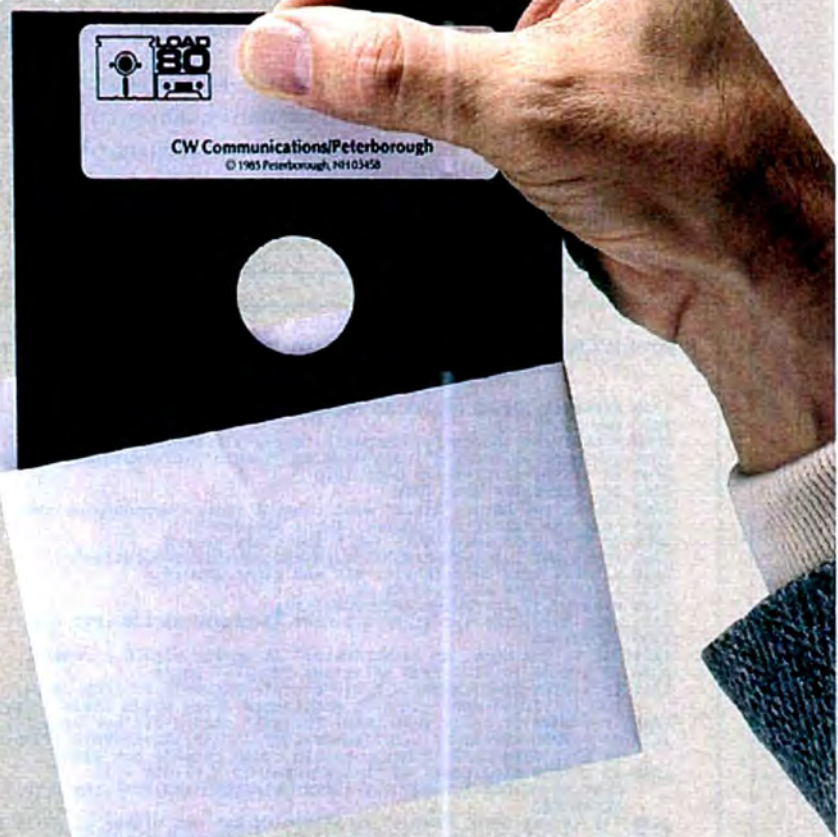
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Program Listing 1. Code to store 80 Micro's name and address in a sequential file.

```
100 A$="80-MICRO":B$="80 PINE STREET":C$="PETERBOROUGH":D$="NH":E$="03458"
110 PRINT #1,CHR$(34);A$;CHR$(34);",",;
120 PRINT #1,CHR$(34);B$;CHR$(34);",",;
130 PRINT #1,CHR$(34);C$;CHR$(34);",",;
140 PRINT #1,CHR$(34);D$;CHR$(34);",",;E$
```

End

Program Listing 2. Using the Instring function to check for commas in fields.

```
100 IF INSTR(A$,"") THEN PRINT #1,CHR$(34);A$;CHR$(34);",",;
    ELSE PRINT #1,A$;";";
110 IF INSTR(B$,"") THEN PRINT #1,CHR$(34);B$;CHR$(34);",",;
    ELSE PRINT #1,B$;";";
120 IF INSTR(C$,"") THEN PRINT #1,CHR$(34);C$;CHR$(34);",",;
    ELSE PRINT #1,C$;";";
130 IF INSTR(D$,"") THEN PRINT #1,CHR$(34);D$;CHR$(34);",",;
    ELSE PRINT #1,D$;";";
140 PRINT #1,E$
```

End

Program Listing 3. Updating a sequential file by opening it as a random file.

```
1000 FIELD #1,128 AS A$,128 AS B$:FIELD #1,255 AS C$,1 AS D$:I=0
1010 I=I+1:GET 1,I
1020 X=INSTR(A$,"Burce"):Y=INSTR(B$,"Burce"):Z=INSTR(C$,"Burce")
1030 X1=INSTR(A$,"Tonkin"):Y1=INSTR(B$,"Tonkin"):Z1=INSTR(C$,"Tonkin")
1040 IF (X+Y+Z+X1+Y1+Z1)=0 THEN 1010
1050 IF (X+Y+Z)<0 THEN 1200
1060 'if we got here, "Burce" must cross a record boundary or this is
1065 'not the record to update. Let's see which.
1070 IF X1>9 THEN 1010:'This isn't the right record.
1080 E$=A$:GET 1,I-1:E$=RIGHT$(E$,50)+E$:X2=INSTR(E$,"Burce")
1090 IF X2<1 THEN 1010:'Again, not the right record.
1100 FIELD #1,206 AS F$,50 AS G$
1110 MID$(E$,X2,8)="Burce"+STRING$(3,0)
1120 LSET G$=E$:PUT 1,I-1:GET 1,I:LSET A$=RIGHT$(E$,128):PUT 1,I
1130 CLOSE:END
1140 'if we got here, at least "Burce" is wholly within a record.
1200 IF X THEN IF Z1<1 THEN 1010:'but "Tonkin" isn't.
1210 IF X THEN E$=C$:MID$(E$,X,8)="Burce"+STRING$(3,0):LSET C$=E$:
    PUT 1,I:CLOSE:END:'using C$ eliminates worry about field crossing.
1220 IF Y THEN IF Y1<1 THEN 1010:'"Tonkin" should fit but doesn't.
1230 IF Y THEN E$=B$:GET 1,I+1:E$=E$+LEFT$(A$,50):X2=INSTR(E$,"Tonkin"):
    IF X2<1 THEN 1010:'"Tonkin" should cross records but didn't.
1240 IF Y THEN MID$(E$,X2,8)="Burce"+STRING$(3,0):GET 1,I:
    LSET B$=E$:PUT 1,I:GET 1,I+1:LSET A$=RIGHT$(E$,128):PUT 1,I+1:
    CLOSE:END
1250 'if we got here, "Burce" is within C$ but not either of A$ or B$.
1260 'no, "Tonkin" must be in B$ or this is the wrong record.
1270 IF Y2<1 THEN 1010
1280 IF Z<1 THEN 1300
1290 E$=C$:MID$(E$,Y,8)="Burce"+STRING$(3,0):LSET C$=E$:PUT 1,I:
    CLOSE:END
1300 PRINT "Logic error. Tell Bruce Tonkin he screwed up.":CLOSE:END
```

End

record doesn't exceed 255 characters), use the command:

```
LINE INPUT #1.A$
```

Once you've read a whole record with the Line Input function, it's up to you to extract individual fields from the record. Even though reading a line at a time is faster, it's easier, in most instances, to read data items one at a time.

Playing Tricks

Suppose you write a sequential file without quotation marks around some items, and suppose further that the items contain leading blanks. When you read the data file with the Input command, the spaces disappear! Basic programs that read sequential data files find no differ-

ence between data stored like this:

```
80 MICRO. 80 PINE
STREET. PETERBOROUGH
```

and data stored without leading blanks like this:

```
80MICRO.80PINESTREET.PETERBOROUGH
```

In other words, the programs automatically trim leading blanks. They will also ignore ASCII null characters (ASCII code zero). Suppose you were to store the following information in a data file (the @ symbol represents null characters):

```
80 MICRO. 80@@@ PINE STR@@@EET
@@@.PETER@@@BOROUGH@@@
```

To a Basic program, this would be identical to the previous example; the program skips over null characters as if

they aren't there. This is handy if you have a lot of data with leading blanks that you want to eliminate. All you need to do is write the data to a temporary sequential file, then read it back. Be careful, however, not to include data items that contain commas.

Trouble in Sequence

Sequential files use only a little more space than is required to store information. This is advantageous if you need 250 spaces to store one customer address and only 10 for another. You won't have to waste 240 characters to store the second one. Neither will you have to shorten the first address to fit into 10 spaces.

Unfortunately, a number of problems associated with sequential files can make them difficult to manage. Retrieving data is one such problem. Though printing data to a sequential file is easy, retrieving it can be difficult because you have no way of knowing where a particular item of information is located. You sometimes have to read a file from beginning to end to find needed data. Most programmers find this too time-consuming, and so load the whole file into memory to speed search and retrieval.

Another problem with sequential files is that they're difficult to alter. While some versions of Basic (GW-Basic under MS-DOS, for instance) allow you to append data to an existing file, there's no obvious way to alter or delete an item somewhere in the file without reading and writing the whole file.

This is less of a problem if you load the whole file into memory and rewrite it after it's altered. But if the file is large, this can be painfully slow, even on a computer with a hard disk and a fast processor. Also, updating a large sequential file requires twice as much disk space, because you must read from the original while writing to an updated version. (Whenever I hear someone praise sequential files for their storage efficiency, I assume they're talking about less than 30K or 40K of data. Otherwise, I can't believe anyone would tolerate the slow speed and large amounts of disk space they require.)

One solution to the problem of updating takes advantage of the fact that sequential files can be read or written as if they were random files. To do this under TRSDOS, you have to open a random file with a length of 256 bytes. (Under MS-DOS or CP/M, you can use any length you want.) Then write blanks or ASCII null characters into selected parts of the sequential file; the next time you read the file sequentially, the space occupied by the "nulled" data will disappear. If you want to update a single field, you can use the same technique, as long as

THE ART of PROGRAMMING

the replacement data isn't longer than the original.

Using extra spaces in your records makes it easier to update individual fields with random file I/O. Even if one field hasn't enough space to accommodate the updated data, you can move fields around and decrease the amount of blanks used. Of course, this approach uses up more disk space.

Manipulating files in this fashion poses problems of its own, however, primarily because the random record inevitably includes parts of fields or parts of different records. To find a specific piece of information in a sequential file with this technique, you might have to read several records and check the beginnings and ends to see if the sequential field you want to update spans more than one record.

For instance, suppose I wanted to search a sequential file for a record containing the field "Buree W. Tonkin" and replace it with "Bruce Tonkin." The program fragment in Program Listing 3 shows what might be involved if I opened a sequential file as a random file with a record length of 256. (I've made some shortcuts in the logic in order to make the fragment easier to understand.)

Other Solutions

In Basic, you can write a general solution that would allow you to update sequential files in place, but the code to do this would be even more complex than that in Listing 3. Consider the variables: The identifying field might be separated from the field you want to update by an arbitrary amount. The identifying field might be duplicated in several random records, of which you want to update only a select few. The sequential record might span three or more random records, not just two.

With Quick Basic or something equivalent, you can open the data file as a random file with a record length longer than any sequential record in the file. This at least will ensure that a random record won't cross more than one boundary. Strings can be longer than 255, which makes the solution a little less complex.

Languages like C that have "long integer" variable types also offer a solution. A long integer is usually 4 or more bytes long and can represent whole numbers from -2,147,483,648 to 2,147,483,647. An integer of this size can represent the starting position of every record in a sequential file containing billions of bytes. By creating a "key" file containing the integers, you can locate any record in a very large sequential file; all you need is a language capable of accessing each individual byte.

Under MS-DOS, GW-Basic accesses in-

dividual bytes in a record essentially the same way C does. The biggest difference is that Basic uses the single-precision variable type instead of the long integer. Only 3 bytes are used for a record number, which means the largest number permitted is 16,777,216. Nevertheless, a 16-megabyte file is probably larger than most users will ever need.

More Problems

In addition to being difficult to update, sequential files cause headaches when you try to move data from CP/M or MS-DOS to TRSDOS. If you do this, and then try to display or print out the file, it'll be double-spaced. If you move data from a TRSDOS file to one written under MS-DOS or CP/M, the data will print over and over on the same line.

The problem also exists if you use the same printer with a Model III and an IBM PC. If you set the printer up so the output looks fine on the Model III, the output will be doubled-spaced if you then use the same printer with an IBM. If you set the printer up to work fine with the IBM, it will print everything on the same line when used with the Model III.

The reason why this problem exists is that TRSDOS adheres to the nonstandard, non-ASCII convention that a carriage return (ASCII code 13) means "carriage return plus line feed"—ASCII code 13 followed by ASCII code 10. In other words, 13 = 13 + 10.

This also creates problems if you use Basic under MS-DOS to read a sequential file transferred from TRSDOS. Basic assumes any character following the carriage return must be a line feed. Thus, you'll lose the first character of each line after the first one in the file.

I don't know why Radio Shack chose to ignore the ASCII standard. The carriage return and the line feed are unique characters with different purposes. It's one thing to use a simple carriage return (or any other character) as a record delimiter. TRSDOS came out long before MS-DOS, and there's no reason why TRSDOS files should be 100-percent compatible with MS-DOS. But by insisting that a carriage return means "carriage return plus line feed" for printers has created problems for MS-DOS users. ■



Bruce Tonkin is an independent software developer, industry critic, and author of The Creator data-base manager. You can reach him at 34069 Hainesville Road, Round Lake, IL 60073, 312-223-8595.

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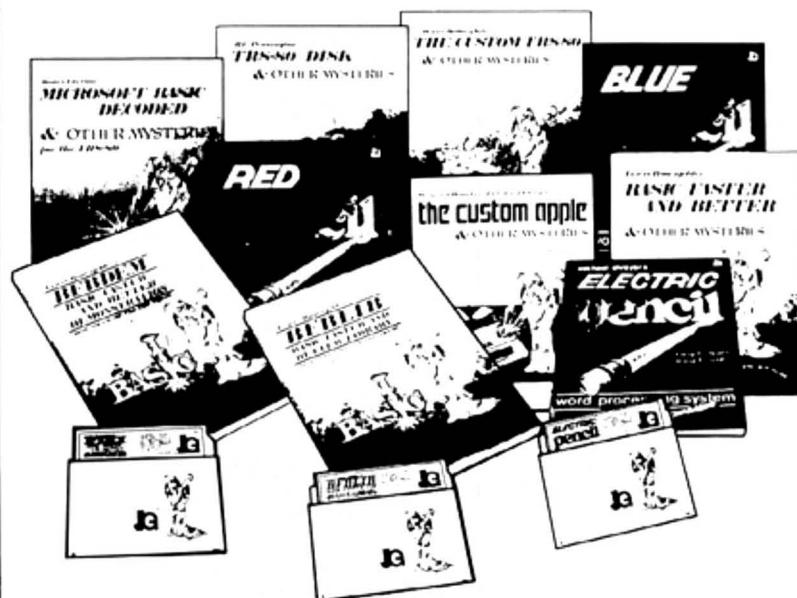
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Scroll 'Em

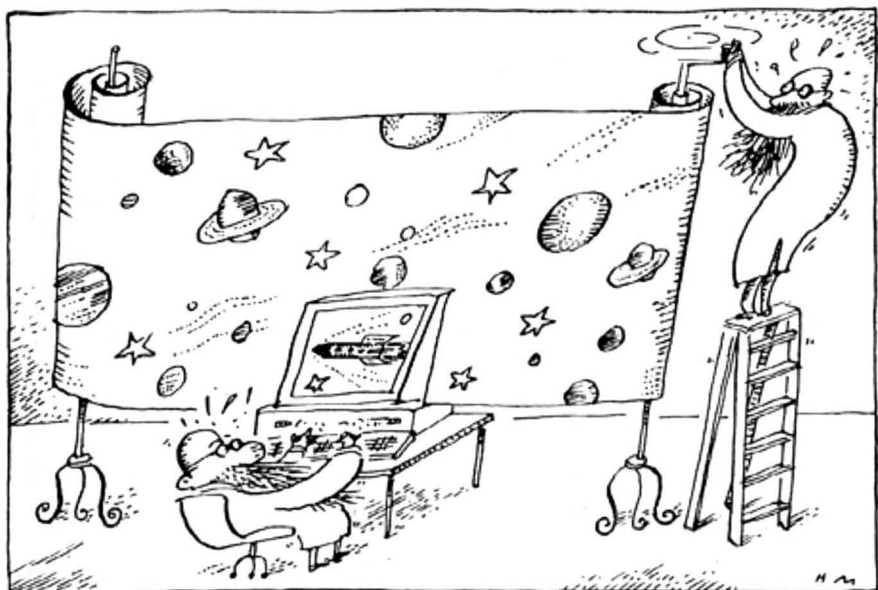
I've been experimenting with the built-in video routines on my MS-DOS computer, and I started wondering why the Model 4 doesn't have more video capabilities. Obviously, the Model 4 was never intended to be a graphics machine (unless you install a hi-res board), but there's no reason it can't perform many of the video tricks that the Tandy 1000 can.

So, taking assembler in hand, I decided to add one of my favorite MS-DOS video capabilities to the Model 4: partial screen scrolls in any direction. The routines were easy to implement and they add a great deal of visual interest to Model 4 programs that may otherwise seem stodgy. And because of the way I've implemented these routines, all the memory they use can be easily reclaimed by a Basic program while it is running.

Also this month, I'll revisit an unusual method of adding machine-language programs to Basic and, not at all coincidentally, looking at how machine language can easily handle complex data structures. I'll also discuss a way of building program modules that simplifies bug chasing and reduces typographical errors.

Video Control

A running program cannot usually address the Model 4 video screen directly. In order to increase the amount of available memory, Tandy has "hidden" the video screen in a memory bank. When TRSDOS wants access to the screen, it must go through a number of steps to move the stack away from screen memory, bank-switch the screen to addressable memory, perform whatever operations are needed on the screen, and then back-switch the "nor-



mal" memory into place. The operations are simple in concept, but the details can lead to some interesting complications upon implementation.

But programs and utilities never have to worry about the screen. They can use

the TRSDOS supervisory calls (SVCs) to write to the screen and, when necessary, to copy the entire screen or parts of it to a working buffer or vice versa. Normal screen displays are done through the @DSP and @DSPLY SVCs; the fancy

Values set by Basic	Byte number	Values set during processing
Top of scroll area	0	
	1	Width of scroll area
Left of scroll area	2	
	3	Height of scroll area
Bottom of scroll area	4	
	5	Current row in This_Line buffer
Right of scroll area	6	
	7	
	8-9	This_Line buffer address
	10-11	Next_Line buffer address
	12-13	Address of left edge of scroll area in This_Line buffer
	14-15	Address of left edge of scroll area in Next_Line buffer
	16-17	Address of right edge of scroll area in This_Line buffer
	18-97	This_Line buffer (80 bytes)
	98-177	Next_Line buffer (80 bytes)

Note: In Basic, each integer-array element requires 2 bytes. Therefore, you can allocate this space with the command DIM BUF%(89).

Table. Scroll-buffer usage.

LOAD
80

System Requirements

Models 4/4P/4D
64K RAM
Basic
Assembly language
Editor/assembler
TRSDOS 6.1 or higher

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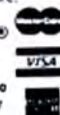
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Program Listing 1. Scroll-routine definitions.

```

00190 ; SVC used:
00200 @VDCTL EQU 0FH
00210 ;-----
00220 ; Buffer structures (offsets from IX+0)
00230 TOP_ROW EQU 0
00240 CHR_CNT EQU 1
00250 TOP_COL EQU 2
00260 ROW_CNT EQU 3
00270 BOT_ROW EQU 4
00280 CUR_ROW EQU 5
00290 BOT_COL EQU 6
00300 TL_ADDR EQU 8
00310 NL_ADDR EQU 10
00320 TL_LEFT EQU 12
00330 NL_LEFT EQU 14
00340 TL_RIGHT EQU 16
00350 THIS_LINE EQU 18
00360 NEXT_LINE EQU 98
00370 ;-----
00380 ; Macro commands
00390 ;
00400 SVC MACRO #NUM
00410 LD A,#NUM
00420 RST 28H
00430 ENDM
00440 ;
00450 CR_2_TL MACRO ;Move "Current Row" to THIS_LINE buffer
00460 LD BC,9<8+1 ;B=9, C=1: screen to buffer xfer
00470 LD H,(IX+CUR_ROW) ;Get current row number
00480 LD E,(IX+TL_ADDR) ;Set DE=> THIS_LINE
00490 LD D,(IX+TL_ADDR+1)
00500 SVC @VDCTL ;Get characters
00510 ENDM
00520 ;
00530 TL_2_CR MACRO ;Put THIS_LINE buffer on Screen
00540 LD BC,9<8 ;B=9, C=8: buffer to screen xfer
00550 LD H,(IX+CUR_ROW) ;Get current row number
00560 LD E,(IX+TL_ADDR) ;Set DE=> THIS_LINE
00570 LD D,(IX+TL_ADDR+1)
00580 SVC @VDCTL ;Move characters
00590 ENDM
00600 ;
00610 CR_2_NL MACRO ;Move "Current Row" to NEXT_LINE buffer
00620 LD BC,9<8+1 ;B=9, C=1: screen to buffer xfer
00630 LD H,(IX+CUR_ROW) ;Get current row number
00640 LD E,(IX+NL_ADDR) ;Set DE=> NEXT_LINE
00650 LD D,(IX+NL_ADDR+1)
00660 SVC @VDCTL ;Move characters
00670 ENDM
00680 ;
00690 NL_2_TL MACRO ;Move NEXT_LINE to THIS_LINE buffer
00700 LD E,(IX+TL_ADDR) ;Set DE=> THIS LINE
00710 LD D,(IX+TL_ADDR+1)
00720 LD L,(IX+NL_ADDR) ;Set HL=> NEXT_LINE
00730 LD H,(IX+NL_ADDR+1)
00740 LD BC,80 ;80 characters/line
00750 LDIR
00760 ENDM
00770 ;
00780 END

```

End

Program Listing 2. Scroll-routine setup.

```

00200 *LIST OFF
00210 *GET DEFS/ASH
00220 *LIST ON
00230 ;
00240 LD E,(HL) ;get LSB of buffer addr
00250 INC HL ;HL=> MSB of address
00260 LD D,(HL) ;DE=> buffer area
00270 PUSH DE ;Transfer buffer
00280 POP IX ; to IX
00290 ;-----
00300 ;Set up pointers to buffers
00310 ;-----
00320 LD HL,THIS_LINE ;Offset to THIS_LINE
00330 ADD HL,DE ;HL=> THIS_LINE buffer
00340 LD (IX+TL_ADDR),L ;Save address in data area
00350 LD (IX+TL_ADDR+1),H
00360 LD HL,NEXT_LINE ;Offset to NEXT_LINE
00370 ADD HL,DE ;HL=> NEXT_LINE buffer
00380 LD (IX+NL_ADDR),L ;Save address in data area
00390 LD (IX+NL_ADDR+1),H
00400 ;-----
00410 ;Calculate line and character counts
00420 ;-----
00430 LD A,(IX+BOT_ROW) ;Get row number of bottom
00440 SUB (IX+TOP_ROW) ;Subtract top row
00450 INC A ;A = number of rows
00460 LD (IX+ROW_CNT),A ;Save it in data area
00470 LD A,(IX+BOT_COL) ;Get right column number
00480 SUB (IX+TOP_COL) ;Subtract left column number
00490 INC A ;A = number of columns
00500 LD (IX+CHR_CNT),A ;Save it in data area
00510 ;-----
00520 ;Calculate left and right edges of scroll area

```

Listing 2 continued

buffer and cursor manipulations are done with the help of the @VDCTL SVC.

Part of the upgrade from TRSDOS 6.0 to 6.1 was the addition of a screen-line function to the @VDCTL SVC. Using that function, a program can ask TRSDOS to move an 80-character line from the screen to a buffer or from a buffer to the screen. This video function is fast, since it uses the Z80's block-transfer capabilities to move data. Note that the line-buffer transfer doesn't look at the data it is moving. If there are any control codes in your buffer, TRSDOS does not intercept them; instead, they appear as alternate characters on the screen.

There is one danger in using the @VDCTL SVC's line-transfer function that the TRS-80 Model 4/4P Technical Reference Manual doesn't mention. You must be sure that all of your transfer buffer is below 0F800 hexadecimal (hex), which is the bottom of screen memory, during the short periods when it is addressable to the Z80 CPU. If it isn't, the screen row will be copied onto some other part of the screen and will never show up in your buffer. In fact, there may be some unusual circumstances where you can make use of TRSDOS's lack of error checking in this particular @VDCTL function.

Scrolling the Screen

When your screen scrolls, each row is replaced by the row immediately below it, the bottom row is erased, and the cursor is placed at the beginning of the bottom row. During this process, the original contents of the screen's top row are lost because the contents of the second row overwrite them.

The routines in this month's programs perform in much the same way, but they can scroll any portion of the screen in any direction. In all cases, the first row or column is overwritten, every other row or column in the screen's scrolling area is moved one space, and the final row or column is erased. It is almost impossible, however, to determine where the cursor should be placed on some partial screen scrolls. Therefore, these routines do not move the cursor at all but leave that task to whatever program calls them. Basic programs can use Print @ to position the cursor; Assembly-language programs can use one of the other @VDCTL SVC functions.

