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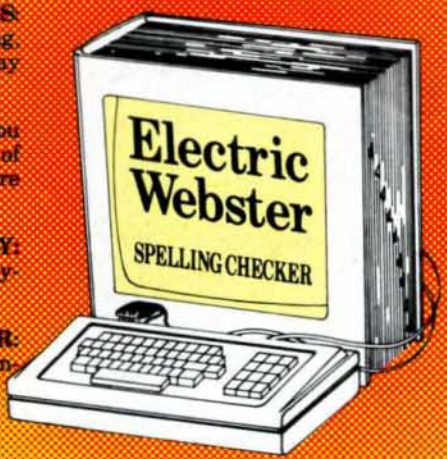

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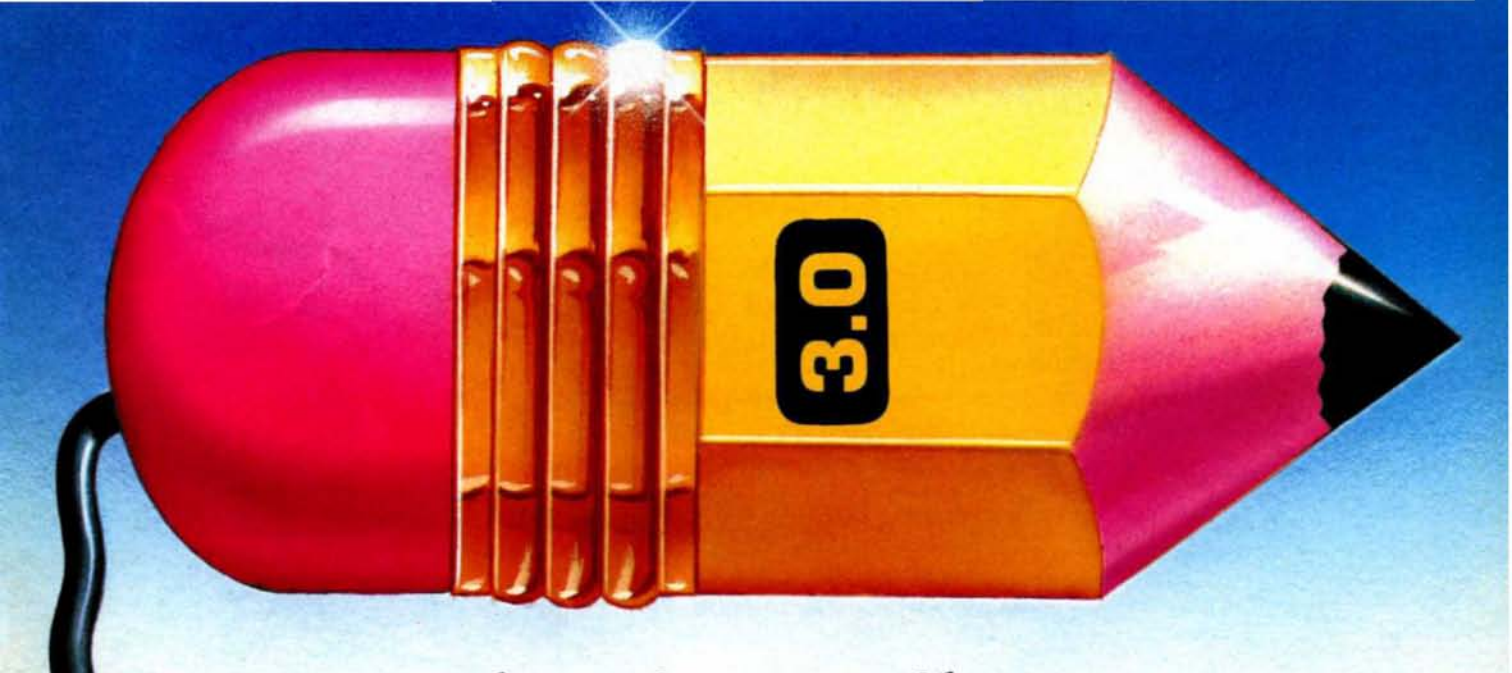

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LOAD 80

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 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.

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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 disk subscriptions to Load 80 are $199.97. Individual loaders are available on disk for $21.47, 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 Elm St., Peterborough, NH 03458.

Directory

Reference Library
Article: Checking References (p. 48).
System: Model 4, 64K RAM (Apparat editor/assembler is optional). To run, type LOAD REFLIB/CMD and press the enter key. Then type DO REFLIB/JCL and press enter again.

Use this keyword-indexed database program to turn your magazine collection into a reference library.
Language: Basic.
Filespecs: REFLIB/BAS, REFLIB/JCL, REFLIB/CMD, REFLIB/ASM.

Comparing Files
Article: Imperfect Matches (p. 60).
System: Model 4, 64K RAM (Apparat editor/assembler is optional).

Let the computer find the differences between two similar files via a byte-by-byte comparison.
Language: Assembly.
Filespecs: COMPARE/ASM, COMPARE/CMD.

64K Drive Bonus
Article: Set Drive Zero Free (p. 69).
System: Model 4/4P/4D, 128K RAM (Disk Basic and Scripsit are optional).

Gain an extra drive—without paying for it.
Language: Job-control language (JCL).
Filespecs: MEMDOS/JCL, MEMBASIC/JCL, MEMSCRIP/JCL.

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Article: Remote Possibilities (p. 73).
System: Model III, 32K RAM (editor/assembler is optional).

Give yourself remote access to your Model III.
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Article: The Old Shell Game (p. 81).
System: Model 4, 64K RAM.

Automate TRSDOS commands with a customized shell.
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Article: The Next Step (p. 106).
System: Model 4, 64K RAM; Pro-Create 3.4a or Pro-MRAS editor/assembler.

Techniques for building and maintaining macro and subroutine libraries.
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Filespecs: LINEIN/ASM, MACLIB/ASM, LINETEST/ASM, LINETEST/CMD.

Checksum
Article: How to Use *80 Micro* Program Listings (p. 116).
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.
Filespec: CHECKSUM/BAS.

Loc-Editor
System: Models I and III; 32K RAM.

A program that finds errors for you.
Language: Disk Basic.
Filespec: LOCEDITR/BAS.

BAS = Basic ASM,SCR = source code CMD = object code JCL = job-control language

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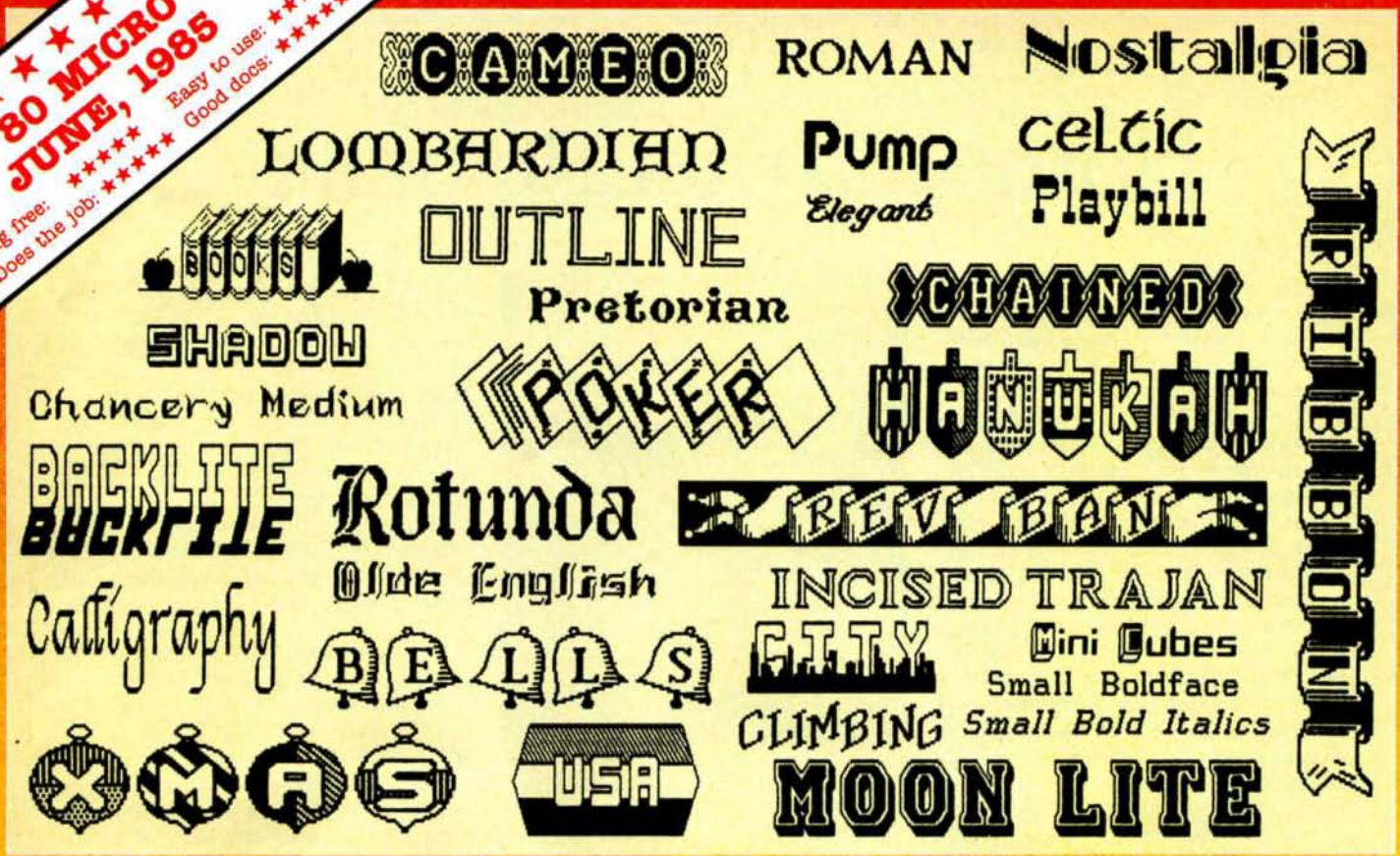

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Home Market Revisited

A while ago someone on one of Compuserve's special-interest forums asked other forum members to help him with an unusual quandary.