All the scrolling routines work in a similar fashion. They move a screen row (or two) to a working buffer, move the characters that are being scrolled, and then send the modified row back to the screen. They are fast (although clever programming could easily make them faster) and they are similar enough that once you have one debugged, working

on the others should be simple.

My first problem writing these programs was deciding where the row buffers should be. Since the buffer must be below 0F800 hex, it is impossible to use protected high memory. Also, there is no place in TRSDOS's low memory that can guarantee the necessary 160 bytes of free space that the routines need.

Since these routines are written to work with Basic (you can also use them with other languages with a little modification), I decided to use Basic's variable-storage area. The programs assume that Basic has created a 180-byte array, that the first part of the array defines the scrolling parameters, and that the rest of the array is free for use as line buffers. There is still a chance that Basic's array will be too high in memory. The routines do no error checking, so if you have trouble with them in a large program, dimension the buffer as the first array in your program.

To use the routines in a Basic program, load the values of the top, left, bottom, and right edges of the area you want scrolled into the first four elements of the array, and then call the scrolling routine and pass it the array address. Since all four values are less than 256, zero bytes will automatically be interspersed with the values you are sending. The program uses those zero bytes, along with a few other bytes at the beginning of the array, to store data of its own. Therefore, when the scrolling routines return to Basic, the values in the array can be quite different from those that your program originally set there.

Writing the Routines

I wrote these routines to fit within Basic's file buffers instead of protected high memory. When you open a file in random-access mode and then get a record, Basic places that record in a special file buffer. If each routine is stored in a different file record (or disk sector, if you open the file with the default size of 256-byte records), then you can put each in a separate file buffer. A special form of the VARPTR command returns the address of the file buffer, and your program can then issue a call to that address.

To create a routine that can run from a file buffer, you must do several things. First, the routine must be no longer than one buffer; if it is longer than 256 bytes, it won't fit in the buffer. Second, the program must be stored in the buffer in "core image" form; that is, it must not contain any loading information that is usually part of a command program on disk. Finally, the program needs to be completely relocatable. It cannot call any subroutines inside itself nor access any data inside itself unless you are willing to go to a lot of extra programming trouble.

Listing 2 continued

```
00530 ; HL is already pointing to NEXT_LINE
00540 ;-----
00550 LD B,0
00560 LD C,(IX+TOP_COL) ;Get left column number
00570 ADD HL,BC ;HL=> left of scroll in N_L
00580 LD (IX+NL_LEFT),L ;Save address in data area
00590 LD (IX+NL_LEFT+1),H
00600 LD L,(IX+TL_ADDR) ;Pick up THIS_LINE address
00610 LD H,(IX+TL_ADDR+1)
00620 PUSH HL ;Save address
00630 ADD HL,BC ;HL=> left of scroll in T_L
00640 LD (IX+TL_LEFT),L ;Save address in data area
00650 LD (IX+TL_LEFT+1),H
00660 POP HL ;Get address of THIS_LINE again
00670 LD C,(IX+BOT_COL) ;Get right column number
00680 ADD HL,BC ;HL=> right of scroll in T_L
00690 LD (IX+TL_RIGHT),L ;Save address in data area
00700 LD (IX+TL_RIGHT+1),H
00710 ;-----
00720 ; Now fall into the scroll routine
00730 ;-----
```

End

Program Listing 3. Scroll-up module.

```
00180 *LIST OFF
00190 *GET SETUP/ASM
00200 *LIST ON
00210 ;
00220 UP EQU $
00230 LD A,(IX+TOP_ROW) ;Get top row number
00240 LD (IX+CUR_ROW),A ;Set as current row
00250 CR_2_NL ;Get top row into NEXT_LINE
00260 LD B,(IX+ROW_CNT) ;Get row count
00270 DEC B ;B = row count - 1
00280 U_1 PUSH BC ;Save loop counter
00290 NL_2_TL ;Move NEXT_LINE to THIS_LINE
00300 INC (IX+CUR_ROW) ;Point to next screen row
00310 CR_2_NL ;Move it into NEXT_LINE
00320 DEC (IX+CUR_ROW) ;Restore row pointer
00330 LD E,(IX+TL_LEFT) ;Set DE=> left of scroll area
00340 LD D,(IX+TL_LEFT+1)
00350 LD L,(IX+NL_LEFT) ;Set HL=> left of NEXT_LINE
00360 LD H,(IX+NL_LEFT+1)
00370 LD C,(IX+CHR_CNT) ;Set BC = number of characters
00380 LD B,0
00390 LDIR ;Move from NEXT_LINE to THIS_LINE
00400 TL_2_CR ;Put THIS_LINE on screen
00410 INC (IX+CUR_ROW) ;Point to next screen row
00420 POP BC ;Retrieve loop counter
00430 DJNE U_1 ;Loop until done
00440 NL_2_TL ;Move last line to THIS_LINE
00450 LD L,(IX+TL_LEFT) ;Set HL=> left of scroll area
00460 LD H,(IX+TL_LEFT+1)
00470 PUSH HL ;Transfer to DE
00480 POP DE
00490 INC DE ;DE --> 2nd char. in area
00500 LD C,(IX+CHR_CNT) ;Set BC = character count
00510 LD B,0
00520 DEC BC ;BC = char. count - 1
00530 LD A,' ' ;Get a space
00540 LD (HL),A ; into first position
00550 LDIR ;Blank scroll area
00560 TL_2_CR ;Put line on screen
00570 RET
00580 END
```

End

Program Listing 4. Scroll-down module.

```
00180 *LIST OFF
00190 *GET SETUP/ASM
00200 *LIST ON
00210 ;
00220 DOWN EQU $
00230 LD A,(IX+BOT_ROW) ;Get bottom row number
00240 LD (IX+CUR_ROW),A ;Set as current row
00250 CR_2_NL ;Move to NEXT_LINE buffer
00260 LD B,(IX+ROW_CNT) ;Get row count
00270 DEC B ;B = row count - 1
00280 D_1 PUSH BC ;Save loop counter
00290 NL_2_TL ;Move NEXT_LINE to THIS_LINE
00300 DEC (IX+CUR_ROW) ;Point to next screen row
00310 CR_2_NL ;Get it in NEXT_LINE
00320 INC (IX+CUR_ROW) ;Restore line counter
00330 LD E,(IX+TL_LEFT) ;Set DE=> left of scroll area
00340 LD D,(IX+TL_LEFT+1)
00350 LD L,(IX+NL_LEFT) ;Set HL=> left of NEXT_LINE
00360 LD H,(IX+NL_LEFT+1)
00370 LD C,(IX+CHR_CNT) ;Set BC = number of characters
00380 LD B,0
00390 LDIR ;Move from NEXT_LINE to THIS_LINE
00400 TL_2_CR ;Put THIS_LINE on screen
00410 DEC (IX+CUR_ROW) ;Get ready to work with next row
```

Listing 4 continued

Listing 4 continued

```

00420 POP BC ;Recover count
00430 DJNZ D_1 ;Repeat for all lines
00440 NL_2_TL ;Move last line into THIS_LINE
00450 LD L, (IX+TL_LEFT) ;Set HL=> left of scroll area
00460 LD H, (IX+TL_LEFT+1)
00470 PUSH HL ;Transfer to DE
00480 POP DE
00490 INC DE ;DE ==> 2nd char. in area
00500 LD C, (IX+CHR_CNT) ;Set BC = character count
00510 LD B, 0
00520 DEC BC ;BC = char. count - 1
00530 LD A, ' ' ;Get a space
00540 LD (HL), A ; into first position
00550 LDIR ;Blank scroll area
00560 TL_2_CR ;Put line on screen
00570 RET
00580 END

```

End

Program Listing 5. Scroll-left module.

```

00180 *LIST OFF
00190 *GET SETUP/ASM
00200 *LIST ON
00210 ;
00220 LEFT EQU $
00230 LD A, (IX+TOP_ROW) ;Get top row number
00240 LD (IX+CUR_ROW), A ;Save as current row
00250 LD B, (IX+ROW_CNT) ;Get loop count (# of rows)
00260 L_1 PUSH BC ;Save count
00270 CR_2_TL ;Fill THIS_LINE buffer
00280 LD E, (IX+TL_LEFT) ;Set DE=> left edge of scroll
00290 LD D, (IX+TL_LEFT+1)
00300 PUSH DE ;Transfer to HL
00310 POP HL
00320 INC HL ;HL = left edge + 1
00330 LD C, (IX+CHR_CNT) ;Set BC = number of chars.
00340 LD B, 0
00350 DEC BC ;BC = char. count - 1
00360 LDIR ;Move it all left
00370 LD A, ' ' ;Get a space
00380 LD (DE), A ;Blank out right column
00390 TL_2_CR ;Put row back on screen
00400 INC (IX+CUR_ROW) ;Bump to next row
00410 POP BC ;Recover loop counter
00420 DJNZ L_1 ;Loop until done
00430 RET
00440 END

```

End

Program Listing 6. Scroll-right module.

```

03480 *LIST OFF
03490 *GET SETUP/ASM
03500 *LIST ON
03510 ;
03520 RIGHT EQU $
03530 LD A, (IX+TOP_ROW) ;Get top row number
03540 LD (IX+CUR_ROW), A ;Set as current row
03550 LD B, (IX+ROW_CNT) ;Get loop count (# of rows)
03560 R_1 PUSH BC ;Save count
03570 CR_2_TL ;Fill THIS_LINE buffer
03580 LD E, (IX+TL_RIGHT) ;Set DE=> right edge of scroll
03590 LD D, (IX+TL_RIGHT+1)
03600 PUSH DE ;Transfer to HL
03610 POP HL
03620 DEC HL ;HL = right edge - 1
03630 LD C, (IX+CHR_CNT) ;Set BC = number of characters
03640 LD B, 0
03650 DEC BC ;BC = Character count - 1
03660 LDDR ;Move everything right
03670 LD A, ' ' ;Get a space
03680 LD (DE), A ;Put at left edge of area
03690 TL_2_CR ;Put row back on screen
03700 INC (IX+CUR_ROW) ;Bump to next row
03710 POP BC ;Recover count
03720 DJNZ R_1 ;Loop until done
03730 RET
03740 END

```

End

Program Listing 7. /CIM-to-/RTN transfer program. (See p. 112 for information on using the checksums in Listings 7-9.)

```

1 'This program transfers UP/CIM, DOWN/CIM, LEFT/CIM and RIGHT/CIM ** 49
2 ' to the SCROLL/RTN file ** 50
3 ' ** 122

```

Listing 7 continued

Generally, short programs are relocatable if they don't have any data areas and if they are written in straight-line code without any absolute jumps or calls.

Each routine must be fully contained in a single sector, yet each also uses the same code to define several macro commands and to set up the buffer's data area. The easiest way to avoid extra retyping and debugging is to ask the assembler to automatically include the definitions section (Program Listing 1) and the Setup section (Program Listing 2) in each of the four scroll modules. The PRO-Create and MRAS assemblers from MISOSYS have a *Get command to automatically read in files during assembly. Other assemblers have similar commands. If yours doesn't, you can load the common-code files into your assembler along with each module just before you assemble them.

Listing 1 begins by defining the structure of the buffer. Once it is defined, you can refer to any information in it by name instead of using an absolute value later in the program. The advantage of doing so is that you can then redefine the buffer structure at any time by changing a few EQU's (equates) in one module; you won't have to search through each program to look for values that have to be changed.

Listing 1 also defines several macro commands that move data between the buffers and screen. Again, this is a convenience to make later debugging easier; once you know that a macro is correctly defined, you won't accidentally add a typographical error to your program.

Listing 2 is the initialization code that goes at the beginning of each scroll routine. It takes the information sent from Basic, calculates the scroll area's length and width, and stores those values in the buffer. The program also stores the line-buffer addresses so that the scroll modules don't have to recalculate them. Not all of the information in the buffer is used by each routine. If you want to speed up the programs a little, you could write a separate setup module for each scrolling routine to do only the work that routine requires. Again, it is easier to write a module once, debug it, and then add it to the other programs, even if it slows them down slightly.

Program Listing 3 is the code that scrolls part of a screen up. First, it copies the "receiving" screen row into a buffer called This_Line and the "sending" row into a buffer called Next_Line. Then it copies the necessary characters from Next_Line to This_Line and finishes one loop by sending This_Line back to the screen. The process repeats for each screen row in the scroll area. The routine ends by filling the last line's scroll area with spaces before sending it back to the screen.

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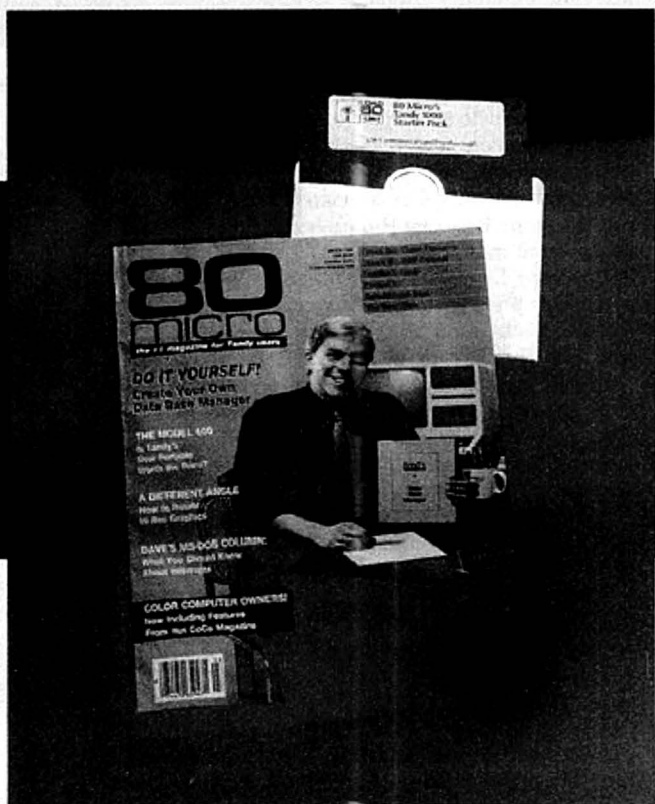
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Program Listing 4 scrolls part of the screen down. It is almost identical to Listing 3, except that it works from the bottom toward the top of the screen. In fact, there are only 4 or 5 bytes that are not the same between the up-scroll and down-scroll modules.

Program Listings 5 and 6 scroll the screen left and right. They, too, are very similar. Each starts by copying a screen row into the This_Line buffer. It then "ripples" the characters in the scroll area either to the left or right and replaces the last byte of the scroll area with a space. Each finishes by sending This_Line back to the screen and then asking TRSDOS to copy the next screen row into the This_Line buffer. The Table (on p. 94) outlines scroll-buffer usage.

The easiest way to get all four routines into the proper places in a file is to first create four separate /CIM files. With PRO-Create, you do so by specifying the -ci switch when you compile the program. Once all four modules are compiled, you can then use Program Listing 7 to combine them into a single Scroll/RTN file. Then it's time to debug the programs.

Debugging Techniques

Program Listing 8 demonstrates how to use the scroll modules and tests each module to ensure that it is working correctly. You can use it to debug the routines if you follow a few rules. First, type the following at TRSDOS Ready:

```
DEBUG (E) BASIC.BASIC (F = 4)
```

The first line loads and enables the extended debugger. The second includes Basic's password so that the debugger will work, and then tells Basic to create room for four file buffers. Before you get to Basic, you will see the Debug screen. Type G and Basic will continue to load.

Once you are in Basic, load Listing 8 and add the line:

```
10035 STOP
```

Then run the program. Just before Basic calls the first scroll routine, the program will halt. Type:

```
PRINT HEX$(SCROLL)
```

to find the address of the routine to which Basic is going to jump. Then press the break key to enter the debugger and set a break point at that address. For example, if the first scroll routine is at 68C5 hex, type:

```
G,68C5 <ret> <ret>
```

in the debugger. You will immediately return to Basic. Now type CONT and you will enter Debug at the beginning of a scroll routine. The process is easier to do than to explain, and you'll soon be adept at it.

In Debug, you can single-step through the scroll routine until you are satisfied that it is working correctly. When you

Listing 7 continued

```

5 DEFINT A-Z: COUNT = 1          ** 1416
10 OPEN "R",1,"SCROLL/RTN:0"    ** 1682
20 FIELD 1, 128 AS A1$, 128 AS B1$ ** 1754
30 OPEN "R",2,"UP/CIM"          ** 1254
40 GOSUB 1000                    ** 741
50 OPEN "R",2,"DOWN/CIM"        ** 1403
60 GOSUB 1000                    ** 743
70 OPEN "R",2,"LEFT/CIM"        ** 1392
80 GOSUB 1000                    ** 745
90 OPEN "R",2,"RIGHT/CIM"       ** 1477
100 GOSUB 1000                   ** 786
110 CLOSE: END                   ** 857
1000 FIELD 2, 128 AS A2$, 128 AS B2$ ** 1852
1010 GET 2,1                      ** 625
1020 LSET A1$ = A2$: LSET B1$ = B2$ ** 1859
1030 PUT 1,COUNT                 ** 995
1040 COUNT = COUNT + 1          ** 1296
1050 CLOSE 2                     ** 686
1060 RETURN                       ** 711

```

End

Program Listing 8. Scrolling demonstration program.

```

1 ' SCROLLING DEMONSTRATION PROGRAM ** 49
2 ' ** 50
3 ' Before you run this program, you must enter Basic from ** 51
4 ' TRSDOS with the command "BASIC (F=4)" in order to ** 52
5 ' create sufficient disk buffer space. ** 53
6 ' ** 54
7 ' This program assumes that the scroll modules are in ** 55
8 ' the first four sectors of SCROLL/RTN and that they are ** 56
9 ' stored in this order: Up, Down, Left, Right ** 57
10 ' ** 97
20 CLS ** 356
30 GOSUB 20000 'Initialize variables and load routines ** 789
40 'White-out screen and turn off cursor ** 180
50 PRINT CHR$(16);CHR$(31);CHR$(17);CHR$(15); ** 2559
100 'Set up screen ** 145
110 FOR I = 0 TO 7 ** 969
120 PRINT @ (1,0),STRINGS$(10,I+ASC("1")); ** 2375
130 PRINT @ (1,70),STRINGS$(10,I+ASC("1")); ** 2431
140 NEXT I ** 605
145 'Scroll blocks to center ** 154
150 FOR I = 0 TO 29 ** 1825
160 TOP=0: BOT=7: LFT=1: RGHT=I+10: DIR=RIGHT: GOSUB 10000 ** 3664
170 TOP=0: BOT=7: LFT=69-I: RGHT=79-I: DIR=LEFT: GOSUB 10000 ** 3755
180 NEXT I ** 609
185 'Scroll blocks back to edges ** 158
190 FOR I = 29 TO 0 STEP -1 ** 1503
200 TOP=0: BOT=7: LFT=1: RGHT=I+10: DIR=LEFT: GOSUB 10000 ** 3608
210 TOP=0: BOT=7: LFT=69-I: RGHT=79-I: DIR=RIGHT: GOSUB 10000 ** 3865
220 NEXT I ** 604
225 'Scroll blocks down ** 153
230 FOR I = 0 TO 15 ** 1819
240 TOP=I: BOT=I+8: LFT=0: RGHT=9: DIR=DOWN: GOSUB 10000 ** 3650
250 TOP=I: BOT=I+8: LFT=70: RGHT=79: DIR=DOWN: GOSUB 10000 ** 3697
260 NEXT I ** 608
265 'Scroll blocks together ** 157
270 FOR I = 0 TO 29 ** 1828
280 TOP=16: BOT=23: LFT=1: RGHT=I+10: DIR=RIGHT: GOSUB 10000 ** 3800
290 TOP=16: BOT=23: LFT=69-I: RGHT=79-I: DIR=LEFT: GOSUB 10000 ** 3891
300 NEXT I ** 603
305 'Scroll block up into itself ** 152
310 FOR I = 1 TO 8 ** 973
320 TOP=16: BOT=23: LFT=29: RGHT=50: DIR=UP: GOSUB 10000 ** 3500
330 NEXT I ** 606
335 'Scroll middle block apart ** 155
340 FOR I = 9 TO 0 STEP -1 ** 1450
350 TOP=8: BOT=15: LFT=1: RGHT=I+30: DIR=LEFT: GOSUB 10000 ** 3703
360 TOP=8: BOT=15: LFT=49-I: RGHT=79-I: DIR=RIGHT: GOSUB 10000 ** 3924
370 NEXT I ** 610
375 'Scroll one up and one down ** 159
380 FOR I = 7 TO 0 STEP -1 ** 1452
390 TOP=1: BOT=I+8: LFT=0: RGHT=30: DIR=UP: GOSUB 10000 ** 3407
400 TOP=15-I: BOT=23-I: LFT=49: RGHT=79: DIR=DOWN: GOSUB 10000 ** 3894
410 NEXT I ** 605
420 'Scroll to other side of screen ** 150
430 FOR I = 0 TO 49 ** 1828
440 TOP=0: BOT=7: LFT=1: RGHT=I+30: DIR=RIGHT: GOSUB 10000 ** 3699
450 TOP=16: BOT=23: LFT=49-I: RGHT=79-I: DIR=LEFT: GOSUB 10000 ** 3887
460 NEXT I ** 610
465 'Scroll bottom one to top ** 159
470 FOR I = 15 TO 0 STEP -1 ** 1499
480 TOP=I: BOT=0+I: LFT=0: RGHT=30: DIR=UP: GOSUB 10000 ** 3487
490 NEXT I ** 613
495 'Scroll together in the middle ** 162
500 FOR I = 0 TO 9 ** 974
510 TOP=0: BOT=7: LFT=1: RGHT=I+31: DIR=RIGHT: GOSUB 10000 ** 3698
520 TOP=0: BOT=7: LFT=49-I: RGHT=79-I: DIR=LEFT: GOSUB 10000 ** 3784
530 NEXT I ** 608
535 'Scroll the middle down and away ** 157
540 FOR I = 0 TO 18 ** 1826
550 TOP=0: BOT=17: LFT=29: RGHT=50: DIR=DOWN: GOSUB 10000 ** 3600
560 NEXT I ** 611
565 'Scroll the rest of the screen up and away ** 160
570 FOR I = 0 TO 9 ** 981
580 TOP=0: BOT=9: LFT=0: RGHT=79: DIR=UP: GOSUB 10000 ** 3361
590 NEXT I ** 614
600 'Turn cursor back on and end ** 150

```

Listing 8 continued



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Listing 8 continued

```

610 PRINT CHR$(14);CHR$(28);
620 CLOSE: END
660 '
10000 ' Perform a scroll and delay
10010 BUF(1) = TOP: BUF(2) = LFT: BUF(3) = BOT: BUF(4) = RGHT
10020 BUFFER% = VARPTR(BUF(1))
10030 SCROLL = DIR
10040 CALL SCROLL (BUFFER)
10060 RETURN
20000 ' Initialize variables and bring routines into the buffers
20010 DEFINT A-2: OPTION BASE 1
20020 DIM SCROLL, BUFFER, DIR, LEFT, RIGHT, UP, DOWN
20030 DIM TOP, BOT, LFT, RGHT, I
20040 DIM BUF(90)
20050 OPEN "R",1,"SCROLL/RTN": OPEN "R",2,"SCROLL/RTN"
20060 OPEN "R",3,"SCROLL/RTN": OPEN "R",4,"SCROLL/RTN"
20070 GET 1,1: GET 2,2: GET 3,3: GET 4,4
20080 UP = VARPTR(41): DOWN = VARPTR(42)
20090 LEFT = VARPTR(43): RIGHT = VARPTR(44)
20100 CLOSE: RETURN

```

End

Program Listing 9. Scrolling routine generator.

```

1 ' This program generates the SCROLL/RTN file
2 ' for the scroll routines.
3 '
10 CLS
20 PRINT "Checking data statements"
30 CHECK.SUM% = 0
40 FOR COUNT% = 1 TO 390
50 READ DAT: CHECK.SUM% = CHECK.SUM% + DAT
60 NEXT COUNT%
70 IF CHECK.SUM% = 1602581 THEN PRINT "Data is okay" ELSE PRINT
  "Data is incorrect.": END
80 PRINT: PRINT "What drive do you want to store SCROLL/RTN on ("
  0 - 7) ==> ";
90 D$ = ""
100 WHILE D$ < "0" OR D$ > "7"
110 D$ = INPUT$(1)
120 WEND
130 PRINT D$
140 FILE$ = "SCROLL/RTN:" + D$
150 OPEN "R",1, FILE$
160 FIELD 1, 255 AS RTNS
170 PRINT "Creating Scroll-Up Routine"
180 RESTORE 1000: UP$ = ""
190 FOR COUNT% = 1 TO 120
200 READ DAT%
210 UP$ = UP$ + MKI$(DAT%)
220 NEXT COUNT%
230 LSET RTNS = UP$
240 PUT 1,1
250 PRINT "Creating Scroll-Down Routine"
260 RESTORE 2000: DOWN$ = ""
270 FOR COUNT% = 1 TO 120
280 READ DAT%
290 DOWN$ = DOWN$ + MKI$(DAT%)
300 NEXT COUNT%
310 LSET RTNS = DOWN$
320 PUT 1,2
330 PRINT "Creating Scroll-Left Routine"
340 RESTORE 3000: LFT$ = ""
350 FOR COUNT% = 1 TO 75
360 READ DAT%
370 LFT$ = LFT$ + MKI$(DAT%)
380 NEXT COUNT%
390 LSET RTNS = LFT$
400 PUT 1,3
410 PRINT "Creating Scroll-Right Routine"
420 RESTORE 4000: RGHT$ = ""
430 FOR COUNT% = 1 TO 75
440 READ DAT%
450 RGHT$ = RGHT$ + MKI$(DAT%)
460 NEXT COUNT%
465 LSET RTNS = RGHT$
470 PUT 1,4
480 CLOSE
490 PRINT
500 PRINT "Scroll routines successfully installed in SCROLL/RTN:"
  ,D$
510 END
998 '
999 ' Data for Scroll-Up Routine
1000 DATA 9054, -19922, -7715, 4641, 6400, 30173, -8952, 2420
1010 DATA 25121, 6400, 30173, -8950, 2932, 32477, -8956, 150
1020 DATA -8900, 807, 32477, -8954, 662, -8900, 375, 6
1030 DATA 20189, 2306, 30173, -8946, 3956, 28381, -8952, 2406
1040 DATA 2533, 30173, -8948, 3444, -8735, 1614, -8951, 4213
1050 DATA 29917, -8943, 126, 30685, 261, 2305, 26333, -8955
1060 DATA 2654, 22237, 15083, -4337, 18141, 1283, -8763, 2142
1070 DATA 22237, -8951, 2670, 26333, 267, 80, -20243, 13533
1080 DATA 261, 2305, 26333, -8955, 2654, 22237, 15083, -4337
1090 DATA 13789, -8955, 3166, 22237, -8947, 3694, 26333, -8945
1100 DATA 334, 6, -20243, 1, -8951, 1382, 24205, -8952
1110 DATA 2390, 3902, -8721, 1332, 4289, -8783, 2142, 22237
1120 DATA -8951, 2670, 26333, 267, 80, -20243, 28381, -8948

```

Listing 9 continued

are ready to return to Basic, type G and your program will continue.