It seems he had a friend who was thinking about buying a PC for home use but couldn't come up with a decent enough reason to do so. The forum member—a PC user and enthusiast—couldn't think of any reasons either. Would his Compuserve companions help him out?

The response was amusing. Forum members, many of whom were grizzled old microcomputer veterans, couldn't help him. They'd been using their computers for so long they'd forgotten why. Someone finally said that the only reason to buy a home computer was because you wanted to. That sounded pretty logical to a lot of the members, except for the questioner, who thought people weren't taking him seriously enough.

What a riot. Ten years after the Apple hit the market, people are still trying to figure out why they should buy a home computer. Maybe that's why so many writers and analysts have concluded that the home market either collapsed or never existed in the first place.

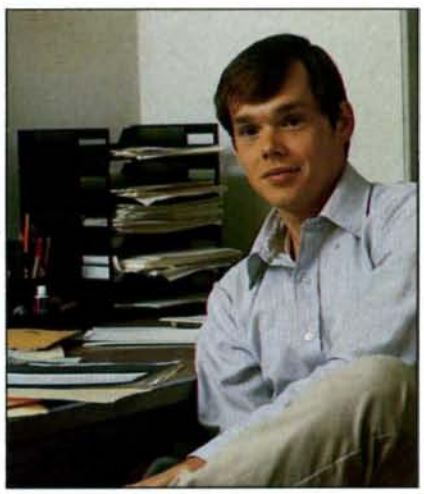
It Does Exist

But I believe that the home market does exist. It just doesn't exist as people in the industry would like it to. Their mistake is in trying to define the market according to a model established by business computing.

The business market has three primary characteristics. First, businesses computerize because they have to. Second, the market is driven by software applications, specifically word processing and spreadsheets. And third, companies, not individuals, foot the bill, which encourages vendors to inflate prices.

Now look at the home market. Nobody has to have a computer at home. Buyers are not attracted by any specific applications. And individuals, not companies, are spending the money, which forces vendors to deflate prices.

The business market tends to operate as one blind, dumb, lumbering organism. Everyone buys IBM PCs and copies of 1-2-3 because everyone else buys them. This beast is controlled by a brain the size of a pea, capable of gross motor reactions but incapable of making logical decisions. The home market, on the other hand, comprises millions of individuals, each of whom comes to a personal decision to buy a microcomputer. Rounding up this crowd is like catching raindrops with a butterfly net.



Photograph by Frank Cordelle

Back in 1983 and 1984 when outfits like Commodore, Atari, and Texas Instruments were selling 3 million units a year, people bought home computers as part of a feeding frenzy. Parents had been told that if junior didn't own a microcomputer, he would most likely become a victim of cretinism and possibly brain death. Deep down inside nobody believed this nonsense, but families justified buying computers much as agnostics do praying: It never hurts to be on the safe side.

Of course, many of those home computers were destined for abandonment before they were even out of the box. They shouldn't have been bought in the first place. The only purpose they served was to grossly inflate our expectations of the home market and lead to its evident collapse.

Imagine, if you will, that only people who needed or wanted a computer had bought one. How many would that have amounted to? Half of the estimated low-end sales of around 12 million? A third? Four million instead of 12 million installed units would have been a lot more realistic and led us to a more accurate perception of how big the home market really was.

Talking Too Much

So home computing doesn't exist as a monolithic block. How, then, do you talk somebody into buying a home computer?

Easy: You don't. Nowadays when someone buys a home computer, it's in response to a conscious need or want. The person has a specific application in mind, such as word processing, home education, or stock-portfolio management. Or he got a PC compatible to do work at home. Or he finds computer technology interesting and simply wants to play with it.

So the answer the forum members gave was essentially correct. The real computerist buys a home computer because he woke up one morning and it seemed like the right thing to do. Anyone else who buys one is making a mistake, contributing nothing to his own life and even less to the world of microcomputers.

Defending TRSDOS

I received an angry letter from a reader accusing me of being anti-TRSDOS. In retrospect, I can see how some of my editorials might have given that impression. But the fact is that I use a Model 4 at the office and a Model III at home. For most of my applications, I'm quite happy with Scripsit, Visicalc, Doubleduty, and Super Utility Plus (I almost look forward to blown disk files just so I can play with SU+). While I'm using a Tandy 1000 more frequently—primarily for 1-2-3 spreadsheets and to run submitted programs—the TRSDOS systems are still my workhorse machines.

However, I can't allow my preferences to obscure the fact that, in the marketplace, the Model 4 is rapidly becoming nothing more than a memory. How many did Tandy sell in 1986? Twenty-five thousand? I'd be surprised if it was much more. (Of course, the Christmas season can bring big surprises.)

How well a computer sells—or whether it's available at all—has nothing to do with how well it does the job. But TRSDOS afficionados have to get used to the fact that the Model 4 is soon to join the ranks of obsolete computers.

Many of *80 Micro*'s readers have already swallowed the pill and moved on to MS-DOS systems. Our most recent surveys (dated mid-July 1986) show that over 40 percent actually own a PC or compatible. Only 15 percent say they have no intention of ever buying an MS-DOS machine.

I suspect that many of the new MS-DOS owners will continue to use their old Model IIIs and 4's. A Tandy 1000 does not necessarily have to replace a Model 4. The former can supplement the latter nicely. ■

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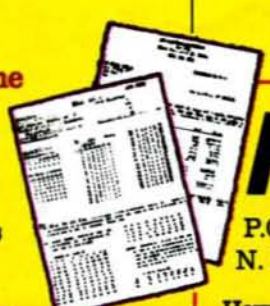

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Spiritual Quest

I recently began a search for information on Microsoft Basic .01.01.01 for the Model 4. Writing first to Microsoft, I enclosed the following peculiar application of the DEF FN (define function) statement as an example of mysteries not explained in the Tandy manual:

```
DEF FND(A,B,C) = B*B - 4*A*C
INPUT A = 1 B = 5 C = - 10
PRINT FND(A,B,C) 65 computes B*B - 4*A*C
PRINT FND(B,A,C) 201 computes A*A - 4*
B*C
PRINT FND(A,C,B) 80 computes C*C - 4*A*B
```

Microsoft referred me to Tandy. Tandy's customer-service representative sniffingly told me that my DEF FN routine works fine, sent me a copy of the page in the Model 4 manual that demonstrates three brief examples, and suggested I "consider a course from your local college."

I infer from this that Microsoft Basic has an oral history only and that I must find a guru. So much for the celebrated Tandy support.

Charles H. Stones
Portland, OR

One of our own gurus, Beve Woodbury, says your routine produced the results indicated because the variables within the parentheses serve only to mark positions. They have nothing to do with the actual variables A, B, and C, and are probably better understood as positions 1, 2, and 3. The function would then read:

```
DEF FND(#1,#2,#3) = #2*#2 - 4*A*C
```

—Eds.

Truth in Advertising

Many people are confused about characteristics of the various chips (microprocessors) that are on the market. Large corporations haven't helped matters with advertising that isn't completely accurate. Such classifications as 8 bit, 16 bit, and 32 bit can be misleading.

The number of bits a microprocessor can distribute from the CPU via the data bus equals the width of the data bus, and the number of bits the CPU can hold in its registers can equal or exceed the data-bus width.

For example, Intel's 8086 chip (the 80186 used in the Tandy 2000) is a true 16-bit chip because both the internal registers and the external data bus handle 16 bits at a time. The Intel 8088 chip (used in the IBM PC, Tandy 1000 and 1200, and most of the so-called compatibles) has an 8-bit data-bus width and processes data internally 16 bits at a time.

The Motorola 6809, like the Intel 8088, is an 8-/16-bit hybrid chip. One must ask the question: Why is the Intel 8088 advertised as a powerful, 16-bit chip while the Motorola, which is used in the Radio Shack Color Computer, is advertised as 8 bit?

The real problem is finding a set of criteria for effectively measuring microprocessor performance. Corporations seem to be conditioning us to think in terms of clock speed and bits. Neither is quite adequate, just as the size of an engine isn't a reliable gauge of its horsepower.

Perhaps a better measure is the number of instructions that can be executed per second.

Joe Stanco
Albany, NY

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Whither the 6000?

The Tandy computer catalog published in the October issue of *80 Micro* suggests disturbing news for business users. The strongest business machine, the Tandy 6000, is being phased out in favor of an IBM-compatible personal computer, the 3000 HD.

Those of us who program the 6000 for small-business users wonder which way to point our customers. We were hoping for an updated 6000 with more memory, the 68020 chip, and a faster disk controller. Such a machine could be clocked at 16MHz and support perhaps six to 10 terminals. Our hopes were in vain.

The Tandy 6000 is unique, a true multiuser system with the reliability and accessibility of Radio Shack service behind it. The 3000, on the other hand, gives us problems. First, it is not as unique as the 6000. There are 10,000 software and hardware vendors clamoring for a piece of the AT-compatible pie—a much tougher market for the little guy to sell to. More important, the 3000 HD isn't the multiuser box the 6000 is; by all accounts, it's a dog in multiuser environments.

It is clear Tandy has turned its corporate back on an important and loyal customer base. That base, the small- to medium-size business users and the consultants who serve them, will return the compliment. We need a new machine to recommend to our clients, and we don't see it coming from Tandy.

John Culleton
President, Culleton Group Inc.
Sykesville, MD

Correction

In the November 1986 Feedback Loop (p. 12), we named the wrong company as the developer of a forthcoming Electric Pencil update for the Model 4. Electric Software Corp. of Dallas, TX, is the developer.

—Eds.

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

Illustration by Anthony Russo

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									300 baud	*1200 baud*
The Source	X	X	X	no	X	X	$49.95	$10.00	$8.40	$10.80
CompuServe	X	X	X	X	X	X	$39.95	none	$6.00	$12.50
GEnie*	**X**	**X**	**X**	**X**	**X**	**X**	**$18.00**	**none**	**$5.00**	**$5.00**

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† *Tandy is a registered trademark of Tandy Corporation.*

Mail-Order Maxims

by Daniel Harmon

Guidelines to making successful mail-order purchases.

Mail-order business is as American as apple pie, but you might encounter problems not found in over-the-counter merchandising. Apart from the obvious fact that you can't examine a product until it arrives, you might receive goods flawed because of negligent manufacture, inspection, or handling. And if you find yourself slighted, accidentally or maliciously, you have to contend with a stranger hundreds of miles away in a different legal jurisdiction.

That doesn't mean you should shun the mails. A shrewd buyer can take steps before ordering and after delivery to ensure satisfaction. And the mail-order branch of the microcomputer industry does lie within reach of our system of justice.

Under the Uniform Commercial Code, a buyer can reject a product "within a reasonable time" if, after usage, it evidences a breach of warranty. What's a reasonable time? That would be up to a court to decide. Just make sure you bring any problem to the seller's attention as soon as you discover it.

An Ounce of Prevention

First, you should follow these steps when you order a product by mail:

- Read the advertisement's fine print and know exactly what you're buying. If you can't find details you want in the ad; if some of the published information seems unclear, contradictory, or wrong; or if you don't understand the meaning of a disclaimer, phone or write the seller for clarification before placing your order.
- Ask in advance about the seller's return policies. Some houses charge "restocking" fees; some require that the buyer pay return postage.
- Never send a cash payment by mail.
- When your order arrives, save all boxes, wrappings, instructions, and other papers until you're sure the product is OK. If it was damaged or lost in transit, carriers usually will make amends. United Parcel Service, for example, either sends someone to check the package or returns it to the shipper at no cost to you. If the U.S. Postal Service handled the shipment, you can lodge a complaint with your local post office or contact Consumer Advocate, U.S. Postal Service, Washington, DC 20260.
- Never return a damaged product without communicating with the seller first. True, you might save time by returning it immediately, and you might receive a replacement or refund by return mail, but you could also create complications for yourself.

How to Complain Effectively

What happens when you've paid your money, taken delivery, and you wind up with shoddy merchandise or an item you don't want? What happens if you send in your check and the days turn to weeks, the weeks to months, and still you receive nothing?

You're not at the seller's mercy; you do have recourses. But before you take action, remember that it's most unlikely that you're dealing with a crook. The U.S. Office of Consumer Affairs estimates that consumers resolve 88 percent of their problems simply by contacting the seller or the seller's supervisor. Mail-order merchants generally aren't out to steal people's money, they're out to do business.

If you do run into a problem, you should first write a letter to the company's president or consumer contact. Your letter should include the dates you ordered and received the item and identify the product by model name/number and serial number. Detail the problem and ask for the form of satisfaction you deem appropriate: replacement, refund, or substitution. Attach copies, not originals, of the advertisement that attracted you and of receipts, warranties, canceled checks, or other pertinent documents.

Bear in mind that it won't hurt, and might help, to squelch your irritation and keep the letter's tone friendly. The person you're writing probably isn't the person who caused your woes, but one who can expedite a remedy.

Unless the seller specified that delivery might take longer, the law requires that vendors deliver merchandise within 30 days of the order. If a company fails to deliver within the allotted time, you have the right to cancel your order at no cost. If you exercise that right, the seller has seven days to refund your money or credit it to your charge account.

Note that when you negotiate mail-order problems, the last thing you should do is threaten to "turn the matter over to my lawyer." Hiring a lawyer should be your final resort. Lawyer's fees aren't cheap, and winning your case won't necessarily exempt you from having to pay costs.

Keep copies of all correspondence to and from the seller.

Wait three weeks. If the matter isn't settled, try a second letter, repeating your complaint and declaring that if you don't get immediate satisfaction, you'll notify the deputy chief postal inspector in the vendor's home region.

For the vendor, this now becomes serious business. The U.S. Postal Service has a nationwide law enforcement arm authorized to investigate mail fraud. The Postal Service can cut off mail deliveries to a vendor's address. If the Postal Service convicts a seller of mail fraud, he could face a stiff fine and possibly jail.

The government is most likely to launch a full investigation when it receives numerous complaints against a seller. Moral: Don't hesitate to report a truly serious problem. If you're really up against an unscrupulous dealer, yours could be the complaint that brings Uncle Sam into the action.

Other consumer defenders include the Mail Order Action Line of the Direct Marketing Association (6 E. 43rd St., New York, NY 10017). This commercial trade association follows up complaints by contacting vendors. It has no power of enforcement, though.

Better Business Bureaus and state or local consumer protection offices might be able to help you, but it can be confusing to find the right place to make your particular complaint. The U.S. Office of Consumer Affairs' *Consumer Resource Handbook* lists the appropriate agencies. You can get a free copy by writing to Handbook, Consumer Information Center, Pueblo, CO 81009.

Finally, if you're having a problem with an *80 Micro* advertiser, you might want to send a copy of your complaint to *80 Micro*, 80 Pine St., Peterborough, NH 03458. ■

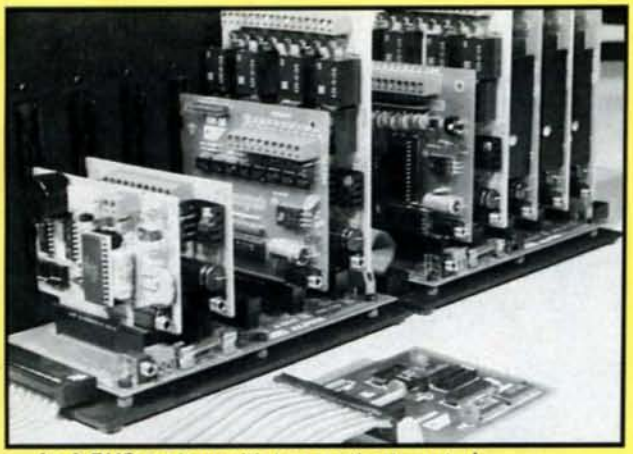
Daniel E. Harmon is the managing editor of The Lawyer's PC *newsletter, P.O. Box 1108, Lexington, SC 29072.*

Illustration by John Pirman

The Amazing A-BUS

NEW

What will you do with it?



An A-BUS system with two motherboards.

- **SHEILA** wanted to set up a variety of experiments in her lab. With an A-BUS, the computer can watch the mice instead of Sheila.
- **HARRY** has a model railroad layout that he wished to automate. Now his home computer controls the engines, gates, signals, etc. through the A-BUS.
- **BOB** tests electrical fixtures as they leave the assembly line. He develops test equipment quickly with inexpensive, off-the-shelf, and easy to use A-BUS cards.

Before they chose the A-BUS, they asked:

- ***What if I change computers?*** Incredibly, this is as simple as replacing the inexpensive adapter card. The A-BUS cards work with hundreds of different computers.
- ***What about my limited budget?*** Good news! The A-BUS is the most economical system for any computer, anywhere. Also, you pay only for the functions you need.
- ***I'm not an engineer. Can I use the A-BUS?*** If you can wire a switch, you can use the A-BUS. Simple OUT and INP commands control everything. (Apple and CoCo use POKE and PEEK). You'll like the detailed user's manuals.
- ***What would I need?*** Select the A-BUS cards, and slip them into a motherboard. Plug the adapter into your computer and connect them with a cable.
- ***Can I get the user's manuals?*** Yes, the complete set for all the A-BUS cards is available for only $10. Also, you are welcome to call our tech line about your application.

A-BUS Adapters

IBM PC, XT, AT and compatibles.

Uses one short slot.	AR-133...$69
Tandy 1000, 1200, 2000, 3000.	AR-133...$69
Apple II, II+, IIe. Uses any slot.	AR-134...$49
TRS-80 Models 100, 200. Plugs into 40 pin socket. (Adapter has another socket).	AR-135...$69
TRS-80 Mod 3,4,4D. Fits 50 pin I/O bus.	AR-132...$49
TRS-80 Model 4P. Includes extra cable.	AR-137...$62
TRS-80 Model I. Plugs into 40 pin I/O bus.	AR-131...$39
Color Computers (Tandy).	AR-138...$49

A-BUS Motherboard MB-120: $99

Will accomodate five A-BUS cards. A sixth connector allows a second motherboard to be added to the first (with connecting cable CA-161...$12). Up to five motherboards can be joined this way to a single adapter. The motherboard is mounted on a sturdy aluminum frame with card guides.