Using the Program

The scroll routines do no error checking. If you send them impossible values from Basic, the result will probably be a system crash. Therefore, save each version of your Basic program on disk before you run it. If you use a Radio Shack hard disk, also press the protect button while you are debugging your Basic program.

The routines assume that you are sending them possible values and that the scroll area is at least two columns wide and two rows high. I avoided many potential problems while I was writing Listing 8 by adding the following line:

```

10035 IF (BOT - TOP < 2) OR
  (RGHT - LFT < 2) OR DIR = 0 THEN
  PRINT "ERROR": STOP

```

Also, make sure that the buffer array and all scroll variables are integers and that they are all defined before they are used. If you don't want to include the DEFINT statement in line 20010, mark each variable name with a % so Basic will treat them as 2-byte integers.

Other than those warnings, the scroll routines are easy to use. The values for the top and bottom of the scroll area must be between zero and 23; the values for the left and right edges of the scroll area must be between zero and 79. Since Print @ uses the same values, you shouldn't have trouble remembering them. To get rid of the memory that the routines use, use the file buffers for other files and erase the buffer array.

If you don't have an assembler or would rather use the routines without the fun of assembling and debugging them, run Program Listing 9 to create the Scroll/RTN file from scratch. The program first verifies that you have typed the Data statements correctly and then uses them to create the four routines on disk.

These routines are not earth-shattering, but they can spice up your programs. If the scrolling area is small enough, they might be suitable for creating simple animation and graphics-type games. And you can use them to impress friends whose MS-DOS computers can only scroll screen areas up or down. ■



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 WE-SIG (PCS-117).

THE NEXT STEP

Listing 9 continued

1130 DATA 3430, -11803, -8941, 334, 6, 15883, 30496, -20243	•• 2865
1140 DATA 1, -8951, 1382, 24285, -8952, 2390, 3902, -13841	•• 2827
1980	•• 281
1990 ' Data for Scroll-Down Routine	•• 211
2000 DATA 9054, -10922, -7715, 4641, 6400, 30173, -8952, 2420	•• 2962
2010 DATA 25121, 6400, 30173, -8950, 2932, 32477, -8956, 150	•• 2925
2020 DATA -8900, 887, 32477, -8954, 662, -8900, 375, 6	•• 2646
2030 DATA 20189, 2306, 30173, -8946, 3956, 28381, -8952, 2406	•• 2998
2040 DATA 2533, 30173, -8948, 3444, -8735, 1614, -8951, 4213	•• 2934
2050 DATA 29917, -8943, 1150, 30685, 261, 2305, 26333, -8955	•• 2943
2060 DATA 2654, 22237, 15883, -4337, 18141, 1283, -8763, 2142	•• 2985
2070 DATA 22237, -8951, 2670, 26333, 267, 80, -20243, 13789	•• 2886
2080 DATA 261, 2305, 26333, -8955, 2654, 22237, 15883, -4337	•• 2940
2090 DATA 13533, -8955, 3166, 22237, -8947, 3694, 26333, -8945	•• 3063
2100 DATA 334, 6, -20243, 1, -8951, 1382, 24285, -8952	•• 2614
2110 DATA 2390, 3902, -8721, 1333, 4289, -8783, 2142, 22237	•• 2878
2120 DATA -8951, 2670, 26333, 267, 80, -20243, 28381, -8948	•• 2886
2130 DATA 3430, -11803, -8941, 334, 6, 15883, 30496, -20243	•• 2866
2140 DATA 1, -8951, 1382, 24285, -8952, 2390, 3902, -13841	•• 2828
2980	•• 282
2990 ' Data for Scroll-Left routine	•• 212
3000 DATA 9054, -10922, -7715, 4641, 6400, 30173, -8952, 2420	•• 2963
3010 DATA 25121, 6400, 30173, -8950, 2932, 32477, -8956, 150	•• 2926
3020 DATA -8900, 887, 32477, -8954, 662, -8900, 375, 6	•• 2647
3030 DATA 20189, 2306, 30173, -8946, 3956, 28381, -8952, 2406	•• 2999
3040 DATA 2533, 30173, -8948, 3444, -8735, 1614, -8951, 4213	•• 2935
3050 DATA 29917, -8943, 126, 30685, -8955, 838, 453, 2305	•• 2807
3060 DATA 26333, -8955, 2142, 22237, 15881, -4337, 24285, -8948	•• 3101
3070 DATA 3414, -7723, -8925, 334, 6, -4853, 16048, 4640	•• 2731
3080 DATA 1, -8951, 1382, 24285, -8952, 2390, 3902, -8721	•• 2785
3090 DATA 1332, 4289, -13881	•• 1424
3980	•• 283
3990 ' Data for Scroll-Right routine	•• 213
4000 DATA 9054, -10922, -7715, 4641, 6400, 30173, -8952, 2420	•• 2964
4010 DATA 25121, 6400, 30173, -8950, 2932, 32477, -8956, 150	•• 2927
4020 DATA -8900, 887, 32477, -8954, 662, -8900, 375, 6	•• 2648
4030 DATA 20189, 2306, 30173, -8946, 3956, 28381, -8952, 2406	•• 3000
4040 DATA 2533, 30173, -8948, 3444, -8735, 1614, -8951, 4213	•• 2936
4050 DATA 29917, -8943, 126, 30685, -8955, 838, 453, 2305	•• 2808
4060 DATA 26333, -8955, 2142, 22237, 15881, -4337, 24285, -8948	•• 3098
4070 DATA 4438, -7723, -8917, 334, 6, -4853, 16056, 4640	•• 2739
4080 DATA 1, -8951, 1382, 24285, -8952, 2390, 3902, -8721	•• 2786
4090 DATA 1332, 4289, -13881	•• 1425

End

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Continued from p. 33

20-Megabyte Test Drive

by Dave Rowell

★ ★ ★

The **PC20-1000** runs on the Models 1000 and comes with 1dir and Zyindex. Qubie, 507 Calle San Pueblo, Camarillo, CA 93010, 800-821-4479 (outside California), 800-987-9741 (inside California), \$549.

★ ★ ★

The **Statewide 20 Hard Disk Kit** runs on the Models 1000/1200 and comes with LeMenu. Statewide, Ten East 22nd St., Lombard, IL 60148, 800-882-8311, \$779.

Should you have 10 megabytes of hard-disk storage? Or do you take the plunge and buy a 20-megabyte hard disk? Ten megabytes of hard drive fills faster than you'd expect, especially if you collect software or have proliferating data files. But since Tandy doesn't sell a 20-megabyte drive for the 1000, you'll have to buy one from a third-party source. Fortunately, there are plenty to choose from, since hard-drive prices have taken as steep a dive as prices for computers.

I tested two inexpensive 20-megabyte hard drives from Qubie (\$549) and Statewide (\$779), both modified to the hardware peculiarities of the Tandy 1000. If you can find somewhere to put it, a second Qubie drive running off the same controller board costs \$399. If you have a Tandy 1200, there shouldn't be any problems with installation; just use the PC version. However, be sure to specify if you have a Tandy 1000.

Both companies supply the same Tandon 20-megabyte Winchester drive; it's the 3½-inch TM 626 with durable, plated data surfaces and a moderate power consumption (14W) that won't drain the 1000's power supply.

Other similarities between the two hard drives include inadequate installation instructions, one-year warranties, and bonus software. The Qubie drive comes with 1dir, a well-respected DOS shell program, (see the review in *80 Micro*, May 1986, p. 31) and Zyindex, a text-retrieval system. Statewide supplies LeMenu, another capable DOS shell program, with its hard drive.

Both drives come with half-size controller boards, with the EPROM-based controller software modified to use the 1000's deviant interrupt-request assignments. The Statewide unit comes with a Western Digital controller board and the Qubie with a customized Basic Time board. As with many expansion boards designed for IBM computers, you'll have to snip ½ inch from the Qubie board's

Similarities between the two hard drives include poor instructions and one-year warranties.

metal support bracket to fit it in a 1000 expansion slot.

What really differentiates the two drives (besides price) is the space each occupies in your 1000. The Qubie drive takes the place of floppy drive B at the top of the metal drive enclosure. Statewide's drive fills the empty space right outside the drive enclosure, in back of the speaker and in front of the fan; you can still fit three expansion boards and two floppy drives in your 1000.

The Qubie

Qubie's PC20, though cheaper, has problems with both the physical and software installation. The software problem is that you'll need to purchase PC-DOS 3.1 or acquire the hard-drive utilities that come with the 1000HD or Tandy's hard-drive kits. They're necessary for installation and Tandy doesn't supply them with the plain-vanilla 1000.

Getting the PC20 in the 1000's upper-drive compartment is hampered by poor instructions, which are too brief to be practical. Also, the accompanying photos are too poorly reproduced to be clear. You may find yourself calling Qubie's customer-service number, where prompt answers should ease your frustration. I had installation problems involving "four knurled bolts" that weren't included (because they're no longer necessary) and setting up the drive light.

The PC20 comes with both a full-height and a half-height front panel. To attach the appropriate panel, you must first plug a connector from the drive-activity indicator light in the black plastic panel onto two pins on the drive. Because the pins are recessed deep under the drive circuit board, they're hard to find and reach (the picture's no help). The drive is mounted in a cage (with shock-absorbing rubber bushings) that you slide into the Tandy drive area and fasten on the right side with two screws.

Qubie supplies a low-level format program, QUBIEFMT, to set up your new 20-megabyte drive. The drive comes formatted, and chances are you won't need

to redo the low-level format. If you want to change the interleave factor (which governs how many revolutions of the disk it takes to read a track), you can change it from the recommended setting with QUBIEFMT. This is not recommended unless you have a working knowledge of hard drives.

After low-level formatting, you must partition the hard drive with the DOS utility Fdisk and then perform a high-level format with Format or Hformat (depending on the DOS version). Both programs come with PC-DOS 3.1 or the MS-DOS 2.11 Tandy supplies with its hard drives. Qubie suggests using PC-DOS 3.1 with the PC20 because it formats hard drives larger than 10 megabytes using smaller clusters (the unit of disk space used for file allocation). DOS 3.x uses 2K clusters on a 20-megabyte hard drive, whereas DOS 2.x uses 8K clusters. If you have many small files, they'll take less disk space with DOS 3.x.

I ran the Qubie drive through standard performance tests that may or may not prove anything. The Core test of hard-drive performance showed acceptable times of 17 ms average for track-to-track and 92 ms average for random access. The Qubie specs list 80 ms for "average access time" with settling. The Doran test (using the Norton Utilities Disktest) ran fairly fast, taking 6 minutes, 29 seconds to test 20 megabytes and thus yielding 53.2 kilobytes per second (KB/s). A standard IBM PC/XT drive tests out at 44 KB/s.

The Statewide

Like the Qubie drive, Statewide's drive-installation instructions are also inadequate, but their software installation is easier. Statewide is revising their instructions to fit the 1000, but in the meantime, you'll have to depend on phone assistance. I'll summarize the procedure, emphasizing potential trouble areas.

Statewide's 20-megabyte drive hangs in the empty area between the 1000's three expansion slots and the metal drive enclosure. The Tandon drive is mounted on its side (no rubber bushings) in a metal cage, one end of which has two holes (and bolts) that match the two holes at the top front edge of the fan. The other end hooks over the 1000's inside metal front panel and slides under a bolt on the front panel. Because the drive frame must hook over the 1000's frame, it sticks up slightly (by the thickness of the metal). When putting the 1000's plastic case back on, you must push down slightly on the left side to get the left screw to go in.

Installation is easier if you install the cables before securing the drive. You must slip the three-wire power cord un-

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der the lower edge of the 1000's drive enclosure and plug it into the only connector it fits. The two ribbon cables are attached to the drive only and must be attached to the Western Digital controller card, which should be in the slot closest to the drive (it fits without modification). The 34-pin cable (the widest) plugs into the pin connector near the top of the card closest to the rear. The 20-pin cable goes to the connector just in front of the wider cable. Both cables must connect pin 1 on the drive with pin 1 on the corresponding controller connector. If the red edges of the two ribbon cables face towards the front of the computer, you're fine.

Software setup is simple. The Statewide drive comes formatted and partitioned with installation software already on the disk. If there is a problem, however, the instructions state that the drive should be sent back for reformatting. All you do to set up is boot the computer from drive A and run the setup program on drive C (or D if you already have a hard drive). The setup program is a batch file that calls on text files from the hard drive and programs on your system disk in drive A, putting your DOS's system files and Command.COM on the hard drive. You're also given the option of installing LeMenu (the DOS shell program) on the hard drive.

Just reboot the computer from the hard drive and you're off. All unnecessary setup files are deleted from the hard drive automatically. Statewide also supplies a copy of Park.COM to prepare the hard drive for moving (Qubie gives you QPark).

Stateside's 20-megabyte drive performed similarly to Qubie's with Core's performance test (17 ms track-to-track, and 100 ms average random-access time), as you might expect with the same Tandon drive. Stateside lists 65 ms for average access time. However, the Stateside drive ran the Doran test faster: 59.7 KB/s, which also surpasses an IBM PC/XT's performance (44 KB/s).

A strange thing happens when you first try to use LeMenu. It brings up the error message "Cannot execute as child of Basic." LeMenu is obviously compiled Basic. This is a problem peculiar to 1000s with hard drives and can be fixed by altering 1 byte in RAM with Debug before running the problem program. (See *80 Micro*, April 1986, p. 30). You can add a line to your Autoexec.BAT file that runs a small Basic program to fix the problem, but that's quite a task for an inexperienced user.

Once LeMenu is set up (the install program is compiled Basic, too), you can create a menu for your application programs on the hard disk or use an existing menu of DOS functions. It works smoothly, but function-key assignments aren't consist-

ent from screen to screen. There are extra capabilities like encryption, passwords, and marking files in a subdirectory for action by some DOS function. However, LeMenu isn't as powerful as a full-blown MS-DOS utility. For example, using LeMenu to examine the inside of a file produces only an ASCII interpretation and the function to see a disk's characteristics just invokes DOS's CHKDSK.

Conclusion

Is the Statewide drive worth \$230 more than Qubie's PC20? The chief consideration has to be location. Statewide's approach lets you have three drive units in the 1000, which to some people could be worth the price difference. My only concern here is the possible effect the Statewide has on cooling. It's placed right in front of the fan. By the time you've added a hard drive, you've probably got other power-consuming, heat-producing boards in there, too. Since the fan draws air out of the 1000, however, it may not matter.

Having to buy hard-disk utilities to set up the Qubie adds to its cost (\$85 for PC-DOS 3.1), but you will probably want the hard-drive utilities for either drive, anyway. DOS 3.1 has definite advantages over 2.11 for hard-drive users, especially with 20-megabyte drives.

While speed is always a concern, there is little real difference between the Qubie and Stateside drives. Both run faster than a standard IBM PC/XT drive with the Doran test, but somewhat slower with the Core test. The tests don't tell the whole story; the speed of a hard drive depends to a great extent on what you are using it for.

Other considerations are ease of setup, warranty, and the free software. While the Statewide drive is easier to set up, that's only a one-time experience. Both drives have one-year warranties, but Qubie also has a 30-day, no-risk guarantee of satisfaction. If you're new to hard drives and subdirectories, the DOS shell programs can make life simpler. However, LeMenu involves running a 1-byte RAM patch every time you use it. And as an extra, Qubie adds the text-retrieval program Zyindex.

The two drives rate about equally in their overall capabilities. Deciding which one to buy must be a decision based on your present and future computer system.

A final note: If your Tandy 1000 runs BIOS version 1.00 (displayed when you boot up), you should upgrade to BIOS 1.01 (approximately \$35 at a Tandy service center) before installing a non-Tandy hard drive. (See "A Hard Bargain," by Jim Creasy, *80 Micro*, June 1986, p. 68.)■

Sweet Memories

by Ryan Davis-Wright

★ ★ ★ ☆

The Zuckerboard comes with either 256K or 512K and works on the Models 1000/1200. A clock/calendar is optional. ATD, 1287 Lawrence Station Road, Sunnyvale, CA 94089, 408-734-4631. \$109 (256K), \$139 (512K), \$39 (clock/calendar).

★ ★ ★

The Turner Hall Card comes with 256K and a clock and works on the Models 1000/1200/3000. Turner Hall Publishing, 10201 Torre Ave., Cupertino, CA 95014, 800-556-1234 ext. 526. \$99.95.

★ ★ ★ ☆

Maxit comes with 256K and works on the Models 1000/1200/3000. McGraw-Hill Software, 8111 LBJ Freeway, Dallas, TX 75251, 214-437-7422. \$199.95.

The least expensive and most useful upgrade for your Model 1000 is more memory. Programs are demanding more RAM and you may find that you can't do without memory-resident programs. Any of these three half-length memory boards can upgrade your system; each however, fills a different need. The Zuckerboard and the Turner Hall Card both increase conventional memory to 640K. The Maxit board, however, adds memory beyond 640K, and you can use it in different ways.

Zuckerboard

The Zuckerboard is available in either 256K or 512K versions (both have the DMA [direct memory access] chip) and the price is probably the best you'll see for that amount of RAM. I tested the 512K version with the clock option. The instructions are specific to the Model 1000 (the only 1000-specific documentation of the three) and are very clear. The board even has a Tandy-style bracket. Installation is largely a matter of setting the jumper on the board for the correct amount of RAM, placing the board in an open slot, and turning on your computer. Instant 640K.

The Zuckerboard also comes with a disk that contains two clock utilities. Clockset sets the date and time while Clock sets the system date and time from an auto-executing batch file, saving you from typing it in at the DOS prompt. Both are small programs that don't occupy a lot of room (about 500 bytes each).

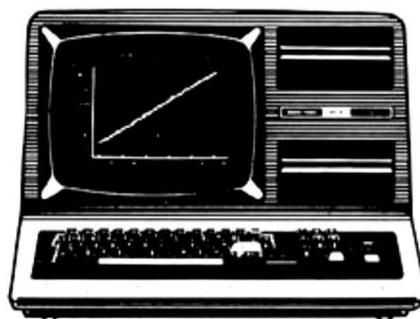
Turner Hall Card

The Turner Hall Card (256K) fills a spe-

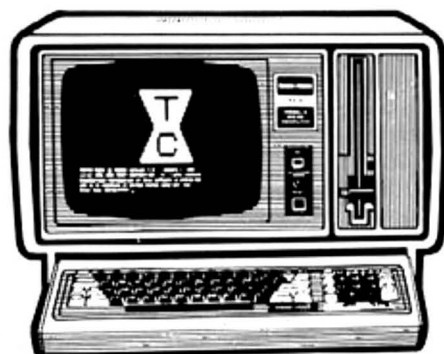
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cial niche. On the Model 1000, you can use it only to increase memory from 384K to 640K of RAM. However, if you own a 1200 or 3000, you can upgrade from any memory configuration. This is strictly a memory board and doesn't contain a DMA chip. Using two boards to gain 512K on your 1000 may seem like one board too many, but this happens when you upgrade incrementally. At \$99.95, the price is certainly right.

Like the Zuckerboard, installation is simple: Set the proper jumper switch and place it in an open slot. The Turner card doesn't have a back bracket, so there isn't the problem of trying to jam an IBM-type bracket into a Tandy slot. But there's more. The Turner card comes with programs for the clock, spooler, and RAM disk. You set both the clock and the RAM disk at startup with a system configuration file, and you can invoke the spooler at any time. You can set the RAM disk for any size and configure the spooler from 8K to 64K.

The documentation is clear but covers only IBM computers. This doesn't matter since the Model 1000 doesn't have any jumpers to set on the motherboard. The software documentation for the clock is extensive, but the documentation for the RAM disk and spooler is on the disk under the appropriate DOC files.

Maxit

Everybody needs more memory, but what do you do when you already have 640K and still need more room? Many board manufacturers are pushing either extended or expanded memory. But this doesn't help if you don't want to shell out big bucks for another board. The Maxit board (256K) is designed to give you more memory when you already have a full system. Usually, you can use any memory above 640K only for a RAM disk or print spooler. What is not generally known is that MS-DOS can address a full megabyte of RAM but reserves a portion of RAM above 640K for system memory. However, MS-DOS usually doesn't use all of this memory. Maxit works its own 256K into the holes that DOS system memory doesn't use.

Setting up the board is easy. Before installing Maxit, you need to run the program Sumaxit to test the memory you already have. I had the Zuckerboard (512K) installed for a full system of 640K. Since the Maxit board has four banks of eight DIP switches (32 in all), proper setup is important. Sumaxit tells you which switches need to be on or off and gives you the command parameters for setting up the Maxit software in an auto-executing batch or system-configuration file. You can also route this information to the printer. Next, you set the

Maxit's memory is there, but the 1000's video RAM blocks it off and prevents you from being able to see it.

switches on the board according to the information given and install it in an open slot. Maxit comes with an IBM-type bracket that doesn't fit in a Tandy slot, but the bracket is screwed on and easily comes off. Close your computer and run the verification program to make sure that all is set up properly. If the report is good, you're ready to set up a batch file to use the additional memory.

Maxit lets you use the extra 256K in two distinct ways. First, you can use it as an extension of RAM for Lotus 1-2-3 Release 1A or as a RAM area for memory-resident utilities. The other way to use it is as expanded memory that conforms to the Lotus/Intel/Microsoft specification. Programs that use expanded memory include such packages as Lotus 1-2-3 Release 2, Microsoft Windows, Framework II, and Symphony 1.1.

Though the instructions are very clear on how to set up your batch files, I immediately had a problem. I ran the AUTOEXEC.BAT file, which needs to have the Maxit parameters repeated twice. I then ran CHKDSK, to see how much memory I had. I not only didn't have more memory, I had less memory than before (by about 16K). What was wrong?

I rebooted and ran the Maxit program once from the DOS prompt, followed immediately by CHKDSK. This showed that I had over 950K. The situation was becoming strange. I again rebooted and ran the program twice from the DOS prompt; I got even weirder RAM information.

I called the technical department at McGraw-Hill to find out what was going on. It turns out that the Maxit program needs to run three times. The first time it determines the amount of Maxit RAM available, initializes its memory, and adds the new memory to the BIOS, and performs a soft reboot of the system. It then runs again, allocates memory wherever it is available until all memory is filled, and terminates. RAM-resident programs are then placed in the uppermost section of RAM. Maxit then runs a third time and initializes the system.