- A three foot cable connects the A-BUS Adapter Card to the first motherboard. **CA-163...$29**
- If you use only one or two cards, the motherboard is not required. One card will plug directly into the CA-163 cable. Cable for two cards: **CA-162...$39**

Relay Card RE-140: $129

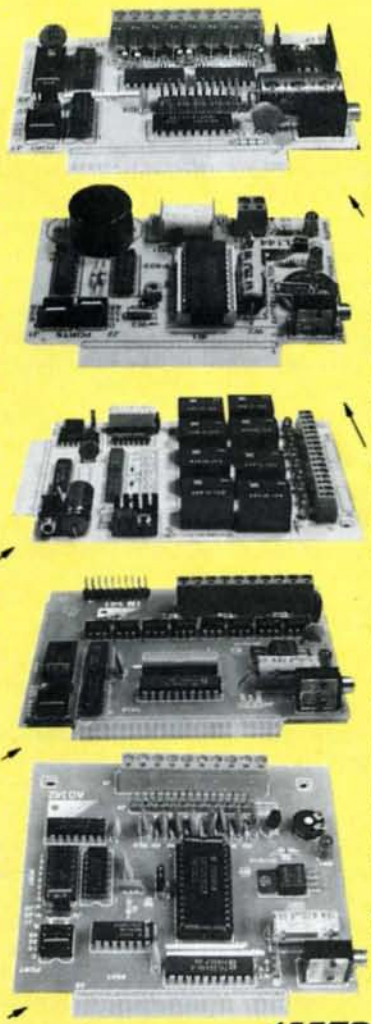
8 industrial relays on board. Contacts are rated at 3 amps. You can control up to 64 cards (512 relays) using several motherboards. Jumpers are used to simply select the card address. The card is easily controlled in BASIC with "OUT" or "POKE". For example, OUT 1,0 turns all the relays off on card #1. Eight LED's show which relays are on.

Digital Input Card IN-141: $49

It's safe and easy to connect and read switches, keypads, thermostats, alarm loops, etc. The eight inputs can monitor the presence of voltage or switch position. Simple INP or PEEK commands read the status (On or Off) of the inputs. Each input is optically isolated for convenience and safety.

Analog Input Card AD-142:$119

With this 8 bit, 8 channel A/D converter, your computer can read voltages, temperatures, pressures, light levels, etc. Take over 100 readings per second in BASIC (several thousand with machine language). It's simple to use, for example: OUT 1,3 selects channel #3, then A=INP(1) reads the voltage on that channel. Input range: 0 to 5.1V. Resolution: 20mV. Conversion time 120us.



12 Bit A/D Converter AN-146:$109

This high performance analog to digital converter features accuracy to 0.025%, 130ms conversion time, sign and over range indication. The basic input range is −5 to +5 volts, with 1.2mV resolution, but the gain of the on-board amplifier can be set to measure microvolts. Ideal for a strain gauge, thermocouple, pH meter, etc.

Motor Controller ST-143:$69

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

Motor: 48 steps/revolution, 300 steps/second, ¼" shaft: MO-103...$15. Power supply: PS-126...$10

Special Package: the controller card, *two* stepper motors, and power supply: **PA-181...$99**

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It's the most powerful clock/calendar available. The features: • 5 second/month accuracy. • Keeps time, date, and alarm for 5 years (even with computer off). • Can time events down to 1/100 second. • Periodic "chime". • Full time and date alarm. • Four alarm outputs: Computer, LED, Buzzer, and Reed Relay. • Easy to use,: for example H=INP(1) reads the hours, Y=INP(6) reads the year, etc.

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

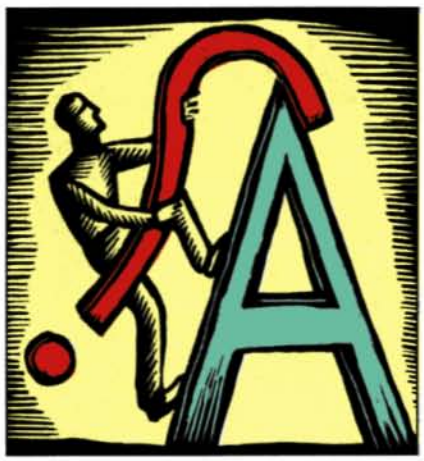

Illustration by Anthony Russo

Moving to a PC

Q: I want to transfer Model I Electric Pencil files, as well as some Model I and 4 Basic programs, to an IBM PC. I also want to transfer similar files from the PC to the TRS-80 computers. What is the best way to do this? *(John J. Williams, Alamogordo, NM)*

A: There are a couple of ways to transfer data between computers. You can use a serial linkup with a communications program running on each machine, but the best way is by disk-based transfer.

You have several options. Educational Micro Systems (P.O. Box 471, Chester, NJ 07930, 800-922-0786), Powersoft Products (17060 Dallas Parkway, Suite 114, Dallas, TX 75248, 214-733-4475), and Hypersoft (P.O. Box 51155, Raleigh, NC 27609, 919-847-4779) all have programs that easily and efficiently transfer data between disks. The programs read the data from the PC disk in one drive and transfer it to the TRS-80 disk in the other, and vice versa. All three companies also sell Basic programs that convert about 90 percent of your code while translating between computers.

Four-Wheel Drive

Q: What is the best way to convert my Model 4 with two single-sided drives to two double-sided drives? I want high-quality drives with a guarantee. Also, does anyone buy used drives? *(John Williams, Charlotte, NC)*

A: If you have a regular Model 4 with the drive connector on the bottom, just add two drives in an enclosure via a cable. (You can still use the existing drives.) It isn't difficult, however, to replace the single-sided drives with double-sided ones. Since you are replacing full-height with half-height drives, you can fit four half-height, double-sided drives in the Model 4 drive slots (two in the bottom and two on top). Aerocomp (Redbird Airport Hangar #8, P.O. Box 764246, Dallas, TX 75376, 800-527-3582), Total Access (P.O. Box 790276, Dallas, TX 75379, 214-337-4346), and Software Support (200 Homer St., Ashland, MA 01721, 617-872-9090) all offer half-height double-sided drives and enclosures. You can send in the computer for installation or do the work yourself. The cost is $110–$120 per drive plus a $50–$100 installation fee, depending on the work.

I know of no company or person that regularly buys used drives. You can try taking out a classified ad in a publication such as *80 Micro*.

Short-Term Memory

Q: I want to upgrade my gate-array Model 4 (26-1069A) from 64K to 128K. I have purchased a set of eight 4164 memory chips (150-ns variety) and have the Tandy service manual, but I have two questions that I would like answered before I roll up my sleeves and void my warranty:

1. Are there any jumpers to move or traces to cut?
2. How do I test to make sure the new memory works?

By the way, in the April 1986 Feedback Loop (p. 16), Dave Hancock mentioned that the print wheel from the C. Itoh Model A10-30 daisy-wheel printer fits the Tandy DWP 210 printer. I also found that it fits. You can call C. Itoh (800-348-1984) and ask for the *A10 Printwheel Catalog* and the names of nearby dealers. *(Richard Rosenblum, New York, NY)*

A: With the gate-array Model 4, you need only open the computer and plug the RAM chips into the empty bank, aligning the notches on the chips with the notches on the sockets. Be careful handling the chips, which are sensitive to static electricity. Unlike earlier Model 4's, your version doesn't need a PAL chip for the 64K-to-128K upgrade. After installing the chips, run the TRSDOS 6.x Memdisk to create a RAM disk in the upper 64K. If there are problems with running the program, make sure the chips are in their sockets correctly.

Multiple Translations

Q: I am nearing completion of a 21K scheduling program written in Basic under TRSDOS 6.2.1 on a Model 4P. I need to convert the program to the Apple IIe disk format under Prodos. How can I get it over to the Apple disk? What language do you recommend for writing on the Model 4P with destination computers such as the Apple IIe, IBM PC/XT/AT, Kaypro, and Commodore? *(Janis Rott, Oriental, NC)*

A: The several versions of Basic on those machines are sufficiently different to make moving code between computers difficult at best. However, Zedcor (4500 E. Speedway, Tucson, AZ 85712, 602-881-8101) has versions of ZBasic that run on the Apple IIe, Macintosh, TRS-80 Models I, III, and 4, CP/M, and MS-DOS computers. You must buy each version separately, but code from one computer is quite compatible with code from another. Use a serial hookup with a null modem between the Apple and the Model 4 to move the program over, then modify the code for that specific machine. With ZBasic's built-in compiler, you can compile programs and use them as command files.

As an alternative, C language has very portable code, but it's hard to find compatible compilers for the machines mentioned. I know of no TRS-80 to Apple IIe disk-transfer programs.

Vital Statistics

Q: Our fire department received a Model 4P with a DMP 120 printer as a donation, and we need help with our first major project: numbering each residence in town and creating a master list of every household. Using PFS:File and Report, we've compiled an alphabetical list that refers to a map page displaying each resident's location along the road by name. Until now, these maps have been done by hand and are difficult to update. We want to computerize them. Any suggestions? *(Scott Fraser, Dunbarton, NH)*

A: You need a program that combines and prints out text and graphics. ZGraph from Misosys Inc. (P.O. Box 239, Sterling, VA 22170-0239, 703-450-4181) fits the bill. You can divide the map

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into grids and make separate map files.

Alternatively, buy a high-resolution graphics board and use a graphics program. In September 1985, we featured a graphics program that works on the Models III and 4 ("Drawing in Detail," p. 56). Micro-Labs Inc. (902 Pinecrest, Richardson, TX 75080, 214-235-0915) sells high-resolution boards and software that should do the trick.