Where was all the extra RAM on the

1000? It was there, but hidden. A regular PC (or 1200 or 3000) would have one large block of contiguous RAM all the way through whatever RAM Maxit added. But the 1000's video RAM is different—it occupies a 16K memory space just below 640K.

Since CHKDSK doesn't see any memory above the largest contiguous block of RAM, Maxit sits above that video RAM, blocked off from view. To be fair, there is a section in the manual that tells you how Maxit works. It notes that CHKDSK will only read the largest block of contiguous memory. But then you have to know how the 1000 uses its video RAM and where it is.

To see if the RAM was there, I loaded a couple of memory-resident programs between the Maxit command lines. This set them up in Maxit's upper RAM area above the normal 640K workspace. CHKDSK showed the same amount of RAM available, but control-Alt pulled down Sidekick and control-zero pulled down WindowDos. And I still had all of my usual RAM to work with.

To find out how much memory I had up there, I tried to see how many RAM-resident programs I could load before they overflowed Maxit memory. The problem was in getting the different ones to work together. After a little trial and error, I was able to place Smart Notes (93K) and Sidekick (50K with a 50K notepad) up in memory with no decrease in the amount of RAM available. There were at least 200K of Maxit memory ready to be used.

You can also use Maxit to either fill in memory up to 640K (which would be a waste of its talent) or to expand memory, which is a form of bank switching. Maxit does conform to the Lotus/Intel/Microsoft specification. But since software that uses expanded memory isn't readily available and the amount of memory is only 256K, most people will probably use Maxit for memory-resident programs.

The documentation is very good, but as with the Turner board, the instructions are IBM specific. The problem with the Model 1000's video memory should be noted in the documentation. The manual gives numerous examples on how to use Maxit and has technical information about the way it works so that you can write programs for it.

Conclusion

All three boards occupy a certain niche and each does the job well. The Turner card and the Zuckerboard offer memory at a price that can't be beat. And Maxit offers features that no other board has. Each can help you inexpensively squeeze the highest performance out of your Model 1000. ■

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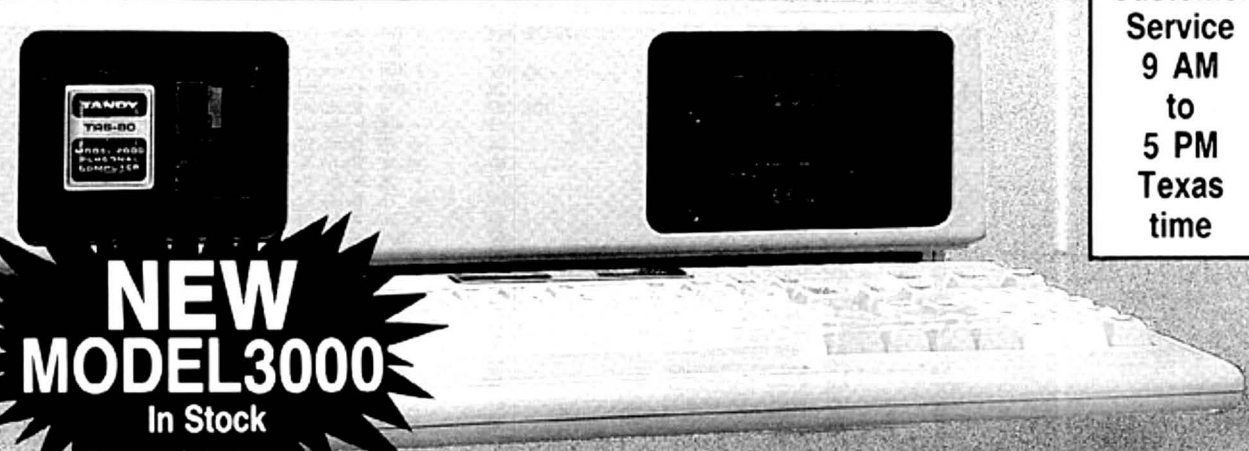
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- Compare the displayed line numbers and checksum values with the check-

sums shown in the listing. Find and correct errors in lines having checksum values that don't match.

—Beverly Woodbury
Technical Editor

Program Listing, Checksum.

```

10 'CHECKSUM/BAS by Beve Woodbury -- 2/7/86          '* 97
20 CLEAR 1000 :CLS:PRINT@140,"VERIFY CHECKSUMS ON PROGRAM" '* 3746
30 PRINT:PRINT:INPUT "Enter name of File to verify";P$ '* 4278
40 PRINT:PRINT:PRINT "List Checksums to:" '* 3234
50 PRINT TAB(10) "1. Printer":PRINT TAB(10) "2. Screen" '* 3638
60 PRINT:PRINT:PRINT TAB(30);:INPUT C '* 2484
70 OPEN "I",1,P$ '* 857
80 IF EOF(1) THEN CLOSE:END '* 1673
90 LINE INPUT#1,LS:L=VAL(LEFT$(LS,6)) '* 2234
100 A=VARPTR(LS):GOSUB 210:Q=PEEK(A) '* 2235
110 LS=PEEK(A+1):MS=PEEK(A+2):A=MS*256+LS:GOSUB 210 '* 3186
120 FOR K=1 TO Q:P=PEEK(A):CS=CS+P:A=A+1:NEXT K '* 2948
130 IF CS=0 THEN 80 '* 1885
140 IF CS<100000 THEN D$="-" '* 1500
150 IF CS<10000 THEN D$="--" '* 1485
160 IF CS<1000 THEN D$="--" '* 1478
170 IF CS<100 THEN D$="---" '* 1455
180 IF C=1 THEN LPRINT "Line";L;D$;CS:CS=0 '* 2693
190 IF C=2 THEN PRINT "Line";L;D$;CS:CS=0 '* 2619
200 GOTO 80 '* 627
210 IF A>32767 THEN A=(65536-A)+1 '* 1831
220 RETURN '* 660
    
```

End

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Traveling Companions

by Thomas Quindry

★ ★ ★ ★

TS-DOS runs on the Models 100 and 200 (24K) and requires the Tandy Portable Disk Drive. Traveling Software Inc., 11050 Fifth Ave. N.E., Seattle, WA 98125-6151, 800-343-8080. \$69.95

★ ★ ★

Lapdos runs on the Model 1000 (256K) and requires the Tandy Portable Disk Drive. Traveling Software Inc. \$89.95.

The Tandy Portable Disk Drive is an economical, efficient means of storing Model 100 program files. Unfortunately, the Tandy Operating System (TOS) is strictly a no-frills program. It allows access to program files only from the main TOS machine-language program. It also doesn't allow access to the drive from Basic or saving program-generated data directly to a disk file. And it provides no easy way to move data from Tandy's 3½-inch drive to another computer.

Traveling Software has a couple of products, TS-DOS and Lapdos, that not only give you more versatility with Tandy's drive, but also provide a means of moving data to and from an MS-DOS machine.

TS-DOS is a full-fledged operating system that can access Basic commands and provides a more convenient way to load and save disk program files. It also provides for sequential data storage and adding to existing files. TS-DOS can store data files up to 64K long.

With Lapdos, you can copy files to and from an MS-DOS computer. The Tandy drive plugs into the RS-232 interface of your Tandy 1000, 1200, 3000, or other MS-DOS compatible and uses Lapdos as the interfacing software.

TS-DOS and Lapdos are products worthy of attention, but the early versions of both programs experienced some operating problems.

TS-DOS

The program called TS-DOS is really a short, 600-byte loader program that will optionally load the operating system from a disk. You can run the operating system without ever saving it as a file in RAM or stored as a file in RAM for faster access. The TS-DOS operating system, called DOS100.CO for the Model 100 version tested, is close to 5K (2K bytes larger than TOS). You can save a significant amount of RAM memory by keeping only the TS-DOS loader in memory. Remember that with machine-language programs, available RAM must be dou-

ble the program size in order to both store and run the program. You don't need the loader program if you saved DOS100.CO in RAM.

Owners of Traveling Software's Ultimate ROM II have an advantage since the TS-DOS loader (but not DOS100.CO) is part of the ROM and can be called when needed. Hereafter, the name TS-DOS will refer to the entire operating-system program to avoid confusion.

TS-DOS is screen oriented; TOS is menu driven. Like the Tandy system, TS-DOS receives commands from the function keys. The TS-DOS system, though, gives you an on-line directory of either the Model 100 files or of the disk files in one of three screens. TS-DOS displays RAM files on one screen and disk files on two screens. Since a disk can hold up to 40 files, you toggle from one screen to the other to see all the disk files when there are more than 20 files on the disk. You select disk files to load or save in the same way that you select Model 100 RAM files for execution from the main menu: You move a reverse-video cursor over the file name and press a function key. This is much more convenient than the Tandy system where you have to remember which files are on the disk.

Nearly all TOS commands are available with TS-DOS. The exception is that TS-DOS has no command to back up the entire disk. This isn't a problem since you can use the Tandy system for that. TS-DOS has other features that make up for this not-too-serious shortcoming. When saving a RAM file to disk, you can add to an existing file. You have to be careful, though. If you make the file larger than your Model 100's available memory, you won't be able to load it back into your computer. You can always access a document in pieces as a data file from Basic, so you have a way of recovering all information you have saved.

Another nice pair of commands are Save All and Load All. They save or load an entire RAM bank to one file in much the same way as Traveling Software's T-backup program does for cassette. This is useful for files that naturally go together, such as a series of related text files or utility programs. Unfortunately, you must load as a block files that are saved in a block.

RAM Problems

Another drawback of the Load All command becomes apparent if you also own a second-party RAM module that gives an extra 32K, 64K, or 96K of memory in switchable banks. Loading all the files saved, say, from bank 1 into another bank will cause problems with that bank. With the Portable Computer Support Group (PCSG) optional RAM mod-

ule, that bank will be cold-started. With the PG Design optional RAM module, the result is less disastrous. PG's optional program to transfer programs between banks will not function properly. It will cause problems in one or more banks and may require you to cold-start the banks. The manual does not warn you of these problems.

TS-DOS versions up to 1.02 have a problem when used with PCSG option ROMs. It is a result of how the PCSG option ROM file name is stored in the Model 100 directory. The file name contains an unprintable character that shifts the TS-DOS directory entry of RAM files by one space. Any file name stored in the directory after the ROM file name selected to save to disk becomes garbled. You can neither load it back to RAM or kill it.

You can get around this problem by deselecting the option ROM and deleting its file name from the directory. Again, Traveling Software makes no mention of this problem in their manual. TS-DOS 1.03 (not reviewed) corrects this problem by not displaying file names with unprintable characters and not displaying file names for invisible files.

From Basic

TS-DOS's best feature is that you can access it from Basic commands. The TS-DOS program DOS-ON provides the hooks for operation from the Basic and text modes and keeps about 60 percent of TS-DOS active in memory to perform the functions after returning to your menu screen. The Basic commands available for use with disk files are Close, EOF, Input \$, Input #, Kill, LFILES, Line Input #, Load, LOADM, Merge, Name, Open, Print #, Print Using, Run, RUNM, Save, and SAVEM. TS-DOS determines commands that operate on disk files by the prefix 0-. TS-DOS has a sample Basic file that illustrates many of the commands.

The Tandy drive allows only sequential file access. Also, you can open only one disk file at a time. This is a minor inconvenience since you can open the active file and then open another.

The manual fails to explain how to run your existing machine-language programs (.CO files) while TS-DOS is active. Most likely, these programs will not load into the same area of RAM as the active DOS program. A program loaded from memory or from disk will more than likely hang up your computer. The command LOADM "0:file name.CO" loads the machine-language program into RAM in the location it runs and not into its storage position.

Lapdos

You can use Lapdos as either a stand-alone program or in the background like



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SideKick. When loaded in the background, Alt-L will call Lapdos. You can access Lapdos while using programs like Lotus and Framework, but not all programs are compatible with Lapdos. Programs that use the same two-key commands as Lapdos would cause problems. Programs that have their own unique way of addressing the operating system may also be incompatible. The LeScript word processor, for example, addresses the MS-DOS operating system in such a way that you can't use Lapdos from within it.

Lapdos's primary function is to transfer files between your Model 100/200 and your MS-DOS compatible computer and save them. Lapdos provides input/output (I/O) control between files in your desktop computer and the Tandy Portable Drive. Actually, you can use Lapdos with non-Tandy drives such as the Brother FB100; as the Lapdos manual explains. Brother manufactures the Tandy drive.

The Tandy drive transfers data through the RS-232 interface at a rate of 19,200 bits per second (bps). The current crop of MS-DOS computers has a maximum transfer rate of 9,600 bps. Fortunately, the Tandy drive has DIP switches on its bottom side that you can easily configure for 9,600 bps. The Brother drive has no DIP switches, but, unlike the Tandy drive, operates normally at 9,600 bps.

Lapdos has several commands that are similar to those that TOS uses, such as Copy, Erase, Format, Help, Quit, and Rename. When you select a different MS-DOS disk or portable drive disk for display in the Lapdos directory, you use the Log command. The View command lets you see exactly what is in your files. View displays ASCII characters only, so nondocument file displays will look a bit sketchy. The Wildcopy command uses conventions similar to those of MS-DOS for copying files from one disk to the other.

Computers with color-display adapter cards sometimes have small transient dots on the screen. The Snow command helps to correct this problem. If your computer can't quite read your portable drive because of a difference in timing, you can use the Timing command to alter Lapdos's timing. If you are using Lapdos as a background program, you can use the Unload command to quit and free the memory occupied by Lapdos. Otherwise, the Quit command gets you back to DOS or to the program you were running concurrently. You can use the Alt-L command again to get back into Lapdos.

If you use programs like ThinkTank, SideKick, or WordStar, the Xchange command can convert the file formats from these programs. Lapdos can convert to ASCII format or a format compatible with Traveling Software's Ideal program. Transfer can be both ways for

Lapdos can be RAM-resident, but it's not compatible with all programs.

most formats. Lapdos suggests a new file's format when you use the Xchange command. You can override this suggestion and select from the other formats available. If the other format is not applicable, Lapdos will tell you when you try to convert to it.

Like the Model 100 and 200, Lapdos is menu driven. The Lapdos screen is partitioned into two windows, displaying MS-DOS files on the left and portable-drive files on the right. A reverse-video cursor bar selects the MS-DOS or portable drive file name to be copied to the other disk. You select commands by either entering the command's first letter or by hitting the escape key and selecting the command by using the cursor keys. Lapdos provides other commands not on the menu. For example, pressing the tab key shows the time and date of the MS-DOS file selected by the bar cursor.

Lapdos displays 40 files of each type on your desktop monitor concurrently. Since the Tandy 3 $\frac{1}{2}$ -inch disk format allows up to 40 file names in its directory, all portable disk files appear at one time in two columns. MS-DOS directories can hold many more file names but only 40 file names of the MS-DOS disk can be displayed at a time. Lapdos scrolls the MS-DOS directory to view all file names on the disk, but this function leaves much to be desired. Each time the screen is scrolled, Lapdos reads the directory off the disk to get two more file names to display. Disk access takes time, and it seems to take forever to scroll through an MS-DOS disk if more than 40 files exist. Lapdos needs a paging function to display up to 40 file names at a time.

Connector Problems

There are several problems with Lapdos. The current Lapdos hardware consists of a 25-pin female-to-female adapter (commonly known as a gender bender) to connect the Tandy portable drive to your desktop computer. Unfortunately, signal levels between some desktop computers and the drive may be marginal due to the Tandy drive's low-level signals. Traveling Software is looking at a different device for Lapdos that will condition the communication signals to give more compatible levels between the

desktop computer and the Tandy drive.

Though the Tandy 1000 doesn't normally have this signal problem, several times during my use of Lapdos on the Tandy 1000 with the gender bender, the communication between the two devices was insufficient and the message, "Drive not responding" appeared. I regained communication after fiddling with the drive's DIP switches and turning it off and on. I don't really believe my fiddling with the drive actually did anything to correct the problem, though. Perhaps signal levels were marginally sufficient for communication to resume.

Error Trapping

In the current version of Lapdos (B108), a number of software problems exist. If the MS-DOS disk is full, you receive no error message when you attempt to save additional files to the disk. If you examined the MS-DOS directory, you would see the file name and an allocation of zero bytes. DOS errors are not trapped well. If you use the Wildcopy command, document files over 7,000 bytes long give you DOS's stack-parameter error, exiting you from the program.

If Lapdos was installed in the background when this error occurred, you would not be able to access it again with the Alt-L command. If you tried to reinstall it in the background, you would receive a message that it is already installed. To install Lapdos in the background again, you must reboot. In fact, any DOS error, such as leaving a disk-drive door open, gives you the same condition.

The Wildcopy function acts only on the MS-DOS files that are currently displayed. When you press the tab key, you sometimes get false information on the time and date at which the MS-DOS file was saved.

If you rename a file and change the extension, your computer will sometimes do the equivalent of a cold reboot if you try to load it in your Model 100.

Conclusion

TS-DOS is much preferable to the Tandy operating system. Commands are self-explanatory and the program is easy to use. You will need the manual only for a short time before gaining experience using TS-DOS. The only complaints I have concern the pitfalls the manual doesn't tell you about. In spite of these shortcomings, I recommend TS-DOS highly.

Lapdos adds features to the use of the Tandy drive that are not found in any other program at this time. However, the Lapdos software doesn't seem fully mature. I recommend Lapdos, but when purchasing, be sure to ask if the version you are buying corrects the problems discussed above. ■

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Going For a Song

by David Engelhardt

★ ★ ★

TuneSmith runs on the Models 1000/1200/3000 (256K) and requires one disk drive. Blackhawk Data Corp., 307 N. Michigan Ave., Chicago, IL 60601, 312-236-8477. \$59.95

Computers may be great for word processing, data bases, and spreadsheets, but all work and no play makes for a dull boy. TuneSmith allows the musically inclined to create, providing all the necessary functions to compose, edit, and play tunes.

Since TuneSmith was written for the IBM PC, it contains only a single-voice sound generator and doesn't take advantage of the Tandy machines' three-voice capability. Another drawback is that you have to input all music as Data statements.

The program comes on a copy-protected disk; you can make one backup and load the program to your hard disk. To run the built-in editor to create and edit songs, you must have the original TuneSmith disk in drive A.

Music, Please!

From TuneSmith's main menu you can choose from 15 options, which are mostly demo programs. TuneSmith also includes a short tutorial and music editor. The music programs consist of BasicA Data statements containing parameters and optional comments. These parameters contain some of the same commands used to create music with BasicA's Play statement. TuneSmith doesn't recognize some extensions of these commands, such as the X and N functions.

TuneSmith has an added function not used by Play—the letter Z. You insert a Z into a Data statement to halt TuneSmith so you can continue to create or make changes. You can also insert multiple halts within the music selection.

To make a song, you first create the melody line. This is the first statement and sets the mode, tempo, and the length of the note. Notes may be played in 3/4 or 7/8 of their original length.

The rest of the song consists of Data statements containing Play commands. You can insert comments or text into the selection by following a Data statement with a quotation mark and a blank space (DATA "This is a comment").

You can enter the editor by pressing F6 after you've made a selection or at any time during the play process. While you're in the edit mode, you have full use of the arrow keys, PgUp, and PgDn to

TuneSmith/PC Music System Version 1.0 Source File: FOGGY.BAS
Mmeasure:28 Beats:1.5 Tempo:220 Length:1636 Legato

F1	play slower	AltA (copy) After	CsrDn	start next bar
F2	play faster	AltB cycle Bgrd color	CsrLft	left 1 char
F3	play lower	AltC Copy (from. . .to)	CsrRgt	right 1 char
F4	play higher	AltD Delete line	CsrUp	start prev bar
F5	buff/sync	AltE cycle Edge color	DEL	erase char
F6	play/edit	AltF cycle Fgrd color	END	end of bar
F7-10	reserved	AltH Help (this screen)	^END	erase to end
BKSP	crslft + del	AltL play Line	HOME	start of bar
Enter	step thru bar	AltM Menu (load file)	^HOME	erase from beg
ESC	step thru note	AltN Notes on/off	INS	insert mode
TAB	tab right	AltP Play screen	PgDn	down 5 bars
ShfTAB	tab left	AltQ Quiet on/off	^PgDn	bottom of file
		AltR Repeat line	Pgup	up 5 bars
		AltS Save file	^PgUp	top of file
		AltX eXit		

Note:9 Duration:32 Pitch:G Octave:1
Rate:1 Transpose:0 PlayMde:Buff RunMode>Edit Spacc: 49698
1Slower 2Faster 3Lower 4Higher 5P1Mode 6RnMode

Figure. TuneSmith help screen.

move through a Data statement in both directions and also insert and delete characters. The program supports color monitors and lets you change the border, foreground, and background colors.

The main menu lists a tutorial program. It runs through many of the editing and playback abilities and allows you to perform requested functions during the tutorial. A single help screen is available by pressing the ALT-H keys (see the Figure).

While in the edit mode, you can play music a note or line at a time, or you can display the current selection. You can also change the song's pitch, speed it up, slow it down, and change octaves. It's easy to change parameters to get different variations of the same song.

You can play back the music via two methods: buffered and synchronous. You would normally use the buffered method, as it allows TuneSmith to keep up with the music by inserting the data into a play buffer. You would use the synchronous method while entering new music and playing it back to get the right sound.

The top two lines of the music screen always display information on the music selection, measure, beats, tempo, and length. The second line from the bottom shows the current note in the Data statement being played along with its duration, pitch, and octave. This information is useful when playing back music a note at a time.

The bottom line gives details on the speed of play, octave changes, play

mode, run mode, and space available. Pressing the function keys F1-F6 changes the parameters shown on the bottom line.

The right side of the screen contains a "dancing note," or rest on a treble or bass clef. When the note's value is within these two clefs, it appears in the correct position on the staff. If the note is above or below the staffs, numbers appear at the top or bottom to indicate where the note is in the score. The bottom of the screen portrays a piano keyboard. As the music plays, a small dot appears over the key that corresponds to the note playing.

You can save your selection and then return to the main menu to select another song, edit, or exit to DOS. For safety's sake, TuneSmith prompts you to save any selection if you've made changes.

Conclusion

The manual is short and to the point. It gives you just enough information to use the program, but the only good way to learn TuneSmith is to start playing with it. My only complaint with the manual is that it wasn't current with the version of TuneSmith I reviewed.

If you enjoy experimenting, the manual shows you how to connect an external speaker and a stereo amplifier to the computer. While I didn't attempt this, I expect that the result would be worth the effort.

If TuneSmith sounds this good with only one voice, I would love to see a newer version that takes advantage of the Tandy machines' three voices. ■

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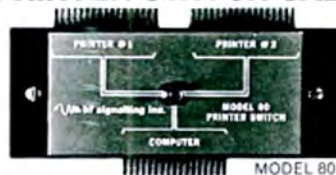
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Stylus

★ ★ ★

Stylus runs on the Models I and III (48K) and one disk drive. Donald W. Ady, 56 Oak Ridge Ave., Summit, NJ 07901. 201-277-3365. \$64.50.

Stylus is a Model III word processor with a few interesting extras thrown in. It has all the usual features of insert, replace, delete, and so on, but it can process graphics as well as text. You can print out graphics on a dot-addressable Epson printer, but graphics printing might not be possible on non-Epson compatible printers. Nevertheless, you can set up Stylus for most printers by running a special configuration program.

Stylus's graphics-processing features include graphics animation, creation of screen displays that can be merged with a Basic program, and a zipper. While these Stylus extras work well, you might find them of limited usefulness because they don't apply to word processing.

The Stylus documentation consists of a 64-page manual and numerous help screens. While the manual is lengthy, lack of organization makes locating a particular topic difficult. The organizational problems are compounded by the lack of an index. Fortunately, the program's extensive help screens answer most questions, so you don't need to refer to the manual.

As it stands, Stylus is a good package and deserves your attention if you are in the market for a low-cost word processor.

—Mark D. Goodwin

Inside the TRS-80 Model 100

★ ★ ★

Inside the TRS-80 Model 100. Soft-cover, 334 pp. Carl Oppedahl, Weber Systems Inc., 8437 Mayfield Road, Chestland, OH 44026. 216-729-2858. \$19.95.

Inside the TRS-80 Model 100 is a definitive guide to the inner workings of the Model 100—from a hardware and an Assembly-language programming point of view. It stresses hardware discussions rather than software.

The first part of the book gives you an overview of Assembly-language programming and machine-language concepts and terminologies. Chapters 1 and 2 provide an introduction for the uninitiated; without an understanding of the Assembly-language jargon, you could easily get lost.

The middle chapters creatively use explanations of hardware to sneak you into the Assembly-language aspects of the

On the 1000, maneuvering is a bit stiff, but on a 3000, the action is as smooth as silk.

ROM that apply to the particular hardware being discussed. ROM information (calls) is discussed.

Not until the end of the book is there further text on the software. Chapter 18 gives a good explanation of ROM routines that aren't expressly tied into the hardware functions. It explains different vectors (pointers) that are stored in memory to ensure proper computer operation. Included is a good table of the vectors and other information stored in RAM above address F5FOH (62960 decimal).

Appendices provide other information for the Assembly-language programmer, including a good ROM map. In addition to an alphabetical index, there is a useful index that tells where certain ROM memory addresses are explained in the book.

Though rather cool to the idea of having to wade through the hardware explanations, I gleaned some useful bits of information from reading this portion of the book. Each of the middle chapters has a software section that tells how sub-routines in ROM apply to the hardware.

Hardware enthusiasts who are writing Model 100 software would probably find the book useful. If you are only interested in Basic, you won't benefit very much, though one chapter does cover Basic commands for input/output and other things not explained well in the Model 100 manual. Someone who is well versed in Assembly language and wants to quickly learn how to program for the Model 100 would probably benefit most.

—Thomas Quindry

Master File

★ ★ ★

Master File runs on the Model III (48K) and requires one disk drive. Ultimate Software, P.O. Box 1291, Hayden Lake, ID 83835. \$29.95.

There are many powerful, expensive data-base and filing programs out there for the serious user. But if you just want to keep a small mailing list for your club or perform some other small filing application, Master File comes in handy. It

looks a bit crude (it is written in Basic), but once you start using it, you uncover a powerful program.

While the documentation was printed on a dot-matrix printer, it is well written and makes learning the program easy. The program disk comes with a sample data file that the documentation uses to demonstrate program operation. The program menus, however, were different from those the manual mentions.

Master File consists of three main parts: the Screen, Filer, and Print programs, which are all accessible from the main menu. To start a new file, you must first create a screen file with the different field names. This sets up the format in which information is to be entered, edited, and printed. You can add fields after you've begun a file by just adding them to the end of the screen file.

The Filer program lets you add, search, or change data. Records can't be deleted, but you can enter new information over the unwanted data.

Master File has a feature-filled Print program. It provides two output types: listings or mailing labels. The listing is printed with the field names as headings; items are printed in ascending or descending order by any field and record you choose. This includes picking a value and printing records that are greater than, less than, or equal to that value; or using two values and printing records greater than, less than or equal to them. You can also print the total of any field.

Printing labels is almost identical to printing a list, but you can design the output in six lines and can print one or two labels across.

The Command File, which allows you to save all the print options that are required for printing and recall them when you want to print a file, contains the only bug in this program. The Command File couldn't find the file for printing, even though it was there. Check with Ultimate Software to see if this error has been fixed.

While Master File isn't a fancy program, it is well written and does the job. It is also fast, for Basic. The sort routine is written in machine language, making it fast, as well. If you have a small job that needs an inexpensive solution, Master File can help.

—Edward Spitzbarth

Jet

★ ★ ★ ★

Jet runs on the Models 1000/1200/3000 (256K) and requires one disk drive. SubLOGIC Communications Corp., 713 Edgebrook Drive, Champaign, IL 61820. 217-369-8482. \$49.95.

EXPRESS CHECKOUTS

Careening off the flight deck, I quickly scrambled left, trying to shake the three MIGs coming in fast. The fateful beep-beep-beep of the incoming missiles told me that I had to do some quick maneuvering. I pulled the jet around, but the red flashing lights told me I was hit. The MIGs fly past me, the pilots grinning, as I eject from the jet. I'll get them next time. I say to myself.

Actually, there are too many next times in Jet, the supersonic shoot'em-up game. You take off, you fire at some enemy jets, and you get hit (at least that's what happens to me). And then on to the next game.

You have two jets: an F-16 (land based) or an F-18 (carrier based). After choosing your flying mode, you choose your mission (target or dogfight). You can also try a demonstration mode or free flight. The difficulty range is from zero to 9, although it doesn't seem to become more difficult above level 5. You can choose which missiles and bombs to carry on your mission, but beware of overloading the jet.

Carrier missions are the most fun; land-based missions lack the excitement of taking off from and landing on the carrier. There just isn't enough variety in the landscape and missions.

Unlike Microsoft's Flight Simulator, Jet isn't suited for long-distance flying, although you can load scenes from Flight Simulator into Jet. Cruising around New York City or Los Angeles at Mach 2 has its points, but you quickly tire of it.

On the Model 1000, the maneuvering is a bit stiff. While you are flying Jet, it seems more like a Cessna. But on a Model 3000, it's another story. The action is as smooth as silk as the jet takes off, and the colors on the CM-1 monitor (with the Enhanced Display Adapter) are exceptionally sharp. Of course, since the 3000 runs at about twice the speed of the 1000, you can also get shot down twice as fast.

Landing on the carrier is tricky; if you screw up, you crash. I always seem to pull the nose up too soon, come in too fast, or skid off the edge. And if you dawdle too much in making a landing, then enemy jets are likely to appear and try to shoot you down. If you are low on fuel, you had better land in a hurry and rearm.

There seems to be a bug in the program: The acceleration sticks and you can't step it down to either land or conserve fuel. The only way out is to press the escape key and start over.

While Jet is a lot of fun, the entertainment factor diminishes quickly, leaving you thirsty for other thrills and challenges. Two years ago, a visual feast like this would have seemed amazing. Now, it's just another game.

—Ryan Davis-Wright

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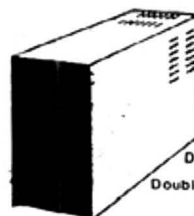
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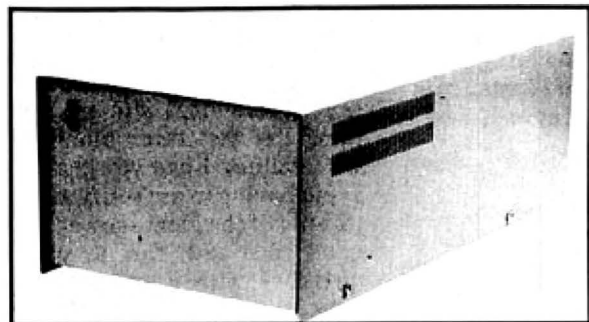
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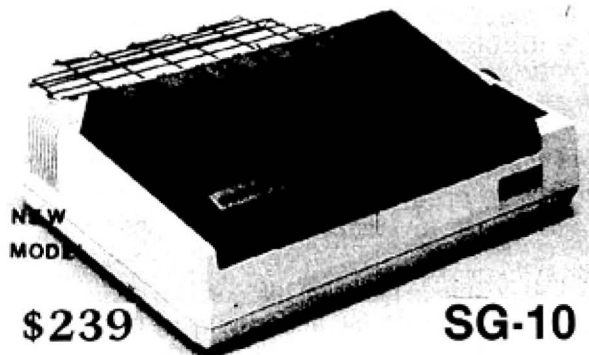
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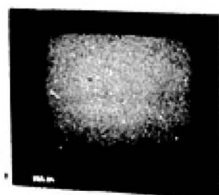
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HOT CoCo

For the Color Computer

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and Richard W. Libra*
- 145. **Color Monitor** *by Scott Norman*

Speed Demons

by Harold Nickel

Software developers labor under the paradox that it takes a long time to write in low-level languages chosen for their superior speed and efficiency.

To reduce the amount of code that must be written in a low-level language, main-frame programmers make use of the "20/80 Rule," which states that 20 percent of the program code accounts for 80 percent of the execution time. My cassette-based programs, CTrace and ATrace, identify these most-used program lines so you can rewrite them for greater efficiency.

Ghosts in the Machine

CTrace (cassette trace) installs machine code that stores Basic line numbers on tape (see Program Listing 1). It POKEs three machine-code routines into high RAM starting at 7F37 hexadecimal (hex), along with a new Basic statement jump table (see the Figure for a machine-code translation).

The code under the first three subroutine labels is specific to the three CTrace routines, while the last two labels mark code commonly used by any of the previous routines.

The SETLNK routine puts a hook into the Basic interpreter that calls line-number storage logic, and replaces the jump-table pointer with the new table's address. SETLNK also initializes a tape buffer and writes the first line-number record.

STRNUM, the logic routine for storing active Basic line numbers, executes each time the Basic interpreter evaluates an expression. It copies the current line number at 68 and 69 hex into the tape buffer at 1DA hex; when the buffer is full, STRNUM writes it to tape.

The Finish routine holds the new End-statement logic. When you execute an End in the Basic program, Finish stores the line number in the tape buffer, writes the record, and closes the file. The program then removes the hook from the Basic

System Requirements

32K RAM
Extended Color Basic
Cassette
80-column printer

Label (Addr)	OP Code:Operand	Assm. Instr	Description
SETLNK (7F37)	8E 7F 50	LDX	Load X with STRNUM address
	BF 01 8C	STX	Store X in interpreter link
	8E 7F 96	LDX	Load X with new Table address
	BF 01 23	STX	Store X in Jump Table pointer
	8E 00 00	LDX	Load X with zero (0)
	BF 01 DA	STX	Store X in tape buffer
	8E 01 DA	LDX	Load X with buffer address
	C6 92	LDB	Load B with two (2)
28 34	BRA	Branch to WRTBUF	
STRNUM (7F50)	8D 1F	BSR	Branch to GETNUM
	C1 77	CMPE	Compare B with max-1 (119)
	2D 02	BLT	Skip next if less than 119
	8D 2C	BSR	Branch to WRTBUF
	7E 88 46	JMP	Jump to normal interp. link
FINISH (7F5B)	8D 14	BSR	Branch to GETNUM
	8D 25	BSR	Branch to WRTBUF
	BD A4 91	JSR	Jump to Close Tape File logic
	8E 88 46	LDX	Load X with old link address
	BF 01 8C	STX	Store X in interpreter link
	8E AB 67	LDX	Load X with old Table address
	BF 01 23	STX	Store X in Jump Table pointer
7E AE 02	JMP	Jump to END command logic	
GETNUM (7F71)	F6 00 79	LDB	Load B with buffer counter
	8E 01 DA	LDX	Load X with buffer address
	10 BE 00 68	LDY	Load Y with line number
	10 AF 85	STY	Store Y in tape buffer
	CB 02	ADDB	Add two (2) to B
	F7 00 79	STB	Store B in buffer counter
	39	RTS	Return
WRTBUF (7F84)	BF 00 7E	STX	Store X for Tape Buf. address
	F7 00 7D	STB	Store B for Tape Block length
	C6 01	LDB	Load B with Tape Block type
	F7 00 7C	STB	Store B for Tape Block type
	BD A7 E5	JSR	Jump to Write Tape Blk logic
	7F 00 79	CLR	Clear buffer counter
	39	RTS	Return

Figure. CTrace machine-code translation.

interpreter, resets the Basic statement jump-table pointer to the original address, and jumps to the normal End logic.

The Basic-statement jump table placed in high RAM by CTrace is the same as the original, except that the Finish address replaces the End statement address. All Basic statements except End will be directed as usual to the original logic and function address.

ATrace (analyze trace) summarizes tape-file data and prints a graph displaying the line numbers' relative frequency and listing the number of occurrences. The program can create up to 2,048 table entries for line numbers and advances a counter with each line added. Data errors are noted on screen.

When the graph prints, the most frequently occurring line is shown as a 60-character horizontal bar; other line frequencies are represented proportionately.

After choosing a Basic program to profile, run CTrace. On screen will be the

following list of criteria the object program must meet: It can't write to tape or execute a general Close statement (which closes the tape file) and must not clear memory above 32,566 decimal (that would clear the machine code); it must finish with an End statement; and line zero must contain the statements

```
OPEN"O", -1,"TRACE":EXEC 32567
```

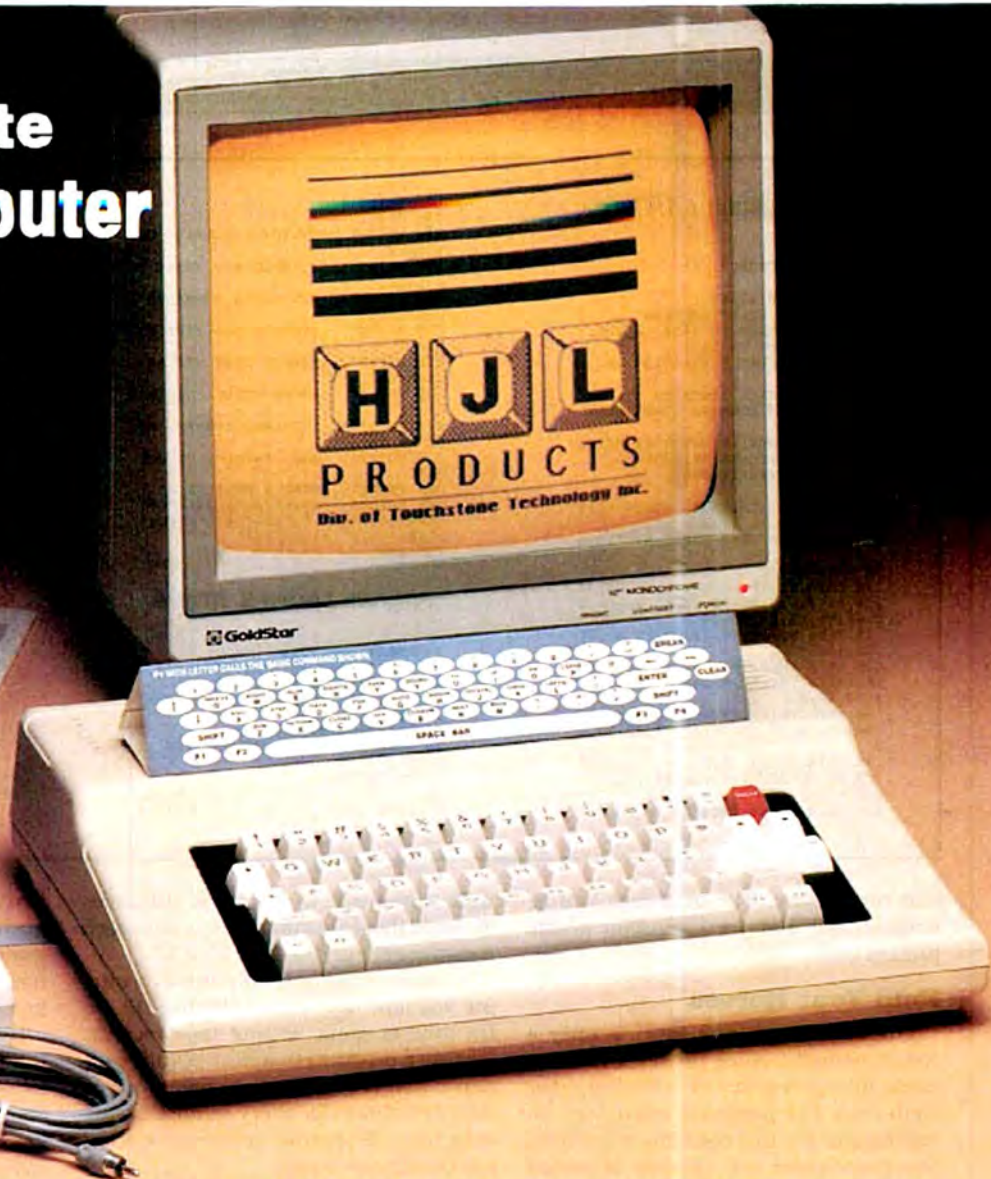
which open the tape file and execute SETLNK. If a line zero already exists, add the statements to the beginning of the line.

Load the Basic program, modify it to meet the criteria, and make sure the cassette player is recording. If the program stops before executing an End statement, the data will continue to be written to tape; enter End from the keyboard to close the file.

Next, rewind the tape and turn on the printer. Enter a New command to ensure that full memory is available, and load

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Program Listing 1. CTrace.

```

# 'INSTALL CTRACE
1# CLS
11 CLEAR 2# 32567
2# A=J2567:START ADDRESS
21 L=95:NUMBER OF DATA VALUES
3# FOR X=A TO (A+L)-1
31 READ H$:POKE X,VAL("&H"+H$)
32 NEXT X
4# PRINT"CTRACE INSERTED AT ";A
5# 'POKE NEW COMMAND JUMP TABLE
6# B=A+L
7# FOR X=(PEEK(&H123)*256)+PEEK(
&H124) TO X+(PEEK(&H12#)*2)-1
71 POKE B,PEEK(X):B=B+1
72 NEXT X
73 POKE(A+L)+2#,&H7P:POKE(A+L)+2
1,&H5B
8# PRINT"NEW JUMP TABLE AT ";A+L

9# GOTO 15#
1# DATA 8E,7F,5#,&H1,8C,&H,7F
,96,&H,23,8E,&H,&H,&H,&H,DA,8
E,&H,DA,C6,&H,2,2,34
11# DATA 8D,1F,C1,77,2D,&H,2C
,7E,88,46
12# DATA 8D,14,8D,25,8D,A4,91,8E
,88,46,&H,&H,1,8C,8E,AB,67,&H,&H,2
,3,7E,AE,&H,2
13# DATA F6,&H,79,8E,&H,DA,1#,&H
,&H,68,1#,&H,AP,85,CB,&H,2,F7,&H,79,3
9
14# DATA BF,&H,7E,F7,&H,7D,C6,&H
,F7,&H,7C,8D,A7,E5,7F,&H,79,39
15# PRINT
16# PRINT" THE PROGRAM TO BE TES

```

```

TED MUST*
17# PRINT" MEET THE FOLLOWING CR
ITERIA."
19# PRINT"1. IT MUST NOT PRINT T
O TAPE."
2# PRINT"2. ANY close COMMANDS
USED MUST*"
21# PRINT" SPECIFY NON-TAPE FI
LES."
22# PRINT"3. MEMORY MUST NOT BE
cleared*"
23# PRINT" ABOVE 32566 (DECIMA
L)."
24# PRINT"4. THE LAST COMMAND MU
ST BE AN*"
25# PRINT" end, return, OR got
o."
26# PRINT"5. LINE # MUST BE -"
27# PRINT" open":CHR$(34):"o":
CHR$(34):"-1":CHR$(34):"trace"
:CHR$(34):":hexec32567"
28# END

```

End

Program Listing 2. ATrace.

```

# 'TRACE ANALYSIS
1# DIM T(2#48,1),L(#),N(#),S(#),
X(#),Y(#),SS(#):T(L,1)=1
2# CLS:INPUT"push enter to start
":SS
3# PRINT"GETTING TRACE..."
4# OPEN"1",-1,"TRACE":POKE126,1:
POKE127,218
5# EXEC42753
6# IF PEEK(129)># THEN PRINT"REA
D ERROR, CODE#":PEEK(129):GOTO5#

```

```

7# IF PEEK(124)>1 THEN GOTO15#
8# FOR X=474 TO 474+PEEK(125)-1
STEP2
9# L=(PEEK(X)+256)+PEEK(X+1):Y=#
1# FOR Y=# TO N:IF L=T(Y,#) THEN
N T(Y,1)=T(Y,1)+1:GOTO 13#
11# NEXT Y
12# N=N+1:T(N,#)=L:T(N,1)=1
13# NEXTX
14# GOTO5#
15# IF PEEK(124)=255 THEN PRINT"
EOF.":GOTO17#
16# PRINT"BLK TYPE ERROR, CODE#":
PEEK(124):GOTO5#
17# CLOSE:S=#:Y=#:L=#:PRINT"PROF
ILE BEGINS..."
18# FOR X=# TO N:IF T(X,1)>Y THEN
N Y=T(X,1)
19# S=S+T(X,1):NEXTX
2# FOR X=# TO N:IF T(X,#)<T(L,#
) THEN L=X
21# NEXTX
22# IF T(L,#)-999999 THEN GOTO 2
7#
23# PRINT#-2,RIGHTS(" *+S
TR$(T(L,#))+ ".1#):
24# PRINT#-2,LEFT$(STRINGS((6#Y
)*T(L,1),"*"),6#):
25# PRINT#-2,TAB(71)*("):T(L,1):"
)
26# T(L,#)-T(N,#):T(L,1)=T(N,1):
T(N,#)-999999:N=N-1:GOTO2#
27# PRINT#-2,"":PRINT#-2,"TOTAL
COUNT=":S
28# PRINT"ANALYSIS COMPLETE."
29# END

```

End

and run ATrace. The tape data will be summarized and the execution profile printed out.

Hold Your Horses

The line-frequency total is only a rough estimate, since the hook into the Basic interpreter stores a line number each time the program evaluates an expression. If a line contains more than one expression, its number is stored more than once. Execution time, however, can be more accurately given because program speed is directly related to the number of commands.

No line number is stored for the following statements: CLS, Data, DEF, GOSUB, GOTO, Input, Next, PCLS, Read, REM, Restore, Return, Stop, TRON, and TROFF. Most of these are associated, however,

with statements that CTrace evaluates. To track those that aren't, tack onto each a statement such as LET ZZ = ZZ.

Programs that normally run in a minute will now take eight minutes; the extra time is spent writing tape records. Testing a program therefore requires patience and enough tape to record seven minutes of data for every minute of running time. To ensure sufficient space, I use 60-minute tapes.

For longer programs, I insert GOTO and End statements that direct execution to smaller portions for testing separately. If I begin to run out of tape during a test, I press the break key, type End, and profile what I've captured. Be aware that ATrace adds another seven minutes to each minute of data on tape.

What's the best rewrite approach once

you've identified the "hogs" in your program? You could rewrite them in the same language using better programming techniques, or in a low-level language to be executed from the main program.

How much speed is gained depends on the type of program. Those requiring a lot of data entry or menu selection may show little or no improvement. But programs more dependent on machine speed than human speed—for scientific computations and games, for instance—may show vast improvement. ■

Harold Nickel is a mainframe programmer and instructor with nine years of microcomputer experience. Write to him at 25 Stuart Road, Rochester, MA 02770.

Equal Bytes

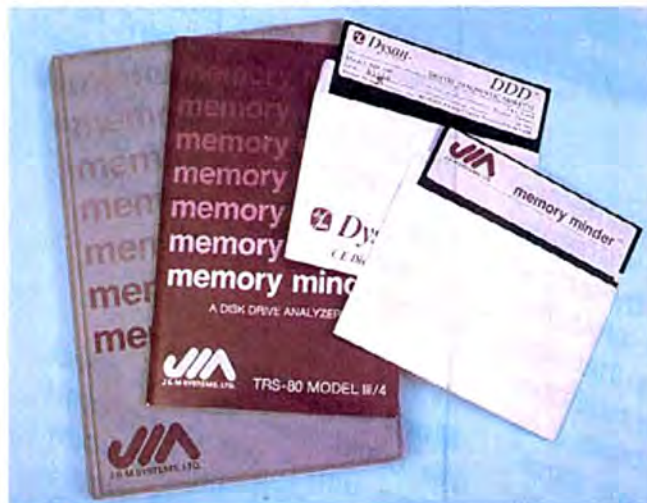
by Bob Helms

System Requirements

16K RAM
Editor/Assembler
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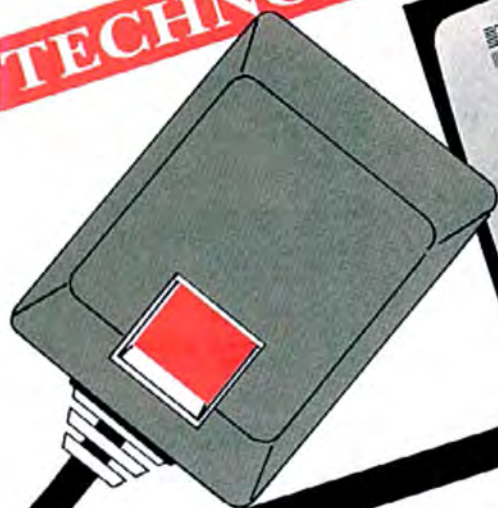
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Address (hex) Description

1000 (600)	Start of lower block.
3FFF (15FF)	Lower block's highest possible end address.
4000 (1600)	Start of upper block.
6FFF (2FFF)	Upper block's highest possible end address.
7003 (3000)	Execution address of utility program.

Table. Addresses for the memory-comparison utility (16K in parentheses).