Double-Sided Drives

Q: I am considering buying external double-sided drives for my Model 4. I use TRSDOS 6.2.1. If I just plug double-sided drives into the external drive connector, will the controller recognize and handle them with no modification to the electronics? *(Patrick Brown, San Francisco, CA)*

A: Aerocomp, Total Access, and Software Support (see addresses above) all offer external half-height, double-sided drives you can plug into the drive connector. TRSDOS 6.2.1 is equipped to handle the drives. The cost is $270–$300 for two drives, enclosure, cable, and power supply.

Electronic Wordsmith

Q: I use the Electric Webster spelling checker with Superscripsit on my Model 4, and it works fine. I bought Scripsit Pro from Radio Shack, which has a spelling checker that isn't as good as Electric Webster. However, Electric Webster doesn't work with Scripsit Pro. What can I do? Also, do you know of any thesaurus programs that work on the Model 4? *(Phil Gulick, Seminole, FL)*

A: Electric Webster publisher Cornucopia Software (P.O. Box 6111, Albany, CA 94706, 415-524-8098) will update your copy to the Scripsit Pro version for $35. I don't know of any thesaurus programs for the Model 4.

Deskmating Calls

Q: How can I get my Tandy 1000 to print Deskmate files in a 130-character-per-line condensed mode on a DMP 120? *(J. W. Jamerson III, Savannah, GA)*

A: Unfortunately, you can't send control codes to your printer from Deskmate. You must set up condensed mode on your printer before entering Deskmate, and you'll remain in that mode until exiting Deskmate and resetting the printer. Dave's MS-DOS Column (Psst. . . Printer Codes, August 1986, p. 84) provides several ways to send printer-control codes. If you always plan to use Deskmate with condensed printing, try inserting lines in the Autoexec.BAT file (before loading Deskmate) that put your printer in condensed mode.

The code combination for condensed printing on the DMP 120 is 27 and 20 (1B and 14 hexadecimal [hex]). That translates to control-[and control-T if you're using the Echo command from a DOS batch file.

Interesting Characters

Q: I have cassette Scripsit 1.0 for the Model III. What modifications can I make to take advantage of my Tandy DMP 105 printer's character modes? I want to activate and deactivate the printing modes by inserting codes.

Also, how can I stop my system from rebooting when I call $Route from Model III Basic ROM at address 108 decimal via the Basic USR function? *(Jonathan Hogg, Cleveland, OH)*

A: First, writing such a patch to Scripsit is possible, but it requires that you have extensive knowledge of the program's coding and more code than will fit in this column. I can tell you this much: You can intercept the CALL 003BH printer-output routine at 4EEF hex and put patches in the free program space between 6888 and 6A87 hex.

Second, you aren't alone on the $Route question. Radio Shack removed the feature without giving out much information about it. The routine at X'006C' has been changed to a simple RET (return) instruction.

You can easily emulate $Route, which found the device-driver addresses for source and destination devices and copied the first 3 bytes of the source device driver over the first 3 bytes of the destination driver. The Table shows the device-driver addresses for standard devices on the Model III. To route video to the printer, for example, execute the following code:

```
FOR X=0 TO 2:POKE 16421+X,PEEK
(16413+X):NEXT X
```

Device	Device name	Hex address	Decimal address
Keyboard	KI	4015	16405
Display	DO	401D	16413
Printer	PR	4025	16421
Serial in	RI	41E5	16869
Serial out	RO	41ED	16877

Table. Model III device-driver addresses.

12 Apostles

Q: Where can I get information for my Radio Shack Model 12? *(Stephen Shoemaker, La Place, LA)*

A: People often ask me for an information/support source for their Models II, 12, and 16. Here are two.

The Tandy Business Users Group (T-BUG) for Models I through 6000 meets in the Chicago area and publishes an informative newsletter. The $35 yearly dues start from the date of acceptance and include a one-year subscription to the *T-BUG Newsletter*. Write or call Membership Chairman Ellen Weinstein, c/o IML Imaging Inc., 3304 Commercial Ave., Northbrook, IL 60062, 312-564-3330.

National 2–6000 Forum is a newsletter and Electronic Data Interchange System covering the Models II, 12, 16, and 6000. A subscription costs $18 for 12 issues and includes access to Electronic Data. Write *National 2–6000 Forum*, P.O. Box 300, Lynnwood, WA 98046-0300, or call the Electronic Data Interchange System at 206-774-3282. The parameters are 1,200 baud, 8-bit words, 1 stop bit, no parity. Have your credit card ready if you aren't already a subscriber.

4 Sale

Q: I recently purchased a Tandy 1000 to replace my Model 4. How can I legally sell the Model 4 programs without infringing on copyright laws or software-license agreements? *(Eric Paules, New Freedom, PA)*

A: You can legally sell the entire original package. It should include the original disk(s), documentation, and any updates. You cannot keep any copies of the disk or documentation.

Inside PC-DOS

Q: I use PC-DOS 3.1 on my 1000. It works fine, except I can't call Basic; I get a "Divide overflow" error. Can you explain this? *(Arthur R. Gumble, Crestview Hills, KY)*

A: PC-DOS 3.1 is almost completely compatible with the Tandy 1000, but the version of Basic that comes with IBM computers is ROM-based. When you run the PC-DOS 3.1 Basic, it expects to find most of its code in the ROM found only on IBMs. The generic GW-Basics that come with MS-DOS clones like your Tandy 1000 are RAM-based; the whole Basic program is loaded in from disk.

Copy the GW-Basic programs that came with your 1000's MS-DOS 2.11 (Basic.EXE and Basica.COM) onto your PC-DOS 3.1 disk after deleting the versions of Basic and Basica that are already there. The Tandy Basic.EXE is longer than the IBM version because all of the Basic interpreter is on disk.

Circle 141 on Reader Service card.

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80 MICRO Review, November 1985

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System requirements - IBM-PC Compatible: One disk drive, 128K memory, color or monochrome monitor, and DOS 2.0 or higher.
TRS-80 Model 1/3/4/4D/4P: One disk drive and 48K memory.

Patching Superscripsit

Q: I have Model 4 Scripsit 01.01.00. When I try to enter a program, the response is that there is no room left for programs, while the directory says 1.5K is left. I try to remove a resident program, but when I use the Kill command the computer replies "Program not found." The same thing happens with Delete. The Remove command produces an "Illegal access to protected program" message.

Now there is a resident program I can't erase. If I bring it up and then try to quit, I get "Illegal access to a protected document." I have one title on the menu, but no program in it and I can't clear it. Please help. *(Hubert Hoover, Spokane, WA)*

A: I assume since you mention version 01.01.00 that you are referring to Superscripsit, and that when you refer to a program you mean a text file. If I'm correct in these assumptions, you need at least 1.5K more disk space. A Model 4 Superscripsit file with no text entered requires two granules (3K) of disk space.

The Kill command is inactive in TRSDOS 6. If you want to use it under TRSDOS 6.2, enter the following patch (by James R. Reed of Dallas, TX):

PATCH SYS1/SYS.LSIDOS (D02,81 = 4B:F02, 81 = 00)

You can solve the "Illegal access to protected program" problem by using the Purge library command or another of Mr. Reed's patches:

PATCH SYS2/SYS.LSIDOS (D02,33 = 18:F02, 33 = 28)

This patch disables passwords and should clear up your problem.

Perfect Copies

Q: I recently transferred a copy of cassette Scripsit to disk with Dosplus 3.0, but the program won't run after I reload it. Is there a way I can get it to run off a disk system without buying the disk version? *(Richard Meronek, Armed Forces)*

A: Transferring the program from tape to disk isn't enough. DOS occupies memory roughly from address 4000 hex to 51FF hex. Cassette Scripsit begins loading at 42E9 hex, causing a conflict in memory. You must load the program to an offset location in memory (initially out of the DOS's way), disable the interrupts and DOS, and then load it down into its proper operating environment.

The Program Listing, which you can type in and run from cassette Basic, will help you do this. Enter SYSTEM, answer the "*?" prompt with SCRIPS, and load the cassette program. When the "*?" prompt appears again, enter /39378. The system will reboot.

Boot up DOS and dump memory from 7000 to 99D1 hex with an entry (transfer) address of 99B8 hex (use the Dump command). This lets you operate the tape version from DOS. You can't save text files to disk with this version, however.

Lobotomized

Q: My 64K Model 4 sometimes locks up and the screen goes blank or fills with garbage. Sometimes it returns to normal after a few seconds. I first assumed that the white electric cable running from the main board to the drive-control board was bad, so I replaced it with the one running to the RS-232 interface. That worked great for about a month.

Now, nothing happens when I turn on the machine, although sometimes the drives run for a few seconds and quit. I've thoroughly checked for loose connections with no results. Please help. *(Chris Kasuske, Peerless, MT)*

A: It sounds like you have a progressive memory problem. I suggest you replace the eight 64K dynamic RAM chips in your machine with other 64K dynamic RAM chips, one at a time, until your system comes up. If the problem isn't memory-related, it most likely has to do with the system-bus driver or Z80A CPU.

Readers Respond

Further Space Explorations

After reading Charles Barnes's comments about the "No more space left" problem in Superscripsit, Gary W. Thomas (Columbus, MS) writes to offer his solution to the problem.

Gary uses a 128K Model 4 with a 5MB hard drive (in four sections) and version 01.01.01 of Superscripsit to do large amounts of word processing. With about 700K free, Superscripsit incorrectly shows the drive as being full.

"It seemed that the most logical way around it was to trick Superscripsit into thinking it had been there before," Gary says. He created a large document (DOC0) and made several copies (DOC1, DOC2, and so on) with the DOS Copy command to fill out a section on the hard drive. While doing this, he kept an eye on his "free" map, and with about 40K remaining on a section of his hard drive, began deleting files starting with DOC0 (leaving the last one). Superscripsit was then able to access all 1.2MB of that section. Gary later did the same with other hard-drive sections and reports no problems.

Escaping Hard Times

Robert B. Ormsby (Newhall, CA) has an answer to Charles W. Barnes' September 1986 question (p. 14) regarding Superscripsit and hard-drive space limitations. Using a Model 4 and a Radio Shack 5-megabyte hard drive, Mr. Ormsby got the same "No more space left on this diskette" message as Mr. Barnes. He contacted Tandy in Fort Worth, TX, which provided the following four patches:

SCRIPSIT/CTL (D3D,05 = CD 3F 6E:F3D,05 = 3A B5 AC)
SCRIPSIT/CTL (D3F,30 = 3A B5 AC 47 3A B6 AC:F3F,30 = 00 00 00 00 00 00 00)
SCRIPSIT/CTL (D3F,37 = B7 3E FF 20 01 78 32:F3F,37 = 00 00 00 00 00 00 00)
SCRIPSIT/CTL (D3F,3E = F2 6F C9:F3F, 3E = 00 00 00)

These patches won't change the internal length limit of about 170K.

Seeking Help

►Adam Levin (125 E. 72nd St., New York, NY 10021-4250) connected his Tandy PC-3 Pocket Computer with an Apple II via the cassette ports to exchange programs. He also wrote a short machine-language routine to sample the incoming PC-3 data, but he needs to know what format the data is in. He knows it isn't in ASCII form and has heard it is compatible with the PC-1.

►Norman Monro (215 Brindley St., Gadsden, AL 35901) and Edward Eschner (1275 Delaware Ave., Buffalo, NY 14209) need help connecting a Leading Edge Gorilla Banana printer with a TRS-80 Model III.

►Jim Savage (510 Clinton Blvd., Clinton, MI 39056) needs a program that allows or produces an index for Superscripsit. He also needs a patch for altering the report format of Profile Plus without using a word processor.

►Thomas Rice (104 W. Center St., Mebane, NC 27302) has the MAI General Ledger and Accounts Payable and the Cornerstone data base. He is looking for someone to write a program (for a reasonable fee) that will print statements when they are due and add a service charge when they are 30 days past due.■

Program Listing. Program for loading cassette Scripsit on Dosplus 3.0 disk.

```
10 HX$="0123456789ABCDEF":PT=-26184:RESTORE
20 GOSUB 30:POKE PT,A:PT=PT+1:GOTO 20
30 READ A$:IF A$="END"THEN END
40 A=0:FOR X=1 TO 2:B$=MID$(A$,X,1):Y=1
50 IF B$<>"MID$(HX$,Y,1)THEN Y=Y+1:GOTO 50
60 A=A*16+Y-1:NEXT X:RETURN
70 DATA F3,21,AA,36,01,4C,00,11,00,40,ED,B0
80 DATA 21,00,70,11,E9,42,01,B8,29,ED,B0,C3,03,43
90 DATA 21,E9,42,11,00,70,01,B8,29,ED,B0,KC3,00,00
100 DATA END
```

End

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5 - Display directory (PC or TRS-80™)
6 - Exit

Shown above is the Main Menu displayed when running TRSCROSS on your PC or compatible.

TRSCROSS will READ FROM and COPY TO the following TRS-80 double-density formats: TRSDOS 1.2/1.3, TRSDOS 6.2*, LDOS 5.1.4*, DOSPLUS 3.5, NEWDOS/80*, & MultiDOS .

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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 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.

TRSCROSS requires: PC or compatible computer, 128K and a normal 360KB (40 track drive) PC drive. Double-sided operation is fully supported. If you have more than one disk drive, fixed drive, or RAM disk, operation will be much smoother. TANDY 1000 requires extra memory card because of the required DMA chip that resides there. TANDY 3000 is supported as long as you have a 360KB drive to use for transferring, rather than the hi-density drive. TANDY 2000 is not supported at this time due to a difference in disk controller and floppy drives. TANDY 1200 is OK. "Special" data files like PROFILE +™ would need to be converted to ASCII on a TRS-80 first before they would be of any use on a PC or compatible.

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Requiem for a Heavyweight

Photo 1. Once considered a revolutionary product, the Tandy 2000 is now a compatibles-market outcast.

"Orphan for sale— cheap!" That's what the signs should have said when Tandy put the 2000 on sale last October for $999. The 2000 was the computer Tandy hoped would beat IBM, but it was a doomed effort. The enormous success of the IBM PC made any incompatible MS-DOS computer an automatic loser.

When Tandy introduced it in November 1983, the 2000 was a revolutionary product (see Photo 1). Many of its standard features (an 80186 microprocessor; 640- by 400-pixel color resolution; and 720K, high-density floppy disks) were well ahead of their time. Some revolutions are short-lived, however, and the 2000 contained a flaw that made its time in the sun especially brief: It couldn't run IBM software. Customers were held hostage by Tandy software.

At least Tandy appears determined not to make the same mistake twice. Why do you think it hasn't jumped on the 80386 bandwagon? (More on this later.) The smell of the 2000 lingers in the air.

Tandy's Christmas sale wasn't very exciting: Buy an EX or SX and get a free CM-5 color monitor. Though the offer made for a great deal on an EX ($799), it failed to break the $1,000 psychological price barrier on the SX ($1,199). The previous Christmas, Tandy offered the 1000 with a CM-4 monitor for $999. If Tandy hopes to beat the other clone makers, it might have to price products more aggressively in 1987.

Fort Worth is gradually cutting back its software business. After years of encouraging customers to buy its versions of popular MS-DOS packages, Tandy is transferring emphasis to the off-the-shelf packages available through its Express Order Software (EOS) program. The shift stems from Tandy's success in making its printers PC compatible. Previously, most MS-DOS software needed special drivers to work properly with the Tandy printers. Now that its printer line is within the mainstream, Tandy has no reason to continue supporting its own software line.

The change is definitely for the better. Because of high support costs, Tandy often failed to provide upgrades when its software became outdated. The worst example was the Macro Assembler, which Tandy sold as version 1.0 long after Microsoft upgraded to version 4.0.

In October, Tandy began selling out of its versions of the Macro Assembler, Fortran Compiler, Pascal Compiler, PFS series, Multiplan, and Microsoft's Word 3.0. When asked whether the company will replace them, Ed Juge, Tandy's director of marketing, said he was unsure. The company might either release later versions of certain products or make them available through the EOS program.

If you do buy software through Tandy's EOS program, you can now be assured of getting the most current version. In the Microsoft MS-DOS Programming Languages section of the current EOS catalog, Tandy mentions that "with support from Microsoft, you'll have quick access to the latest versions." A good idea.

All programs listed in the EOS catalog sell at full retail prices, however. Wouldn't it be great if you could order MS-DOS software at mail-order prices through your local Radio Shack store? Tandy would make a killing.

Tandy has accepted Borland International, the leader of low-priced software, into its EOS program. Tandy will offer all of Borland's MS-DOS products except for Turbo Graphix Toolbox. Borland has modified the keyboard mapping of Superkey, its keyboard-enhancement program, to make it compatible with the Tandy 1000.

Software Publishing Co.'s new products, PFS:Professional File and PFS:Professional Write, should be available in Radio Shack stores by now. The Tandy stores have carried PFS products since the introduction of the line in 1983. PFS: Professional File ($250) and PFS:Professional Write ($199) are upgrades of Software Publishing's original data-base and word-processing programs. Anyone who bought the earlier MS-DOS versions through Tandy can upgrade by calling Software Publishing at 800-255-5550. The cost is $60 per program, with a sliding-discount scale. (The price is $35 for 10 or more upgrades.)

Tandy will also carry Personal Publisher and Professional Publisher, two desktop-publishing programs that Software Publishing acquired last summer.

The computer industry is buzzing with speculation over when IBM will introduce a product based on Intel's 32-bit 80386 chip (see Photo 2). Though a number of manufacturers are already

Photograph by Larry Dunn

Circle 167 on Reader Service card.

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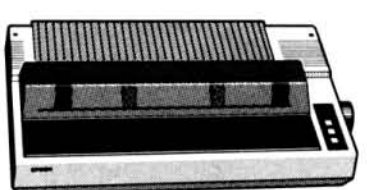
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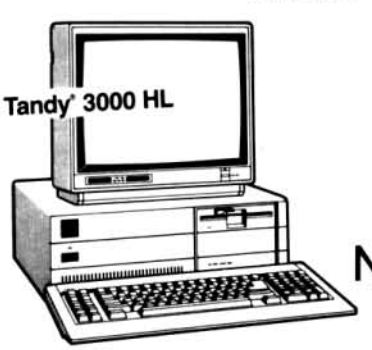
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rushing to beat Big Blue out of the starting gate, Tandy is hanging back, apparently waiting to see what IBM cooks up before deciding on its strategy.

Tandy is probably being wise. A potential problem exists with 80386 computers in that no standard has yet been established for the microprocessor-bus arrangement. A standard might be in the offing, however. At the instigation of Phoenix Technologies Ltd., the company that supplies many computer makers with an IBM-compatible BIOS (basic input/output system), a committee of manufacturers is working to define a standard, 16-bit, AT-compatible bus with a 32-bit extension. Committee members include Tandy, AT&T Information Systems, Emulex Corp., Olivetti USA, Quadram Corp., and Chips and Technologies Inc.