Program Listing. Memory-comparison utility.

```

00150          *****
00160          * REMARKS WITH 16K AT END REPLACE THE LINE
00170          * ABOVE FOR 16K TAPE BASED MACHINES.
00180          ORG $7000          LOCATE M/L AT $7000
00190          *ORG $3000 LOCATE M/L AT $3000 16K
7000          006F          EQU $6F          PRINTER FLAG (0=SCREEN ONLY)
          FF22          EQU $FF22        PRINTER HANDSHAKE
7000          00220 FLAG          RMB 2          END FLAG
7002          00220 LOC          RMB 1          BUFFER FOR LINE ON SCREEN
          00240          *** EXECUTE HERE
7003 BD A928          00250 START          JSR $A928          ROMCALL TO CLS ROUTINE
7006 0F 6F          00260          CLR DEVNUM          INITIALIZE PRINTER FLAG
7008 6F 8C F7          00270          CLR LOC,PCR          INITIALIZE LINE COUNTER
700B 30 8D 013E          00280          LEAX MENU,PCR          POINT X TO TEXT
700P 8D 60          00290          BSR OUT          SHOW IT ON SCREEN
7011 8D 71          00300          BSR READ          GET 1ST CHAR FOR END ADR
7013 48          00310          LSLA          SHIPT LEFT
7014 48          00320          LSLA
7015 48          00330          LSLA          4 TIMES
7016 48          00340          LSLA
7017 B7 7000          00350          STA FLAG          STORE AT FLAG
701A 8D 68          00360          BSR READ          GET 2ND END ADR CHAR
701C BA 7000          00370          ORA FLAG          COMBINE 1ST 2 CHARS
701F B7 7000          00380          STA FLAG          STORE 1ST 2 CHARS
7022 8D 60          00390          BSR READ          GET 3RD CHAR
7024 48          00400          LSLA          SHIPT LEFT
7025 48          00410          LSLA
7026 48          00420          LSLA          4 TIMES
7027 48          00430          LSLA
7028 B7 7001          00440          STA FLAG+1          STORE
702B 8D 57          00450          BSR READ          GET LAST END CHAR
702D BA 7001          00460          ORA FLAG+1          COMBINE LAST 2 DIGITS
7030 B7 7001          00470          STA FLAG+1          STORE LAST 2 CHARS
7033 PC 7000          00480          LDD FLAG          GET END ADR IN D
7036 1083 4001          00490          CMPD #$4001          IS IT > $4000?
          00500          *CMPD #$1601 IS IT > $1600? 16K
703A 25 06          00510          BLO QUIT          IF LOWER GO EXIT
703C 1083 7000          00520          CMPD #FLAG          IS IT < FLAG
7040 25 07          00530          BLO DEV          IF SO GET OUTPUT DEVICE
7042 30 8D 01DC          00540 QUIT          LEAX NOADR,PCR          POINT X MESSAGE
7046 8D 29          00550          BSR OUT          SHOW IT
7048 39          00560          RTS          EXIT TO BASIC
          00570          *** SELECT PRINTER
7049 3D 8D 0230          00580 DEV          LEAX PRMSG,PCR          POINT TO *PRINTER ?*
704D 8D 22          00590          BSR OUT          SHOW IT ON SCREEN
          00600          *** SELECT OUTPUT DEVICE
704F AD 9F A000          00610 KBD          JSR {$A000}          GET KBD INPUT
7053 27 FA          00620          BEQ KBD
7055 81 59          00630          CMPA #'Y          WAS Y HIT?
7057 26 66          00640          BNE CHECK
7059 86 FE          00650          LDA #SPE          SET DEVICE TO PRINTER
705B 97 6F          00660          STA DEVNUM          SET PRINTER FLAG
          00670          *** CHECK FOR PRINTER READY
705D B6 FF22          00680 HNDSHK          LDA PIA          GET PRINTER HNDSHK FROM PIA
7060 44          00690          LSRA          SHIPT BIT 0 INTO CARRY
7061 24 5C          00700          BCC CHECK
7063 0F 6F          00710          CLR DEVNUM          SWITCH TO SCREEN
7065 30 8D 0228          00720          LEAX NOTRDY,PCR          POINT TO PRINTER OFF MSG
7069 8D 06          00730          BSR OUT          GO SHOW IT
706B 0A 6F          00740          DEC DEVNUM
706D 0A 6F          00750          DEC DEVNUM          SWITCH BACK TO PRINTER
706F 20 EC          00760          BRA HNDSHK
          00770          *** PRINT STRING TO SCREEN
7071 A6 80          00780 OUT          LDA ,X+          GET FIRST CHAR IN A
7073 81 1B          00790          CMPA #S1B          IS IT LAST CHAR?
7075 27 0C          00800          BEQ OUT1          IF SO GO EXIT
7077 8D 02          00810          BSR OUTE          GO SHOW IT
7079 20 F6          00820          BRA OUT
          00830          *** PRINT CHAR TO SCREEN
707B 34 14          00840 OUTE          PSHS X,B
707D AD 9F A002          00850          JSR {$A002}          ROMCALL TO OUTPUT CHAR
7081 35 94          00860          PULS X,B,PC          RESTORE STACK & RETURN
7083 39          00870 OUT1          RTS          EXIT
          00880          *** READ KEYBOARD FOR HEX DIGIT
7084 AD 9F A000          00890 READ          JSR {$A000}          ROMCALL TO POLCAT ROUTINE
7088 27 FA          00900          BEQ READ          IF NO KEY WAS STRUCK, RETURN
708A 81 39          00910          CMPA #'9          WAS 9 HIT?
708C 22 09          00920          BHI LTR          IF HIGHER GO DECODE
708E 81 30          00930          CMPA #'0          WAS ZERO HIT?
7090 25 F2          00940          BLO READ          IF < 0 THEN TRY AGAIN
7092 8D E7          00950          BSR OUTE          GO ECHO CHARACTER

```

Listing continued

Listing continued

```

7094 84 0F 00960   ANDA #GP      MASK UPPER BITS
7096 39          00970   RTS           EXIT
7097 81 46 00980 LTR   CMPA #F      WAS F HIT?
7099 22 E9 00990   BHI READ    IF HIGHER GO TRY AGAIN
709D 81 41 01000   CMPA #A     WAS A HIT?
709D 25 E5 01010   BLO READ    IF LOWER GO TRY AGAIN
709F 8D DA 01020   BSR OUTE   GO SHOW IT
70A1 80 37 01030   SUBA #537   SUBTRACT $37
70A3 39          01040   RTS
70A4 34 36 01050 HALT   PSHS X,Y,A,B  SAVE REGS ON STACK
70A6 0D 6F 01060   TST DEVNUM  IS PRINTER IN USE
70A8 26 11 01070   BNE EXIT    IF SO, RETURN
70AA 30 8D 01C2 01080   LEAX PROMPT,PCR POINT TO MSG
70AE 8D C1 01090   BSR OUT     GO SHOW IT
              01100   *** PAUSE UNTIL KEY STRUCK
70B0 AD 9F A000 01110 POLCAT JSR [$A000] ROMCALL TO KBD INPUT
70B4 27 FA 01120   BEQ POLCAT  LOOP TIL KEY STRUCK
70B6 86 00 01130   LDA #0      CLEAR SCREEN LINE COUNTER
70B8 B7 7002 01140   STA LOC
70BB 35 36 01150 EXIT   PULS X,Y,A,B  RESTORE REGS & EXIT
70BD 20 34 01160   BRA NEWSCN
              01170   *** ACTUAL COMPARE ROUTINE
70BF 8E 1000 01180 CHECK  LDX #51000 GET START OF 1ST FILE
              01190 *CHECK LDX #50600 GET START OF 1ST FILE 16K
70C2 108E 4000 01200   LDY #54000 GET START OF 2ND FILE
              01210 *LDY #51600 GET START OF 2ND FILE 16K
70C6 EC 81 01220 LOOP   LDD ,X++    GET 2 BYTES AT X IN D
70C8 10A3 A1 01230   CMPD ,Y++  COMPARE TO BYTES AT Y
70CB 26 19 01240   BNE ERROR  IF DIFFERENT GO REPORT
70CD 10BC 7000 01250 RESUME  CMPY FLAG   IS IT END ADR?
70D1 23 F3 01260   BLS LOOP   IF NOT GO CHECK NEXT 2 BYTES
70D3 30 8D 018A 01270   LEAX ENDMSG,PCR POINT X TO FINISH
70D7 8D 98 01280   BSR OUT     GO SHOW IT
70D9 31 3P 01290   LEAY -1,Y  MOVE Y DOWN 1
70DB 1F 20 01300   TFR Y,D    MOVE Y ADR TO D
70DD 8D 43 01310   BSR CONV   GO SHOW A REG DIGIT
70DF 1F 98 01320   TFR B,A    MOVE B DIGIT TO A
70E1 8D 3F 01330   BSR CONV   GO SHOW IT
70E3 0F 6F 01340   CLR DEVNUM RETURN TO SCREEN
70E5 39          01350   RTS        EXIT TO BASIC
              01360   *** ROUTINE TO REPORT MISMATCH
70E6 34 36 01370 ERROR  PSHS X,Y,A,B  SAVE LOCATIONS ON STACK
70E8 B6 7002 01380   LDA LOC    GET SCREEN LINE
70EA 4C          01390   INCA      COUNT LINE
70EC 81 0E 01400   CMPA #50E  HAVE 14 LINES BEEN USED?
70EE 24 B4 01410   BHS HALT   IF SO STOP FOR INPUT
70F0 B7 7002 01420   STA LOC    SAVE LINE COUNT
70F3 86 0D 01430 NEWSCN  LDA #50D   DO A LINE FEED
70F5 17 FF83 01440   LBSR OUTE PRINT IT
70F8 35 02 01450   PULS A     RESTORE A FROM STACK
70FA 34 02 01460   PSHS A     PUT ANOTHER COPY BACK
70FC 8D 24 01470   BSR CONV   PRINT A ON SCREEN
70FE 1F 98 01480   TFR B,A    MOVE B DIGIT TO A
7100 8D 20 01490   BSR CONV   PRINT IT ON SCREEN
7102 86 20 01500   LDA #520   PRINT A SPACE
7104 17 FF74 01510   LBSR OUTE PRINT IT TO SCREEN
7107 31 JE 01520   LEAY -2,Y  CORRECT FOR DBL INC
7109 1F 20 01530   TFR Y,D    MOVE Y ADR INTO D
710B 8D 15 01540   BSR CONV   GO SHOW A REG DIGIT
710D 1F 98 01550   TFR B,A    MOVE B DIGIT TO A REG
710F 8D 11 01560   BSR CONV   GO SHOW IT
7111 86 20 01570   LDA #520   PUT A SPACE IN A
7113 17 FF65 01580   LBSR OUTE SHOW IT
7116 EC A4 01590   LDD ,Y     PUT BYTE AT Y IN B
7118 8D 08 01600   BSR CONV   GO SHOW A REG DIGIT
711A 1F 98 01610   TFR B,A    MOVE B REG DIGIT TO A
711C 8D 04 01620   BSR CONV   GO SHOW IT
711E 35 36 01630   PULS X,Y,A,B RESTORE OTHER REGS
7120 20 AB 01640   BRA RESUME GO BACK TO MAIN LOOP
              01650   *** ROUTINE TO CONVERT BINARY TO HEX FOR SCREEN
7122 34 22 01660 CONV   PSHS A,Y     SAVE ON STACK
7124 44          01670   LSRA      SHIPT RIGHT 4 TIMES
7125 44          01680   LSRA      TO MASK LOWER 4 BITS
7126 44          01690   LSRA
7127 44          01700   LSRA
7128 31 8D 0011 01710   LEAY TBL,PCR POINT Y TO LOOKUP TABLE
712C A6 A6 01720   LDA A,Y   GET CHAR VALUE
712E 17 FF4A 01730   LBSR OUTE GO PRINT IT
7131 35 02 01740   PULS A     GET FULL BYTE AGAIN
7133 84 0F 01750   ANDA #50P MASK UPPER BITS
7135 A6 A6 01760   LDA A,Y   GET TABLE CHAR
7137 17 FF41 01770   LBSR OUTE GO SHOW IT
713A 35 20 01780   PULS Y     RESTORE Y
713C 39          01790   RTS        RETURN
              01800   *** LOOKUP TABLE FOR DIGITS
713D 3031 01810 TBL   PDB $3031   SCREEN CHARS FOR 0 & 1
713F 3233 01820   PDB $3233 2 & 3
7141 3435 01830   PDB $3435 4 & 5
7143 3637 01840   PDB $3637 6 & 7
7145 3839 01850   PDB $3839 8 & 9
7147 4142 01860   PDB $4142 A & B
7149 4344 01870   PDB $4344 C & D
714B 4546 01880   PDB $4546 E & F
714D 0D0D 01890 MENU  PDB $0D0D  DOUBLE LINE FEED
714F 20 01900   PCC / MEMORY COMPARE UTILITY/
7168 0D0D 01910   PDB $0D0D  DOUBLE LINE FEED
716A 43 01920   PCC /COMPARES BLOCKS BEGINNING AT/
7186 0D 01930   PCB $0D
7187 24 01940   PCC /$1000 AND $4000 TO EACH OTHER/
7189          01950 *PCC /$0600 AND $1600 TO EACH OTHER/ 16K

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Listing continued

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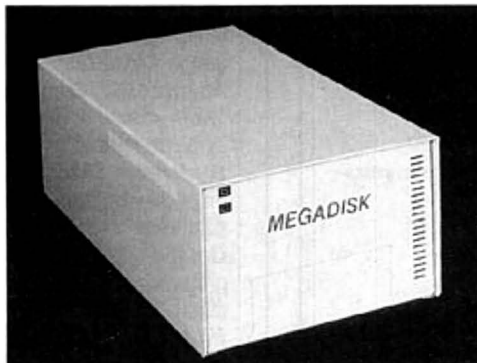
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Byte vs. Byte

When you enter LOADM (or CLOADM) and EXEC with the memory-comparison utility, it displays instructions and prompts you for the end memory address of the upper block to be compared (see the Table).

After you enter the fourth digit of the hexadecimal (hex) address, the program checks whether the address is valid. If it is, the comparison begins.

To increase program speed, I've used 16-bit registers to compare byte pairs. If either pair doesn't match, the program displays the discrepancy on the screen. After each screen is full, the program prompts you to press any key to call up

the next screen. Once the end address is reached, the program exits to Basic.

Now for a test run. Type in the source code in the Program Listing and assemble it to disk or tape with Micro Works' Macro-80C or Radio Shack's EDTASM+. Users with 16K memory should omit the asterisk at the beginning of remark lines ending in "16K" and leave out the line just above. To compare two copies of CBUG, for example, use the LOADM function to load one copy so its start address is 1000 hex; give the second copy a start address of 4000 hex. Since CBUG is 734 hex bytes long, the two copies' end addresses are 1734 and 4734 hex, respectively. Run the memory-compari-

son utility, and type in 4734, the upper address, at the first prompt.

The utility begins comparing the two copies of CBUG; nothing should appear between addresses 4000 and 4732 hex. Because the utility compares two byte pairs at a time, the final CBUG bytes at 1734 and 4734 hex will be compared with the bytes at 1735 and 4735. If the upper bytes don't match, the utility will display the following:

```
EEEX 4734 EEYY
```

where EE is the value of the last byte in each CBUG copy, and XX and YY are the mismatched bytes located at 1735 and 4735, respectively. In this case, the mismatched bytes do not indicate a discrepancy between the two programs.

You don't have to use CBUG to run the test; any machine-language program will do.

To compare programs longer than 2FFF bytes (15FF with a 16K machine), split them into segments that fit within the limits shown in the Table. You might also have to adjust for inserted and deleted subroutines when comparing some programs. For example, let's say you've removed from the second program the NOPs (No Operation statements) used to delete a routine from an earlier version. In the comparison, the second program may exhibit no dissimilarities if it has been offset-loaded to compensate for the removed bytes. ■

Write to Bob Helms at 434 W. Ercole Drive, Midwest City, OK 73110.

Listing continued

```

71A4 0D0D 01960 PDB $0D0D
71A6 4D 01970 FCC /MISMATCHED BYTES & THE ADDRESS/
71C4 0D 01980 PCB $0D
71C5 49 01990 FCC /IN THE UPPER FILE WILL BE SHOWN/
71E4 0D0D 02000 PDB $0D0D
71E6 48 02010 FCC /HEX END ADR MUST BE BELOW $7000/
          02020 *FCC /HEX END ADR MUST BE BELOW $3000/ 16K
7205 0D 02030 PCB $0D
7206 4C 02040 FCC /LWR ADR UPR END ADR?/
7221 1B 02050 PCB $1B
7222 0D 02060 NOADR PCB $0D
7223 6E 02070 FCC /nothing checked - INVALID ADR/
7240 0D 02080 PCB $0D
7241 56 02090 FCC /VALID END ADR = $4001 TO $6FFF/
          02100 *FCC /VALID END ADDRESS = $1601 TO $2FFF/ 16K
725F 001B 02110 FDB $1B
7261 0D 02120 ENDMSC PCB $0D
7262 43 02130 FCC /CHECKED THRU /
726P 1B 02140 PCB $1B
7270 0D 02150 PROMPT PCB $0D
7271 74 02160 FCC /touch a key/
727C 1B 02170 ZEND PCB $1B
727D 20 02180 PRTMSC FCC # USE PRINTER (Y/N)?#
7290 1B 02190 PCB $1B
7291 70 02200 NOTRDY FCC #printer not ready !#
72A4 0D1B 02210 FDB $0D1B
          7003 02220 END START

```

End

Out in Font

by Eric A. Wolf

Dot-matrix printouts lack personality. Unfortunately, creating a type-style with a bit more pizzazz is time-consuming. To encourage self-expression, I wrote Font, a typeface design utility for

Epson-compatible printers (see the Program Listing). Font reads any ASCII file and prints it out using the character set of your choice.

Cast of Characters

Font uses the high-speed POKE, POKE 65495. If your Color Computer doesn't accept this POKE, answer N to the opening prompt. The next screen displays the 12-by-16 design grid and function menu (see the Table).

To design a character, use the arrow keys to position the cursor within the grid. Press the space bar to set dots. You can

edit characters using R to erase (reset) dots; pressing C clears the grid, erasing both dots and the grid's vertical lines. Type in I to invert the character—dots become empty spaces and vice versa.

Once you are satisfied with your character, invoke the load/save function (L) to store it in memory. Because Font saves and retrieves characters in sets, the program prompts you for the ASCII value of the character you are storing. To store the letter "a," for example, type in 97 (the ASCII value of a lowercase "a") at the prompt. *Getting Started with Color Basic* and *Getting Started with*

System Requirements

32K RAM
Extended Color Basic or
Disk Extended Color Basic
Epson MX-80 or
compatible printer

Extended Color Basic contain complete lists of ASCII equivalents.

The design grid is never empty. After you have stored the first character, Font prompts you for the ASCII value of the next character. To store a character set, press M, the option to load or save a character file. The next prompt asks you whether you want to save or load a file. In this case, press S to save your file. After selecting T (tape) or D (disk), enter a legal file name to begin the save (Font reminds you to prepare your cassette recorder or disk drive first). To load a pre-

Command Function

X	Exit to Basic
Space bar	Set dot
R	Reset dot
C	Clear grid
I	Invert grid
L	Load or save a character
M	Load or save a character set
P	Print a file
T	Test a character set

Table. Font's function keys.

```
1670 OPEN "I",#D1,F#%MOTOROFF
1680 CH=0:B#="" :A#="" :PMODE 4.5:PCLS
1690 IF EOF(1)=-1 THEN 1880
1700 INPUT #D1,A#
1710 IF A#="" THEN 1690
1720 B#=A#
1730 B=INT(CL/12):B#=LEFT$(B#,B)
```

Figure. Sample Basic listing printed with a cursive character set.

viously saved character set, type in L at the first load/save prompt; answer subsequent prompts to retrieve your file.

In Print

Before you print out a document using your new character set, run a test to ensure that you've properly equated all characters with their ASCII values. Press T to initiate the test and then choose a 40- or 80-character display. Once you've checked the paper feed and reset the printer by turning it off and then on, press any key to print your character set. Use option L to load and edit any characters you want to change.

If the results of the test are satisfac-

tory, you're ready to print out a file. Font accepts only files saved in ASCII format; users with disk systems must also append TXT as an extension.

After you press P, Font prompts you for the information it needs to load and print your file from cassette or disk. As with the test print, you can elect to print 40- or 80-character lines. The Figure shows a section of a Basic listing printed out using cursive characters and an 80-character format. ■

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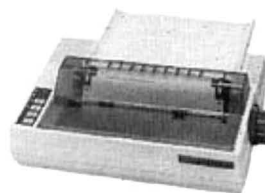
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 Tandy 3000 HD \$2699



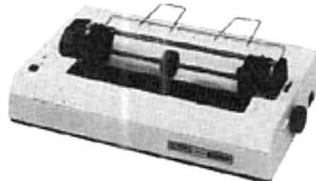
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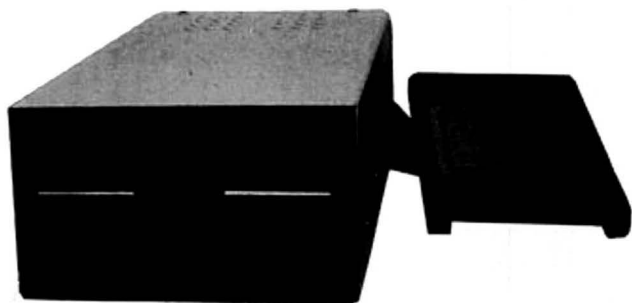
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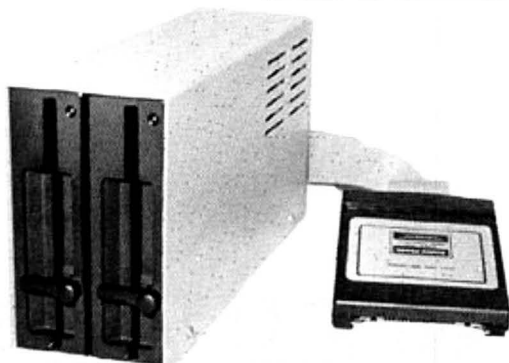
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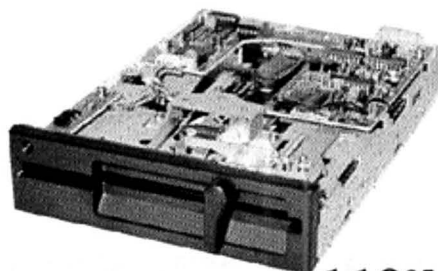
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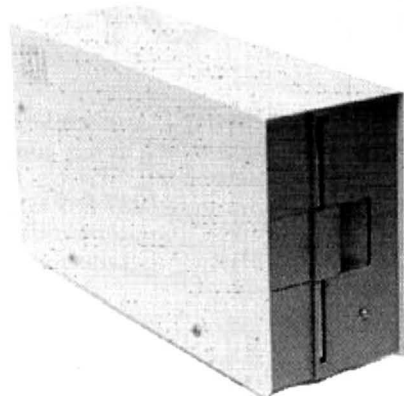
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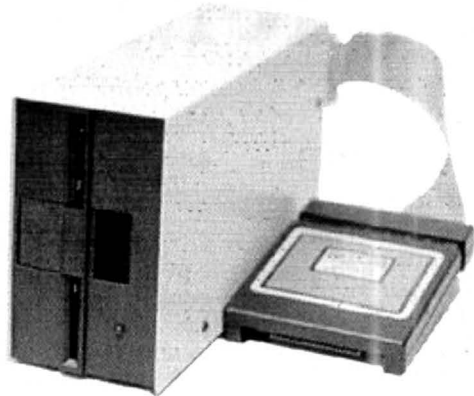


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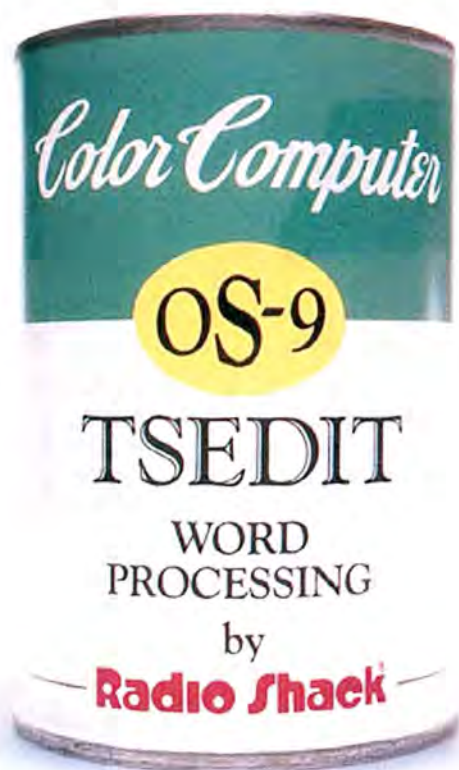
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In the Dumps

Q: Our computer club recently purchased DeskMate, Tandy's integrated software package. Although text prints fine, the graphics program produces only line feeds on my Gemini SG-10 printer. Do I have to buy a Radio Shack printer to dump DeskMate's graphics?

Also, can you provide recent information on the Motorola VDG (video-display generator)? (Arch Parsons, Lewistown, New Foundland)

A: If you pipe the graphics output to a C. Basic-09, Pascal, or Assembly-language program using a translation table of graphics codes, your SG-10 will print graphics.

Motorola has discontinued production of the MC6847-T1, the VDG with built-in lowercase—probably because there is little interest in its 32-column by 16-line display now that 80-column by 24-line displays are available.

Getting a Transfer

Q: I have a 64K Color Computer, the OS-9 operating system, and a Basic-09 disk. Can I purchase software that will permit me to transfer Microsoft disk files between OS-9 and the Color Computer's Basic? (Robert Freedman, Pittsburg, PA)

A: Radio Shack's TRSCOPY (catalog number 26-3263), which sells for \$24.95, lets you transfer text files between OS-9 and Basic disks.

All in a Line

Q: Can I load the source code from the Macro80C editor/assembler into an EDTASM+ disk editor/assembler? I get a "bad line number" error whenever I try this.

Can I give my CoCo 2 a graphics screen with a resolution of 600 by 400 pixels without performing major surgery? (Jason McCampbell, St. Johns, MI)

A: EDTASM+ requires line numbers; the Macro80C does not. To overcome this incompatibility, you could write a Basic program that inputs the unnumbered Macro80C lines from disk, numbers them, and prints them back to disk.

To get a 600-by-400 display, you'd need 24,000 (24K) bytes of memory. If you add a modest color requirement (four colors), you'd need 48K of a 64K CoCo. You really need an external hardware display driver, along the lines of PBJ's Word-Pak. So far none is available, and unless Tandy markets such a device (and I doubt that they will), software support would be quite limited.

In Translation

Q: How can I learn to translate Basic programs from different computers to the kind of Basic my CoCo uses? (Michael Rye, Cumberland, WI)

A: David Lien's *The Basic Handbook* (CompuSoft Publishing, 1050 E. Pioneer Way, El Cajon, CA 92020; \$19.95) is a good reference on the different dialects of Basic.

Track Record

Q: I added Word-Pak to my OS-9 operating system and can no longer backspace without destroying text. Am I doing something wrong? I'd also like to know if there is an OS-9/Word-Pak II-compatible word processor that will let me use the Gemini printer's superscripts, subscripts, and special characters.

Finally, how can I make a Radio Shack drive 2 think that it is drive zero or drive 1? I've heard that the CoCo's 35-track drives have the same number of tracks per inch as a 40-track drive. However, I can't read a 35-track disk on a 40-track drive or vice versa. (Fran Walters, Bethesda, MD)

A: Word-Pak includes a full-screen editor that patches into Basic; unfortunately, this software isn't compatible with OS-9. However, OS-9's clear-A command gives you limited editing capability. When you notice a typographical error, press clear-A, use the left-arrow key to backspace to the appropriate spot, type in the correction, and press clear-A

again to replace the rest of the line.

In my opinion, the best word processor available for OS-9 is Stylo Software's Stylograph III (Express Order Software number 90-0195; \$99.95). You can configure it for any printer, and, to my knowledge, it is the only word processor for the CoCo that supports justified proportional spacing.

In OS-9, you can use Backup only to copy to and from similarly formatted disks. However, you can use more than one device descriptor for the same drive. For example, D0 could refer to drive zero with 40 tracks; DA might refer to drive zero with 35 tracks. You could type in BACKUP /D1 /DA, assuming drive 1 contained 35 tracks. If disks are formatted differently, you must invoke the Copy command to copy individual files or use the OS-9 pipe feature to copy all files in a directory. To copy all files from drive zero to drive 1, type in:

```
dsave /D0 ! (-x chd /D1)
```

A Different Color

Q: I'm looking for solutions to two graphics problems. I've used the graphics function:

```
PMODE 4,1; PCLS; SCREEN
```

to create a mathematics program with green graphics on a black background. The borders are green. Can I create similar graphics and change the border to black?

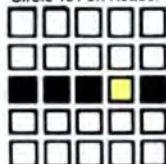
When I execute a graphics program that ends with n GOTO n, I must press the break key to stop. After breaking out of a program like this, can I reexecute it without typing in RUN? (Jose Guida, Buenos Aires, Argentina)

A: Due to the MC6847 VDG's limitations in high-resolution-graphics mode, the CoCo can produce only black lines on a buff background or black lines on a green background. The picture frame can be green or buff.

To circumvent the break key, substitute the following code:

```
n A$ = INKEY$: IF A$ = "" GOTO n
```

Your program will then pause until you strike a key. If you prefer to continue to use the break key, retain the original code and type in SCREEN1,0:CONT. ■



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Color Monitor

by Scott Norman

I've got a mixed bag this month: a reader's report of trouble with OS-9 Dynacalc, a new utility for manipulating text files, and some program fragments you may find useful in writing application software.

Card Games

Charles Gerkin of Atlanta, GA, called about having difficulty bringing up the OS-9 version of Dynacalc on a CoCo with a PBJ Word-Pak display card. Since I had gone on at some length in the May column about how this high-density display improves the spreadsheet, it seemed logical to field the question. I'm afraid I offered more sympathy than enlightenment, but it's worth passing along a description of the problem.

I reported getting a useful 20 rows and eight columns worth of spreadsheet using Word-Pak. Charles saw more of the spreadsheet—21 or 22 rows and nine columns—but to no avail. The extra material wrapped around the screen boundaries and contained garbage instead of real data. Even the Dynacalc title screen deteriorated on its trip through Charles' display driver, mangling the copyright and author data. It sounded as though a screen-addressing routine had gone astray.

We decided there may be a conflict between version 2.0 of the Word-Pak software and version 01.01.00 of the operating system. My own Word-Pak 3.1 seems to handle both this OS-9 version and the earlier 01.00.00 with ease. I advised Charles to get a more recent copy of the PBJ product and hope for the best.

In the interest of giving armchair detectives all the facts, I should mention that we set up our working disks differently. I slavishly followed PBJ's instructions, which included letting their Install.2 routine grind away for nearly 20 minutes while it copied a ton of files and made a new Word-Pak-compatible OS9Boot file. Charles used the Cobbler command to make a new Word-Pak system disk from one that worked already with other software. I doubt this contributed to his display problems, however.

```

445 XO=4Ø:YO=165-BØ/1Ø:YL=YO
45Ø FOR K=Ø TO N
455 XK=4Ø+5*(B(K,Ø)-JØ)
46Ø YK=YO-B(K,1)/1Ø
465 IF YK>191 THEN YT=191 ELSE Y
T=YK
47Ø IF YK<Ø THEN YT=Ø ELSE YT=YK
475 LINE (XO,YL)-(XK,YL),PSET
48Ø LINE (XK,YL)-(XK,YT),PSET
485 XO=XK:YO=YK:YL=YT
49Ø NEXT K

```

Figure. Plotting routine for checking account graph.

I'd like to hear from those who have had similar experiences; I'll be happy to pass along your ideas.

I'm awaiting my copy of the newly released OS-9 version 02.00.00. I'll be keeping my fingers crossed lest it contain any ill effects.

BBSing It

The mail occasionally brings something interesting—a DOS modification, a Basic extension, or a utility or two—from Bob Rosen at Spectrum Projects in Woodhaven, NY. The latest shipment included Text Util, a file manipulation utility that should interest regular users of bulletin-board systems (BBSes). Text Util's main function is preparing word-processor disk files for loading to and from a BBS.

Word processors and BBS programs often treat carriage returns (CRs) differently. Your word processor may save each paragraph as a single long line with one CR at the end. If you want to send text to a BBS that handles a fixed number of characters between CRs, Text Util can read the file and insert CRs in the proper places for transmission. (The default separation is 80 characters.) It also prepares downloaded material for reformatting by your favorite text processor by stripping all but the CRs that mark the end of a paragraph.

The utility also recognizes and removes the embedded control characters

most word processors use to send formatting commands to a printer. Since control characters are almost always specific to a program, you must remove them before exchanging disk files with someone using a different word processor. It's nice to have a routine that automates this chore. There's even a special option for handling WordStar files that adds 128 to the ASCII code of the last character in every word. You can connect your CoCo to a CP/M computer by modem and download WordStar text for massaging with such word processors as Cognitech's Telewriter-64 and VIP Technologies' VIP Writer.

Another feature converts text to all uppercase, all lowercase, or mixed typography to make it compatible with specific bulletin boards. The program does a good job of assigning descriptive default extensions to file names so you can tell how they were derived. Housekeeping commands let you rename or kill a text file, count characters, or display the file's contents on screen. Unfortunately, the slow-running display option is unformatted and lacks word-wrap.

Otherwise, Text Util works well. Its biggest drawback is the undocumented requirement that text files be on the same disk as the program and in drive zero. Programming fans can fix this (the program is written in Basic and there's no fancy protection scheme), but I think the option of specifying the working

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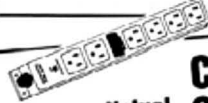
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drive should have been built in.

I have another complaint: The six-page manual is a proofreader's disgrace. Repeated use of such misspellings as "carraige," "helpfull," and "usefull" shows someone just wasn't paying attention. ("Carraige" appears in the main menu as well.) Just because a program is inexpensive doesn't mean it has to be sloppy.

Balancing Act

On several occasions, I've mentioned the simple homebrew program I use to keep track of family finances. Its biggest task is to read Data statements on my checking account and to produce a high-resolution video graph forecasting the balance. It is easy to glance at the graph to see if my spending plans conflict with the bank's minimum balance requirements, which I find hard to estimate from columns of figures.

At several points my program must either calculate the number of days between two dates or find the latest in a pair of dates. Business and finance programs often require such calculations, but our irregular calendar makes days-between-dates computations a pain. I developed a snippet of code to do the job.

The usual approach is to assign a unique ordinal number to each date; if May 30, 1986, is day #N then May 31 is #(N + 1), June 1 is #(N + 2) and so on. You can then find intervals by subtracting ordinals instead of having to write code to keep track of the number of days in each month and leap years.

A short routine I often use comes from an old Naval Observatory publication (astronomers and navigators are very interested in the problem) and produces a Julian calendar date. If variables M, D, and Y represent a given month, day, and year, then the Basic line:

```
JD = 367 * Y - INT(7 * (Y + INT((M + 9) / 12)) / 4) +
INT(275 * M / 9) + D
```

gives you the corresponding Julian date

JD, always a number above 760,000.

Ultimately, I have to convert dates, deposits, and check amounts into CoCo screen coordinates and draw the graph showing the balance versus time. The biggest potential problem is in handling off-scale data points.

For legibility, each day is represented by five horizontal pixels, while a single vertical pixel stands for \$10. Suppose the balance in my account somehow

The graph shows that a bank balance stays constant between transactions.

went high enough to drive the graph off the top of the screen; this corresponds to a negative y value in the CoCo's coordinate system and would make Basic's Line command show an FC error and shut down the program.

I've therefore included a routine to keep such graphs within bounds by clipping the display at y=0. At the same time, the program must keep track of where the plot would fall without the negative numbers so it can continue making an accurate graph when things return to normal. (This may be the last time I ever think of extra money as a problem.)

Four variables represent computed and plotted y coordinates: YK, the computed coordinate for the current data point; YT, the plotted coordinate for the current point; YO, the computed coordinate for the previous data point; and YL, the previous data point's plotted coordinate (see the Figure.)

The graph's origin is at x = 40, y = 165.

Every transaction is represented by a pair of numbers in an array called B: B(K,0) is the Julian date of the Kth data point, and B(K,1) is the dollar amount of the corresponding transaction. (Other program parts ensure that deposits and checks are given opposite signs so they appear properly in the graph.) J0 is the Julian date for the day the program is run, and B0 is the account balance on that day; both are entered from the keyboard. There's no clipping routine for x coordinates, since negative dates can't occur, but I did include one for y > 191, which corresponds to a slight negative balance (horrors!).

The line-drawing commands in lines 475 and 480 produce a staircase-like graph to show that a bank balance stays constant between transactions rather than changing continuously.

I suppose that deep within every user of packaged software is a closet programmer fighting to get out. ■

Scott Norman is the manager of solid-state science at GTE Laboratories in Waltham, MA. Write to him at 8 Doris Road, Framingham, MA 01701. Enclose a stamped, self-addressed envelope for a reply.

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DynaCalc for OS-9, \$99.95.

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MS-DOS

A Light Touch

Lite-Pen Company has introduced a Lite-Pen for the Tandy 1000 and 1200 that lets you enter information by touching the screen.

The device works with such software packages as ZSoft's PC Paintbrush, Media Cybernetics' Dr. Halo, Micrografix's PC-Draw, and Microsoft's Windows. It comes with sampler software that includes graphics, games, sample applications, keyboard tutorials, programming instructions and source code.

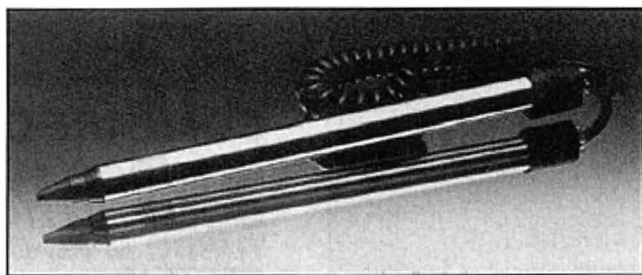
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insert lyrics, and employ 15 pre-designed instrument voices. A sound editor creates custom-made instruments. With MIDI (musical-instrument digital interface) compatibility, the computer can play songs through electronic keyboards and drum machines.

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Small Is Beautiful

Manzana's MDQX external drive lets you use 3½-inch disks with the Tandy 1000.

The MDQX attaches with an adapter card and comes with software that includes format and utility commands and a device driver. It interprets disks from many of the 3½-inch-based computers made by IBM, Tandy, Data General, Kaypro, GRiD, Toshiba, Texas Instruments, Hewlett-Packard, Atari, Apricot, and GE. Tandy 1000 owners can access a full 720K on the drive without using MS-DOS 3.2, yet the software

will run on MS-DOS versions 2.0 and higher.

The MDQX costs \$395; a \$15 cable is required for the Tandy 1000. For information, contact Manzana, 935 Camino Del Sur, Isla Vista, CA 93117, 805-968-1387.

Circle 554 on Reader Service card.

Parlez-vous AI?

Borland International's Turbo Prolog is a language-development system for artificial-intelligence (AI) software.

An interactive text editor identifies source-code errors for correction while a program is running. Programmers can move between windows to use the text editor, a debugging facility, the source-code listing, and a sample query.

Turbo Prolog costs \$99.95 and works on IBM PC-compatible computers. For more information, contact Borland International, 4585 Scotts Valley Drive, Scotts Valley, CA 95066, 408-438-8400.

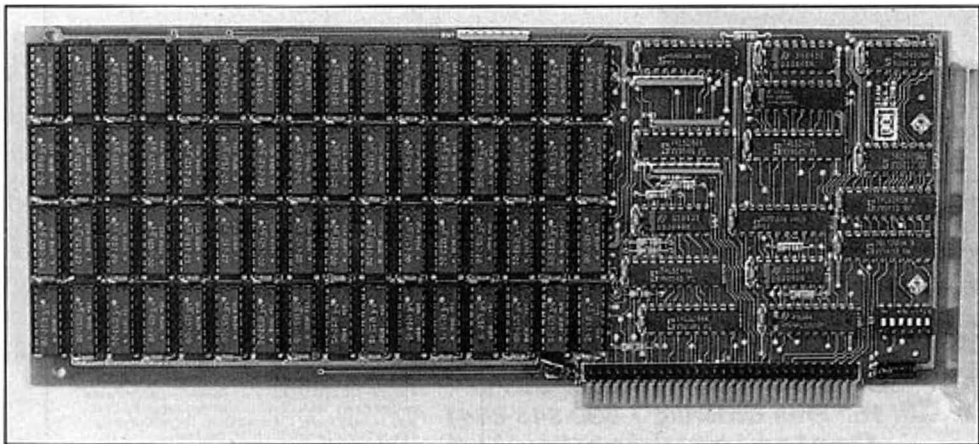
Circle 553 on Reader Service card.

Dog-Eat-Dog World

Fooblitzky, the new strategy game from Infocom, takes place in the busy, graphics-animated city of the same name. You're a canine trying to find four secret objects while managing your funds, keeping records, and outsmarting the other players.

Players secretly choose one of several items available in the stores of Fooblitzky and use their allowance of foobles to acquire the other secret items or to buy decoys to confuse their opponents. Overspending might force you into washing dishes in a restaurant or selling your goods at a pawn shop.

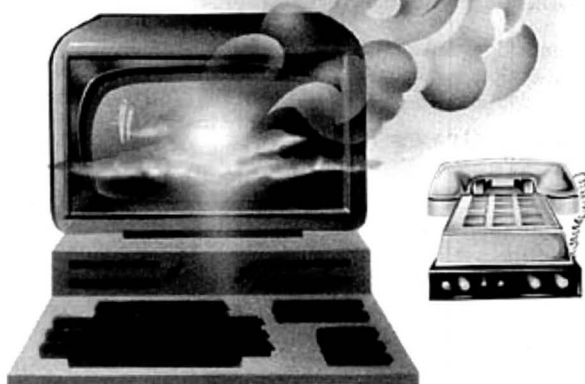
You can play Fooblitzky with a joystick or a keyboard. The game runs on IBM PCs and compatibles with 128K RAM and a graphics card. Its price is \$39.95. For information, contact Infocom Inc., 125 CambridgePark Drive,



PBJ's XRAM memory board adds 2 megabytes of RAM.

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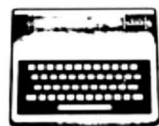
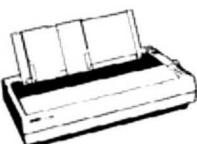
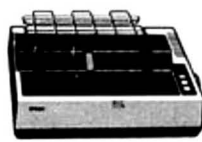
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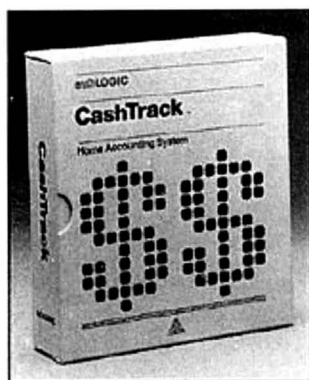
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NEW PRODUCTS



CashTrack, the home accounting system from SubLOGIC Corporation.

Cambridge, MA 02140. 617-492-6000.

Circle 555 on Reader Service card.

Money Grows On Trees

CashTrack is SubLOGIC Corporation's new home accounting system for the IBM PC and compatibles.

The program features full-option menu selections, screen instructions, and help messages. Account categories are set up in a hierarchical tree structure up to five levels deep. The program supports all conventional printers and color or monochrome monitors in 40- and 80-column display modes. A single disk can hold 10 years' worth of data.

CashTrack requires 128K RAM and sells for \$149 plus \$4.50 for shipping. Contact SubLOGIC Corp., 713 Edgebrook Drive, Champaign, IL 61820. 217-359-8482.

Circle 557 on Reader Service card.

EPROM Programmer

ZAX Corporation announces the availability of the EZ-PRO 198, a lightweight (under 4 pounds) EPROM programmer. EZ-PRO can program 98 types of EPROMs and EEPROMs. Typical MOS-type PROMs ranging from 16K to 512K can be programmed using a single socket by designating the device type from the keyboard. A special automatic programming mode lets you set the ROM device automatically.

The EZ-PRO features an integral keyboard and an easy-to-understand menu of instructions for fast programming. Programmers can verify instructions as they work on a 16-character by two-line liquid-crystal display (LCD). The EZ-PRO also has built-in device protection, including checks to ensure the proper programming voltages and to prevent incorrect device installations.

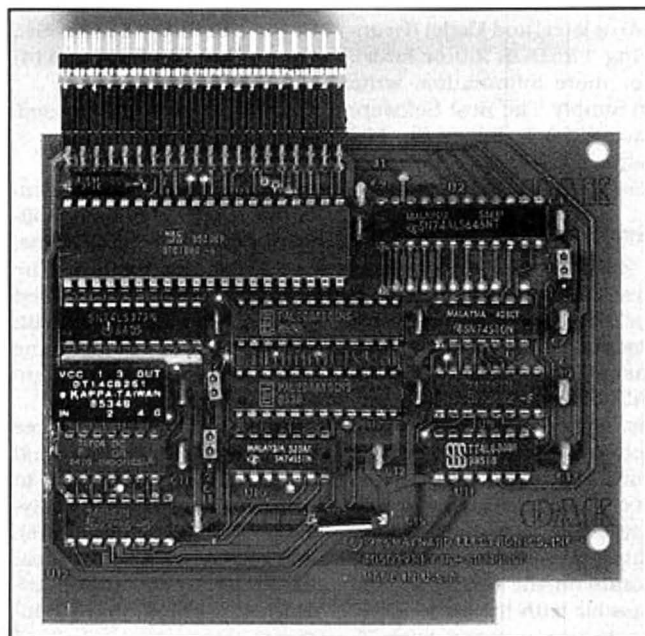
The EZ-PRO incorporates both serial (RS-232C) and parallel (Centronics standard) ports as standard equipment. You can use the parallel port for a data printout of the programming session and the serial port to interface the EZ-PRO to an IBM PC or a compatible for remote control of the keyboard operations.

The price is \$895; the communications software package (EZ-COM 198) for the IBM PC costs \$200. For more information, contact ZAX Corporation, 2572 White Road, Irvine, CA 92714. 800-421-



EZ-PRO can program 98 types of EPROMs.

NEW PRODUCTS



The SURPRISE! board brings AT-like speed to IBM PC/XTs and compatibles.

0982; California residents call 714-474-1170.

Circle 559 on Reader Service card.

Booster Rocket

SURPRISE!, a high-speed board from Maynard Electronics, makes IBM PC/XTs and compatibles run up to 2½ times their normal speed—about the same as a PC/AT. It replaces the 8088 chip in the system's mother board and requires no expansion slot.

A simple command lets you toggle between fast and slow operation. The card and software together speed up both the hardware and disk operating system (DOS).

SURPRISE! comes with a five-year warranty. It costs \$249. For more information on the product, contact Maynard Electronics, 460 E. Semoran Blvd., Casselberry, FL 32707, 305-331-6402.

Circle 561 on Reader Service card.

The Latest Word

NewWord 3 is the latest word processor from Newstar Software Inc.

The program includes built-in spelling checks, keyboard macros, row-and-column summing, calculator mode, a control to merge print and math formatting, and multi-user and network

support. It maintains true compatibility with previous NewWord versions and with MicroPro International's WordStar Professional, including MailMerge.

NewWord runs on the IBM PC and compatibles and will soon be available for CP/M-86 machines. It retails for \$349. For details, contact Newstar Software Inc., 3351 Vincent Road, Pleasant Hill, CA 94523, 415-930-9400.

Circle 558 on Reader Service card.

Unix on the PC

PCUNIX from Wendin Inc. is a multi-tasking, multi-user operating system that makes the features of AT&T's Unix available to users of IBM PC/XT/ATs and compatibles.

The system comes on four disks and can be installed on a 5-megabyte hard disk. It supports 70 popular Unix commands, including CAT, CD, Finger, GREP, PS, and LS, which can be combined to make more powerful commands using the Pipes utility. It also translates most MS-DOS system calls in real time.

PCUNIX requires 384K and sells for \$99. For information, contact Wendin Inc., Box 266, Cheney, WA 99004, 509-235-8088.

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This program is based on the **Dome Bookkeeping Record #612** and handles **bookkeeping** and **payroll** for a small business. Bookkeeper provides single entry ledgers with category breakdowns for both income and expenses. Monthly, through last month, and year-to-date summaries. Fiscal year can start with any month.

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CAT Scan

SOTA Computing Systems Ltd. announces trsCAT, a disk-cataloging program for Model 4/4P/4D users. The program allows you to catalog, sort (alphabetically or numerically), search (by file name, partial file name, or disk code), and print up to 1,600 files.

TrsCAT can read and catalog any TRSDOS 6.x, DOS-PLUS (3.4 or 3.5), MULTIDOS (1.3, 1.5, or 1.6) or LDOS 5.x disk. You can edit any catalog entry and examine the directories of mounted disks. TrsCAT keeps track of each disk's free space so that you can easily determine available storage capacity for new files.

TrsCAT costs \$39.95 and requires at least one disk drive and 64K RAM. Improved performance is real-

ized with a second disk drive and 128K RAM. For more information, contact SOTA Computing Systems Ltd., 213-1080 Broughton St., Vancouver, British Columbia V6G 2A8, 604-688-5009.

Circle 562 on Reader Service card.

Small C Talk

Simply The Best Software Inc. offers a software package containing the Small C Compiler (Version 2.1) and the Small Mac Assembler (Version 1.2). The package also includes a macroassembler for either Intel 8080 or Zilog Z80 mnemonics, a linking loader, a library manager, a source-code file archiver, a utility program for altering the assembler, and libraries containing over 80 functions. In addition, the package contains the source code for all programs, many of which are written in C.

The package retails for \$59.95. It works on both the Model 4 (running TRSDOS

6.0 or later) and Model II (running TRSDOS 2.0 or later). For more information, write to Simply The Best Software Inc., 2709 N. Sibley St., Metairie, LA 70003.

Circle 563 on Reader Service card.

Screen Editor

Z-EDIT is a full-screen editor designed as an enhancement for the editor that comes with Radio Shack's Assembly Language Development System (ALDS). It features block copies, moves, and deletions and requires no line-editor-type commands. You can insert text anywhere on the screen without having to erase anything previously typed. All points on the screen are accessible with the arrow keys. Programs created with Z-EDIT can be assembled with Radio Shack's ALDS.

The software runs on all Model 4 computers under TRSDOS 6.2. The package price is \$19.95. For more information, contact Frank

Software, 1164 Emilie St., Green Bay, WI 54301, 414-437-6446.

Circle 564 on Reader Service card.

Geometry Lesson

Gameco Industries Inc. announces release of a new software program called Perimeter, Area, and Volume. The program combines guided drill in geometry skills with an arcade-style reward game and a program/student management system.

Students choose from three lessons and then from several levels within each lesson. In Perimeter, the levels are polygons, circles (circumference), and mixed practice. In Area, the levels are rectangles, triangles, circles, parallelograms, trapezoids, and mixed practice. In Volume, the levels are rectangular prisms, triangular prisms, cylinders, and mixed practice.

After a student chooses a lesson and level, the program reviews the appropriate for-

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mula(s) and provides several examples. Students then are given randomly generated problems to solve. To complete them, he or she must select the correct formula, substitute values, and enter a final answer. The computer checks each step in sequence and gives the user three opportunities to answer. After three incorrect answers, the correct one is displayed. At the end of each run, students who have scored a certain percentage may play an arcade game.

A management system automatically records students' names, the lessons and levels completed, raw scores, and the percent correct. The system holds up to 200 student files in alphabetical order.

The Model III/4 program costs \$39.95 for individual copies, \$54.95 with backup disk, \$164.95 for class pack, and \$164.95 for TRS-80 network. For more information, contact Gameco Industries Inc., Box 1911, Big Spring,

TX 79721, 1-800-351-1404. Texas residents call collect, 915-267-6327.

Circle 566 on Reader Service card.

On Display

KNEWCO Inc. has developed a full-screen processor for the TRS-80 line of computers. FULSCR is a program-development tool that aids in the design, implementation, and modification of user-oriented display screens. The program allows you to enter literal and control information on a blank screen, which is then stored on disk. An application program calls FULSCR, which displays the screens along with any data it might pass. The program controls and validates keyboard input and passes the information back to the application program for further processing.

FULSCR's features include forward and backward tabs, character insert and delete, clear remainder of field, and cursor positioning. The pro-

gram also provides field validation, justification and filling, screen test facilities, and screen documentation and printing functions.

FULSCR requires TRSDOS 1.3, 32K, and one disk drive. It interfaces with Assembly language, Basic, and Cobol. The program normally sells for \$59.95 but is on sale for a limited time at \$29.95. For more information, contact KNEWCO Inc., P.O. Box 25329, Wilmington, DE 19899.

Circle 568 on Reader Service card.

Software Medicine

Elixir is a collection of utility programs for the Models I and III. It includes 30 Basic application programs and an assortment of machine-language USR routines that you can install easily in your programs. Included are routines to invert the screen display, flip the display horizontally or vertically, perform bitwise and character screen scrolls,

fill displays with graphics horizontally or vertically, print screens, and perform bubble sorts.

Elixir requires 48K RAM and one disk drive. The package costs \$39.50. For more information, contact Donald W. Ady, 56 Oak Ridge Ave., Summit, NJ 07901, 201-277-3365. Circle 565 on Reader Service card.

Checks and Balances

PC Home Checkbook (order number 542-X) is a new product from SourceView Software International that allows you to keep track of your checkbook by week, month, and year. It lets you record and edit four basic types of transactions: checks written, deposits, automated teller activity, and bank charges. PC Home Checkbook runs on the TRS-80 Model III and on the Tandy 1000/1200/3000.

When you enter a transaction, PC Home Checkbook provides space for recording the transaction or check

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Graphics Solutions

High-Resolution Software and Hardware

GBASIC 3.0 - Radio Shack Model 4/4D/4P/III hi-res board owners take note of an enhanced graphics Basic: GBASIC 3.0. It not only provides an equivalent for each of the BASIC commands but adds a number of important new ones while using less memory. Without having to exit Basic, the hi-res screen can be saved to disk, loaded from disk, or printed on any of 30 popular printers: Epson, Star Micronics, Radio Shack, Okidata, C. Itoh, NEC, etc. The software works with TRSDOS 1.3, 6.1.2, 6.2; DOSPLUS 3.4, 3.5, 4; LDOS; and NEWDOS80. The disk contains 40 graphics programs/files. Also included is a detailed manual with assembly language entry addresses. \$49.95. (Specify Model 4 or III mode or add \$10 for both.)

The following eleven programs run on a Model 4/4D/4P/III equipped with a Radio Shack graphics board and GBASIC 3.0 or a Micro-Labs Grafyx Solution board:

DRAW - A powerful full screen graphics drawing and editing program. \$39.95.

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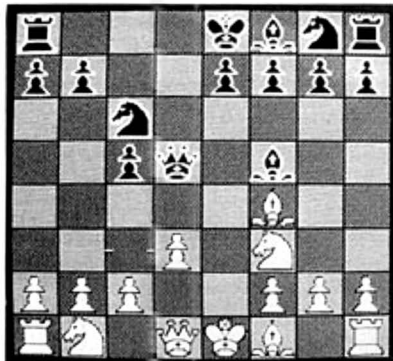
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3D Tic-Tac-Toe - Play the computer or a friend on a $4 \times 4 \times 4$ matrix. \$19.95.

SLIDESHOW - Create a sequence of hi-resolution picture displays. \$19.95.

Biorhythm/USA - Plot your biorhythm or learn the states and capitols. \$19.95.

JOY-MOUSE - Allows a Radio Shack Color Computer joystick, mouse, or touch pad to be connected to any Model 4/4D/4P/III. Hardware provides X, Y position values from 0 to 255. \$129.95.



GRAFYX SOLUTION - A plug-in, clip-on board enhances any Model 4/4D 4P/III to provide 640×240 dot graphics. (512×192 on a Model III) The board comes with a 56 page manual and a disk containing both model 3 and 4 mode versions of over 40 programs and files including GBASIC 3.0 which adds over 20 graphics commands to Basic. \$199.95.

Please specify your exact system configuration when ordering or requesting information. Payment may be by check, Visa, Mastercard, or COD. Domestic shipping is free on pre-paid orders. Texas residents add 5% sales tax.

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gram can print individual transactions.

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0100, extension 440. For a catalog of all 497 products, send \$5 (refundable upon first catalog software purchase) to SourceView Software International, 835 Castro St., Martinez, CA 94553.

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Etc.

Scientific Methods

Jandel Scientific publishes a free, 16-page catalog titled *Microcomputer Tools for the Scientist* describing products for the IBM PC/XT/AT and Apple II computers and compatibles.

The illustrated catalog includes measurement and digitizing systems and equipment for creating slides from the computer. Also featured is software for creating graphics and statistics for scientific journals, matrix manipulation, and dynamic systems simulation. Many of the products are made by Jandel.

For a copy, contact Jandel Scientific, 2656 Bridgeway, Sausalito, CA 94965, 415-331-3022.

Circle 574 on Reader Service card.

Lab Work

Micro-Lab is a circuit-engineering aid that combines power sources, clocks, control and sense lines, voltmeter, audio amplifier and speaker, breadboarding area, and debounced switches in a single device.

Developed by Fisher Instruments, the Micro-Lab contains several input/output (I/O) ports: two 8-bit TTL ports and one 8-bit counter for input and two 8-bit TTL ports, three 16-bit timer-counter channels (write only), and three xtal-controlled clock

ports for output. The device has four 8-bit channel A/D converters and one 8-bit channel D/A converter.

Micro-Lab has an 896-pin solderless breadboard. Its interface requirements are three-wire RS-232 (no handshaking) at 300-19,200 baud (selectable). The unit is 7½ inches long by 3½ inches wide and weighs 1½ pounds.

The Micro-Lab costs \$179.95 plus \$3.50 for shipping and handling. It comes with a six-month parts and labor limited warranty and a 10-day money-back guarantee. For more information, contact Fisher Instruments, Suite 205M, 15127 N.E. 24th, Redmond, WA 98052.

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on your custom-programming and development needs. The price for the programmer's kit, containing the controller, 64K RAM, case, power supply, and a technical programming pack, is \$349. The technical programming pack is available separately for \$14.95.

For OEM pricing and technical information, contact Omnitronix Inc., P.O. Box 43, Mercer Island, WA 98040, 206-236-2983.

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Understanding AI

The rapidly developing field of artificial intelligence (AI) is explored in a new book from Addison-Wesley Publishing Company titled *Introduction to Artificial Intelligence*. The book's authors, Eugene Charniak and Drew McDermott, are leaders in the AI field.

The book introduces readers to the concept of artificial intelligence and presents programs and underlying theory in a readable, scientific style. The authors begin with a single logical representation scheme and follow it throughout the book, relating other such schemes and putting logical representation in perspective.

Introduction to Artificial Intelligence also provides a comprehensive view of language processing and planning. The cover price is

Programmer's Kit

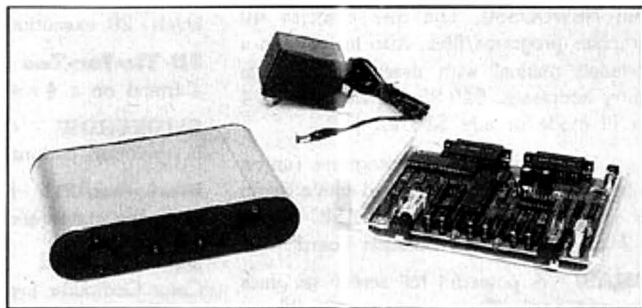
Omnitronix Inc. is offering a stand-alone, Z80-based RS-232 micro controller for commercial applications. The board provides 8K of EPROM, one bank of dynamic RAM, and two bidirectional, asynchronous RS-232 serial ports. The RAM addressing supports your choice of either 16K, 64K, or 256K DRAM. The controller is housed in an aluminum case.

The controller comes with a UL/CSA-approved wall power supply. It is available as a complete programmer's kit or Omnitronix can quote

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Portable Case

A carrying case for the Model 100/200 is available from Compucase. Constructed of brown vinyl, the case has two zippered compartments—one to store the computer, cables, instruction manuals, and paper, and another to store accessories such as the ac adapter, a small disk drive, or a cassette recorder. The case has a carrying handle that can be lengthened into a shoulder strap.

The case costs \$25, plus \$3 for shipping and handling. To order, send check or money order to Compucase, Box 3086, Montrose, MI 48457, 313-639-6182.

Circle 569 on Reader Service card.

Printed Matters

Silver-Reed America introduces the EXP420, a low-end, daisy-wheel printer intended primarily for home users. The EXP420 prints 12 characters per second. Standard features include super- and subscripts, bold and shadow print, auto-underline, and 10- and 12-pitch selection. The printer retails for \$299.95.

The company also intro-

duces the CF231, an automatic, dual-bin, cut-sheet feeder with envelope capability. Designed for use with Silver-Reed's EXP600 and EXP-800 daisy-wheel printers, the sheet feeder automatically collates and has a manual feed slot to insert single sheets by hand without removing the unit from the printer.

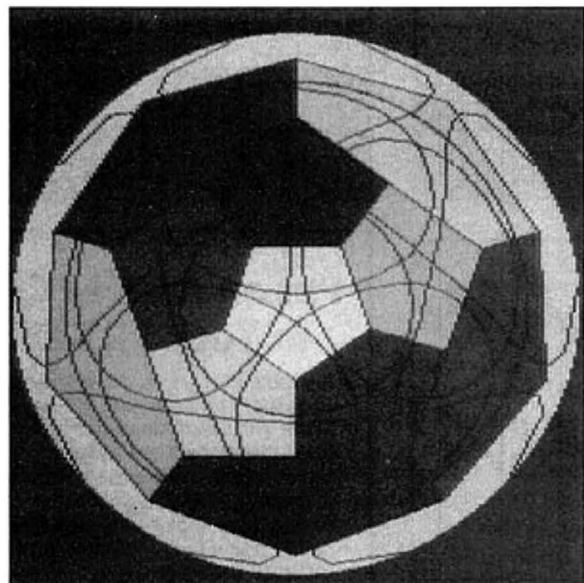
The CF231 can hold a maximum of 200 sheets of paper in each of its two bins. This allows an operator to use letterhead and second-sheet sta-

tionery for collated output. Up to 150 printed sheets can be accommodated by an attached paper stacker. The sheet feeder accepts a variety of paper widths, and it has built-in eject rollers to avoid paper jams. The suggested retail price for the CF231 is under \$400.

For more information, contact Silver-Reed America Inc., 19600 S. Vermont Ave., Torrance, CA 90502, 213-516-7008.

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DIFFERENT TRACK



Hexace Technologies' computerized puzzle.

The Ultimate Scramble

Hexace Technologies has a new challenge for those of you who've lost interest in Rubik's Cube: a puzzle that has more possible combinations than Rubik's Cube cubed.

The puzzle is an icosahedron, the Platonic solid that consists of 20 triangular faces. Each vertex is the site of a possible scrambling operation. When a vertex is rotated, the five incident triangles are rotated, as well. Each triangle has three colors. In unscrambled form, the colors adjacent to each vertex are the same. In addition to colors, the puzzle plays a musical note for each move.

The program is available for \$49.95; it runs on any IBM PC or IBM compatible. To order, send a check to Hexace Technologies Inc., 271 N. Mathilda, Sunnyvale, CA 94086, 800-822-9922. California residents should call 408-738-1680.

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Game Theory

So many one-line games tickled our judges' fancies that we can't let you see all the winners at once. Rather than leave anyone out, we'll print the names of the runners-up in future issues as space permits.

Wall Wars

Out of a strong field of finalists, Kevin Gross (Houston, TX) moved into the spotlight and captured the coveted T-shirt with a true original. In Kevin's Wall Wars (Program Listing 1), you use the arrow keys to keep a furiously blinking pixel on the move while the program erects barriers, aiming to fence you in. Each move you make as a free pixel scores a point. The game is over when you're trapped and can move no more. Press the break key to start over.

To adjust the degree of difficulty, change the 12 in `Q = RND(12)` to any value from four to 99; the lower the number, the greater the challenge. The program displays your score, constantly updated, in the upper-left corner of the screen. The best I did at "level" 12 was 721. Since Kevin didn't boast about his own high score, mine has to stand as the record. The gauntlet has been dropped.

Kevin's classic Model I/III technique establishes boundaries, keeps the pixel in play, and prevents crashing. Your pixel won't wrap around the sides of the screen or escape top or bottom. Kevin even prevents the pixel from charging through the scoreboard. His extensive, skillful use of the true (-1) and false (zero) results of logical comparisons for every function the program performs accounts for most of the program's brevity, but it's not the only factor.

Longtime TRS-80 users will scarcely be able to look at the `PEEK(14400)` statement, which reads the keyboard directly, without a twinge of nostalgia. The newer BIOS-based operating systems—TRSDOS 6.x and MS-DOS—are unquestionably better than Radio Shack's original systems, and the Basics associated with them are more extensive, more powerful, and faster for many things. But they don't let you at the heart of the system with immediate access from Basic to keyboards, video memory, and other devices. (A melancholy sigh is appropriate here.)

No Fair

The number of variations on the "I'm thinking of a number" game was as-

tonounding, though none of them impressed our judges. Kai Grimm (Clackamas, OR) got my attention—and an 80 Micro bumper sticker—with a thoroughly diabolical twist wherein the player instead of the computer thinks of a number between one and 100, and the program guesses it every time in seven tries or less. As ironic an approach as it is, Kai's technique—the relentless halving of the search field—is fundamental to many computer search routines.

Feeling that any irony should be complete, I borrowed the concept of Kai's program and twisted it further into the Ultimate Guess That Number Game (Program Listing 2). Anyone can play this generic version, which should work regardless of which Basic you're using. Type it in, run it, and watch the program think of a number from one to 1,000 and try to guess what it just thought of in 10 or fewer turns.

While this can also be appropriately called the Ultimate Useless Program, it proves a point: Although the range to be searched has increased geometrically, the program, by using the halving technique, needs only three more turns to find what it's looking for. How many passes, maximum, will it take for such a program to locate one number in a million? The answer underscores the efficiency of the technique, and why it's a common search method.

Utility Lines

Turning from useless to utilitarian, I recently learned a lesson about utilities by watching a telephone company worker repair a storm-damaged line. Having surveyed the situation from atop the pole, she chose the tools she needed, loaded a toolbelt, and scampered, hands free, to her aerial job-site with the agility of an acrobat.

Most of us keep a "toolbox" of utilities

meant to make our computing lives easier. If yours is anything like mine, however, it's hefty, bordering on unwieldy, and disorganized besides. Wouldn't it be nice, I recently thought, to have a collection of tools small enough to carry wherever we needed them.

To enter this month's contest, take your favorite programmer's aid or housekeeping utility and fold it into no more than three lines of Basic code. Line packing, in which older versions of Basic have a distinct advantage, will not be a consideration of our judges. Those submitting the most useful and interesting programs will win 80 Micro T-shirts, and their names will appear here in the November issue.

Here are the rules:

1. Owners of all TRS-80 and Tandy systems with the exception of the Pocket Computers are eligible. We'll consider degree of difficulty when comparing solutions created on different machines.
2. The deadline will always be the 15th of the issue month. Thus, this month's deadline is August 15. We realize this doesn't give everyone the same amount of time to come up with their entries (we apologize to our overseas readers especially), but postponing the deadline any longer would add another month to our publishing the answers.
3. Speaking of the answers, they'll appear three issues from the issue in which the problem appears. Thus, this month's winners will make their appearance in the November 1986 issue.
4. Employees of CW Communications are not eligible.
5. Send your entry to: 80 Micro, Fine Lines, 80 Pine St., Peterborough, NH 03458. We will not, unfortunately, be able to return entries.
6. Specify your T-shirt size. Bumper size is not required. ■

Harry Bee is a freelance writer, puzzle creator, programmer, and dreamer. Contact him at P.O. Box 567, Cornish, ME 04020.

Program Listing 1. Kevin Gross's winning Wall Wars game for the Model I/III.

```
8 IFPRINT@S;K=PEEK(14400);Q=RND(12);SET(X,Y):A=X+(Q=1)-(Q=2);B=Y+(Q=3)-(Q=4);S
ET(A,B);RESET(X,Y);C=X;D=Y;Y=Y-(Y>4)*(X=8)+(Y<46)*(X=16);X=X-(X>1)*(X=32)+(X<126)*
(X=64);IFPOINT(X,Y)X=C;Y=D;GOTOELSE-S-(C<>X)-(D<>Y);GOTOELSECLS:DEFINTA-Z;X=64;Y=
24;Z=-1;G0
```

Program Listing 2. The Ultimate Guess That Number Game.

```
1 CLS:B=1;U=1000;N=INT(RND(8)*1000)+1;PRINT "I'M THINKING OF A NUMBER.":PRINT:FOR
T=1 TO 10:G=INT((U+B)/2);PRINT "IS IT";G;"?":IF G>N THEN U=G-1;PRINT "TOO HIGH." E
LSE IF G<N THEN B=G+1;PRINT "TOO LOW." ELSE PRINT "I GOT IT IN";T;" TRIES!":END
2 FOR L=1 TO 200:NEXT L:NEXT T
```

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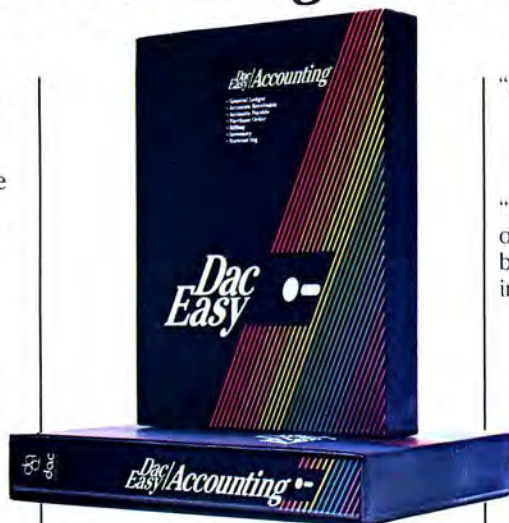
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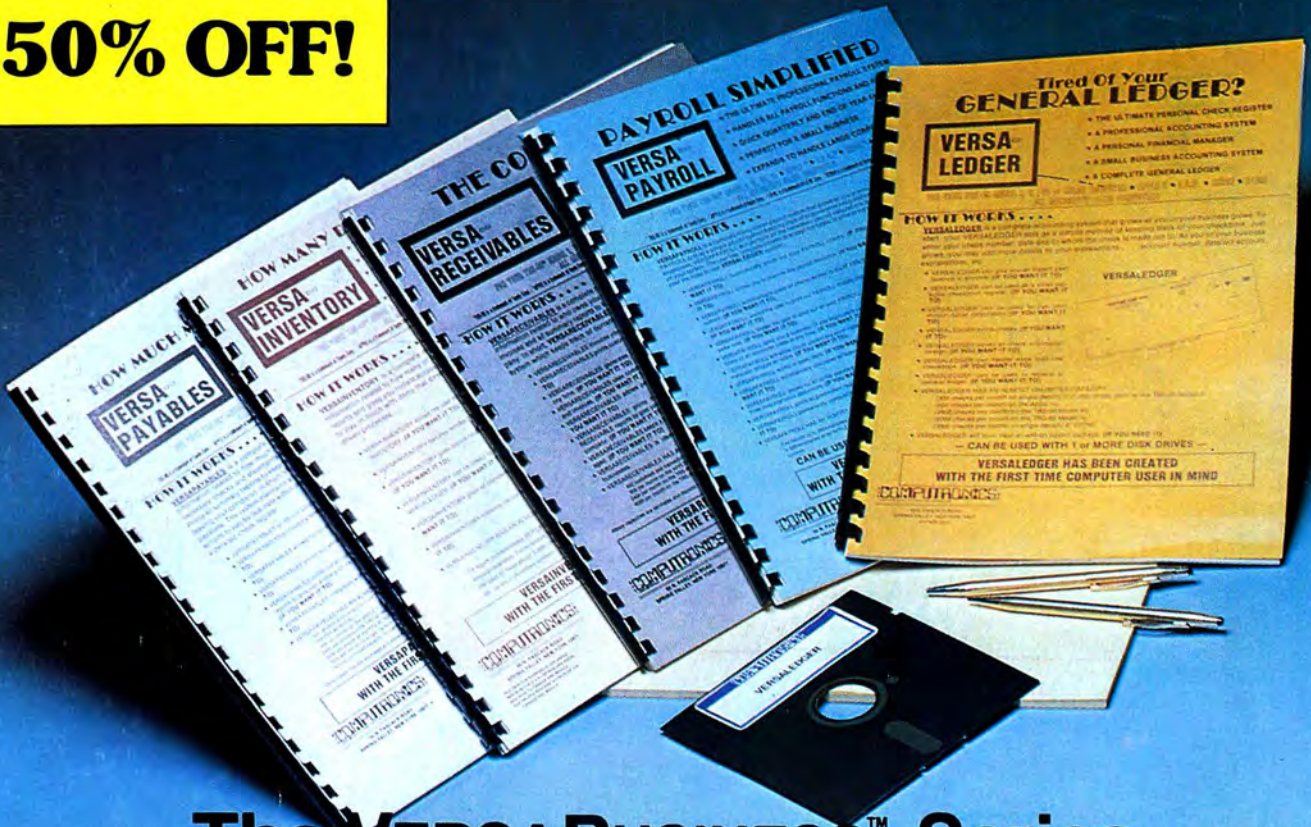
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- * add \$4 for C.O.D. or non-UPS areas
- * add proper postage elsewhere

DEALER INQUIRIES WELCOME

All prices and specifications subject to change / Delivery subject to availability.

COMPUTRONICS INC.

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