According to Stephen Parker, director of corporate communications at Phoenix Technologies, the committee for Personal Computer Extended Technology (PCET) recently submitted an 80386 bus-standard proposal to the Institute of Electrical and Electronics Engineers (IEEE). If accepted, the proposal will become the published standard for the industry.

Instead of developing an 80386 computer, a more reasonable strategy for Tandy would be to introduce a higher-performance 3000 that runs in the 12–16 megahertz (MHz) range. Everyone "oohed" and "ahhed" when Tandy unveiled the 3000 in November 1985, but 8MHz 80286-based computers have become standard. Today, many machines clip along at 10–12MHz. PC's Limited has even announced a 16MHz 80286-based machine. A faster 3000 would be relatively easy to engineer and would fill in Tandy's MS-DOS line nicely.

What does IBM have up its sleeve? Rumors have been flying since the fall, with many industry watchers predicting a new series of computers to be announced this month. Will it include a low-cost PC-clone killer? A faster AT? An 80386 computer? Will IBM develop a proprietary technology for new machines? Will IBM get out of the PC business? Will it make a difference?

Frankly, this IBM business gives me a headache. Predicting what IBM will do is about as reliable as forecasting the weather: You know what the possible elements are, but figuring out the exact combination is next to impossible.

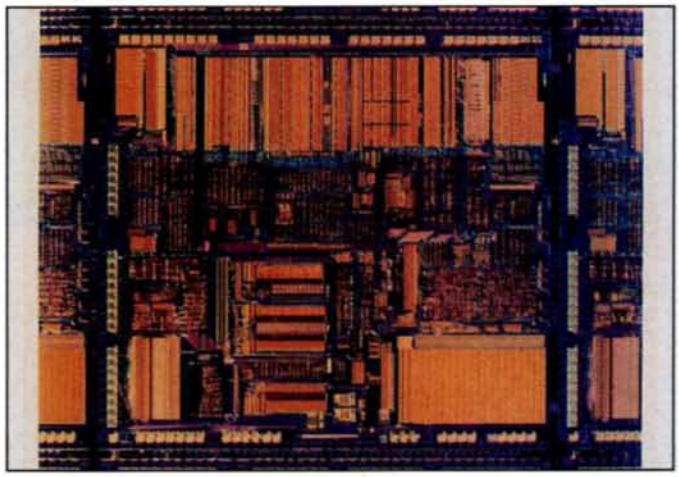

Photo 2. Intel's 80386 chip: While other manufacturers jump aboard the bandwagon, Tandy holds back.

Did Tandy shoot itself in the foot with its new telephone-service policy? We've received letters at *80 Micro* from people who are extremely upset about the new pay-as-you-go plan. (In case you haven't heard, the plan requires you to pay $60 for every three months of support.) In a letter sent to customers in July, Tandy said that if people wanted expanded phone support from their local Customer Training and Support Centers, they would have to pay for it. However, the company neglected to say that telephone support would still be available from Radio Shack stores and from Tandy's service department in Fort Worth.

During Tandy's July press conference, Radio Shack president Bernie Appel said "it was all a misunderstanding." The letter (and the service) had been aimed at Tandy's business customers, who need immediate answers to their questions. Tandy didn't say this in its letter, however. The letter said only that customers wanted expanded telephone support and that Tandy would provide it for a nominal fee. (For many people, $60 for three months isn't nominal.) Bill Wash, Tandy's director of service, said the letter was phrased so as "to sell the service to as many people as possible. Putting in the (Fort Worth) phone numbers would have diminished the letter's impact." In other words, it was a marketing decision. Wash said that of the more than half-million customers who received the letter, only 200 wrote back to complain. On the whole, he said, businesses have reacted favorably.

In defense of the company's service, Wash pointed out that Tandy spends about $20 million annually for support. Recently, it spent an additional $1 million to install new phone lines and improve training. According to Wash, Tandy fields over 135,000 calls a month. "We have seen the superfluous calls to the Training and Support Centers stop." I'm sure they did.

Is it true that Fort Worth is sitting on a cache of unreleased programs for the Model 4? Rumor has it that Tandy is holding back a number of software packages, including a query-language for Profile 4 Plus, an assembly-language Deskmate, interfaces to Tandy's Disk Cartridge System, and a Model 4 network that runs under TRSDOS 6.x, replacing the misnomered Network 4 that runs under Model III TRSDOS 1.3.

It's possible. Last year, Tandy slipped Scripsit Pro out the door without a peep. It will probably be the last software product for the Model 4. Why is Tandy letting the Model 4 die? The reason might have something to do with the fact that the Model 4 has had six different buyers in four years, none of whom could be called a Model 4 enthusiast. (The buyer is the corporate person in charge of the product line.) The current Model 4 buyer is also in charge of the Color Computer line. Interestingly, Tandy introduced a new Color Computer in July, but it had nothing for the Model 4.

Good news surfaced in both the high and low ends of the computer market in October. ITT Information Systems Div. announced an AT computer with built-in enhanced graphics, while Bondwell Industrial Co. announced a PC compatible that sounds a lot like the Tandy 1000 EX.

ITT's XTRA/286 ATW (Advanced Technology Workstation) is a high-performance AT computer running at 10MHz with a built-in enhanced-graphics adapter (EGA). The price is very reasonable: $2,499 for a system with one 1.2-megabyte (MB) disk drive; $4,299 for a system with a fast-access, 30MB hard drive and one 1.2MB disk drive. Though ITT is the first manufacturer to offer the EGA as standard equipment with an AT computer, once one vendor does it, others are sure to follow.

Bondwell's X'Press 16 breaks the low-end price barrier with a price tag of $499. It features 256K, built-in audio and video (like the Tandy 1000 EX and SX), and one disk drive (two disk drives cost $599). It has only one expansion slot, however, and to use it you have to upgrade to 640K and install a direct-memory access (DMA) chip. Shades of the original Tandy 1000.■

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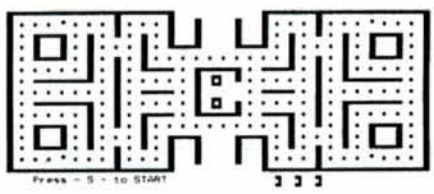

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Note: Model I/III products available on request

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Got a hot tip you'd like to share with our readers? Send it to Reader Forum, c/o 80 Micro, 80 Pine St., Peterborough, NH 03458. We pay $10 for each tip we use. Sorry, but we cannot return or acknowledge submissions.

Finding the Switch

The low-memory RAM locations shown in the Table allow direct access to the status of the TRSDOS 6.2 video-control switches. You can set all functions (except for inverse video, which is also dependent on the high-bit routine being enabled) using these locations. You can access locations 0076 and 0078 hexadecimal (hex) via the FLAG$ SVC as MFLAG$ and OFLAG$, respectively.

Mike Zarowitz
San Carlos, CA

Function	Address	Operation
Tabs/chars.	0B94	bit 3: 1 = space compression, 0 = display characters
0–31 characters	0B94	bit 4: 1 = display character, 0 = control function
Alternate/ special chars.	0076	bit 3: 1 = alternate, 0 = special characters
80/40 columns	0076	bit 2: 1 = 40, 0 = 80
High bit	0078	bit 3: 1 = enabled, 0 = disabled
Inverse video	0DCB	80 hex = inverse, 00 = normal

Table. Low-memory hex addresses of video-control switches.

Superscripsit + Memdisk = Fast

Model 4 Superscripsit would run much faster if you could put it in Memdisk. Unfortunately, the program is too large to fit there. The trick is to install specific Superscripsit files in Memdisk. Of course, you need 128K and TRSDOS 6.x.

First, you must activate the KSM (keystroke multiplier) device:

```
BUILD SYSTEM/KSM
A = > SYSTEM (SYSTEM = 2);
```

Then press the shift-control-@ combination to exit and execute the following four lines:

```
SET *KS KSM/FLT USING SYSTEM/KSM
FILTER *KI *KS
SYSGEN (YES)
```

The second step is to set up a JCL file to prepare Memdisk automatically:

```
BUILD MEMSCRIP/JCL
SYSTEM (DRIVE = 2,DRIVER
 = "MEMDISK")
D
D
Y
BACKUP SYS1/SYS:0 :2 (S)
BACKUP SYS2/SYS:0 :2 (S)
BACKUP SYS3/SYS:0 :2 (S)
BACKUP SYS4/SYS:0 :2 (S)
BACKUP SYS6/SYS:0 :2 (S)
COPY SCR16/CTL:0 :2
COPY SCR18/CTL:0 :2
COPY SCR32/CTL:0 :2
COPY SCR33/CTL:0 :2
COPY SYSTEM/CTL:0 :2
.Press clear-A to complete installation.
//EXIT
```

Then press shift-control-@ to exit.

You've created a JCL file called Memscrip. To use it, leave your Superscripsit disk in drive zero (which the computer now considers to be drive 2, since it has changed places with Memdisk). Type DO MEMSCRIP at TRSDOS Ready and press enter to install the JCL file and begin work. You can also set up your Superscripsit boot disk to install Memscrip automatically by typing AUTO DO MEMSCRIP/JCL at the DOS prompt.

This procedure leaves about 13.5K in Memdisk for the document you are working on. Remember to save the document to a physical disk before shutting off the computer; otherwise you will lose everything. You can open documents directly onto a disk in drive 1.

You can gain 1.5K on Memdisk by purging SYS11/SYS from it. You can increase it to about 28.5K by purging SYS6.SYS, but you lose all that file's library functions.

Richard Kunc
Orlando, FL

Kill It Right

My one-line program, Zerokill (Program Listing 1), zeroes disk data sectors when you kill a TRS-80 Model I, III, or 4 file. (Model 4 users should delete the CLEAR 500.) It works with any kind of file, and perhaps it will work on other versions of Microsoft Basic.

You can fill a file with zeros without killing it by deleting KILL F$ from the Listing. To prove that this fill works, use a visible character such as String$(128,"•") to fill the file. Then use the DOS List command to view the file.

Donald W. Ady
Summit, NJ

Program Listing 1. Zerokill.

```
10 CLEAR 500:F$="":LINE INPUT"FILE TO ZERO AND
KILL ? ";F$:IF F$="" THEN STOP ELSE OPEN
"R",1,F$:FIELD 1,128 AS Z$,128 AS Z1$:LSET
Z$=STRING$(128,CHR$(0)):LSET Z1$=Z$:L=LOF(1):FOR
N=1 TO L:PUT 1,N:NEXT N:CLOSE 1:KILL F$:GOTO 10
```

End

Illustrations by Hal Mayforth

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Quick Recovery

by John B. Harrell III

Mace + Utilities runs on the Tandy 1000/1200/2000 (256K) or PC compatible with at least one disk drive. Paul Mace Software, 123 N. First St., Ashland, OR 97520, 503-488-0224. $69.95.

Recover all files on a hard disk after someone has formatted it? Who are you trying to kid? That was my initial reaction to this program. After installing the Mace + utilities and backing up my hard disk, I typed FORMAT C: and, with great trepidation, pressed the return key. After the format was done, I performed the steps outlined in the Mace + manual to recover the files. Seconds later, Mace + claimed to be done.

I had over 33 subdirectories and more than 600 files on that 10-megabyte (MB) hard disk. Backups in hand, I made preparations to reload the disk. After performing a CHKDSK, I was astounded to find all files and directories intact. I spent the next hour checking every one of them.

Mace + also packs and sorts directories, condenses disks, recovers files and subdirectories, diagnoses disk problems, and remedies file errors. Several other minor functions are available from the Mace + menu.

Anatomy of a Disk

To understand some of the Mace + functions, you need a little knowledge about disks. What follows pertains to a hard disk, but the structure of a floppy is similar. Each disk consists of four areas: the boot sector, the file-allocation table (FAT), the root directory, and the file area.

The boot sector contains the initial startup information and a description of the physical disk structure. The FAT is a coded description of all clusters on the disk that might be null, indicating that the cluster is unused. It can indicate that the cluster is bad and should never be used, or point to the next cluster in a file chain, or flag the end of a file's allocated clusters. This table is so important that DOS maintains two complete copies.

The root-directory structure, a fixed table of 32-byte entries, describes pertinent information for disk files. Because of the fixed size (512 entries on a 10MB disk), it is possible to fill the directory prior to filling the disk. This file descriptor has the unique property of denoting another subdirectory allocated in cluster units. The last part of the disk is the data area, which holds all files and is also divided into cluster units.

On a 10MB hard disk, each subdirectory is initially allocated one 4K cluster that can contain 126 files (128 actually, but DOS uses the first two entries, "." and ".."). If you store more than 126 files in this subdirectory, another cluster is added. Because clusters are used by files that fill up the subdirectory, the different clusters are physically separated on the disk. When you delete files, DOS does not compress these open spaces and will not free up unneeded clusters. Loading files from this subdirectory can be an agonizing chore.

DOS allocates files sequentially, storing a disk file beginning with the first free cluster and using each succeeding cluster to store the entire file. When the disk is empty, DOS stores files as consecutive clusters on the disk; this maximizes processing speed.

As you delete and add files, the consecutive storage is interrupted and a heavily used disk becomes badly fragmented, with files stored in many different areas of the disk. Processing speed decreases as the disk head requires additional time to find each succeeding cluster.

The Star Ratings

80 Micro's star ratings reflect our reviewer's impression of a product. The stars mean:

★★★★★ Superior
★★★★ Excellent
★★★ Good
★★ Fair
★ Poor

Mace + Functions

Mace + can recover all files on a formatted hard disk in two distinct ways. On an IBM PC, formatting the hard disk does not write to the disk—it verifies that the disk can be read and initializes the directory and FAT. When installed, Mace + creates a file copy of the boot-record sectors, the FATs, and the root directory.

A small program included as part of your Autoexec file updates this special file each time you boot up. Any time you need to recover the disk files, running Mace + from a floppy restores these special areas from the Mace + file. That works out fine if you have Mace + installed. If you don't, Mace + can still recover most files from the disk but cannot recover files in the root directory—the format utility has destroyed these completely. Mace + recovers all subdirectories and the files that they contain, but recovery will not be 100 percent. It depends on how fragmented your disk was prior to formatting.

Mace + also sorts and compresses directories. File entries in a directory are

Illustration by Regan Dunnick

initially marked as unused. When DOS searches a directory, it doesn't progress past the first unused entry. The sort-and-compress utility moves all entries to the top of the directory cluster, deallocates unused clusters, and marks all unused directory entries.

The condense utility solves the problem of fragmentation. All subdirectories are transferred next to the root directory, where files are restructured into consecutive clusters. This can take some time, but it is well worth the effort. Once you have restored a badly fragmented disk, file-access speed improves dramatically.

Mace + lets you optionally mark special files (SYS, COM, EXE) as read-only when it performs the directory sort. Tagging occurs during the compression routine, and specially marked files are moved to a section of the disk nearest the directory with the assumption that they will not change. The single drawback to this procedure is that several commercially available software packages cannot find their component files with this read-only attribute set.

A clutch of additional utilities lets you reclaim files and reconstruct FATs, recover deleted files and subdirectories, and remedy disk errors. These functions can be invaluable for smaller tasks, and their success depends on how badly fragmented the disk was originally.

Mace + installation is a snap. Pick the disk medium (hard disk or floppy) and type the name of the appropriate batch file. Mace + automatically selects the proper memory-size version and transfers the programs to the designated medium.

Hard-disk users should also install a copy on a floppy, as the software runs best from an installed disk. If you have not created one, don't worry because you can still use Mace + directly from the master disk.

Conclusion

If you value your data files and other disk items or have a hard disk and do not have a compression program, you are wasting valuable time. Mace + can remedy this and is worth its weight in gold—it's an excellent performer with clear documentation. Mace Software has gone out of its way to explain the detailed structure of disks and the operation of the Mace + utilities.

While testing this program, I received a frantic call from *80 Micro* asking if I could help recover the files that someone using a PC had accidentally formatted. The Mace + utilities recovered all the files and rescued an immense amount of work. I recommend that you buy Mace +.■

Video Tools

by John D. Wolfskill

★★★½

Telecomp 1000 operates with any computer equipped with a composite-video output port. Avas Corp., 196 Holt St., Hackensack, NJ 07602, 800-631-0867. $399.95 (not including optional video camera).

★★★★

ComputerEyes video-acquisition system works with a Model 1000, 1200, or 3000, one 5¼-inch floppy-disk drive, MS-DOS 2.1 or higher, 256K RAM, a color-graphics adapter, and a video source that provides a standard composite-video signal. Digital Vision Inc., 14 Oak St., Suite 2, Needham, MA 02192, 617-444-9040. $250.

Until recently, video-image processing was unheard of outside television studios. Equipment that was capable of mixing computer and video technology was complicated and expensive. Now those with a video-cassette recorder (VCR) and a personal computer can use affordably priced video-imaging systems to create titles for home-video recordings, dabble in graphic arts, and design educational and professional presentations. Industry also benefits in the areas of security, surveillance, and product quality control.

The Telecomp 1000 is a scaled-down version of a professional video combiner, providing a way to mix the video output of a personal computer with that of a video camera. You can display the combined output on a system monitor or record it with a VCR. The package includes the Telecomp 1000 combiner and a high-resolution black-and-white video camera. If you already own a camera, you can buy the combiner separately. The price of the complete package is $599.95.

Connecting the unit to my Tandy 1000 took about five minutes. The manual is complete and contains little technical information. The rear panel is equipped with RCA-type phono connectors to receive the computer video output, video camera output, and composite synchronization signals. A fourth RCA connector sends the combiner output to a monitor. A ⅛-inch phone plug connects the combiner to a 9-volt external power supply.

The SGM-13 black-and-white video surveillance camera was also easy to attach. It transmits a suitable image under a wide range of light conditions. No manual is provided with the camera. A BNC-type adapter connects the camera's video output to the combiner. The final connection is a three-pin DIN plug that links the camera's composite synchronization signal with the combiner. Your video camera must provide this external signal to the combiner for proper operation.

Switch On

The front panel allows control over both video sources. A three-position switch determines the source signal sent to the monitor; the output signal can be that of the computer, video camera, or a mix of both.

Overlay control provides the monitor or VCR with two layers of video information. With the overlay switch in the video position and the source switch in the mix position, the video camera image appears dominant. The layers are reversed with the overlay switch in the computer position.

A cluster of four closely spaced dials provides overlay windowing control. The overlay can appear as a single pixel or expand to canvas the entire screen. With practice, you can position the window anywhere on the screen. The overlay is proportional, meaning the full camera frame can't be compressed to fit into a smaller screen window.

With the source and overlay switches in the mix position, you can adjust the intensity of both signals. Separate dials control the brightness of both computer and video images, allowing fade and dissolve capabilities. Both images appear somewhat dim in this mode. I found that bright text characters appearing behind the camera image will not completely disappear in this mode. Although camera input was set at full intensity and computer video at the minimum setting, the computer image bled slightly.

Another annoyance occurred when I shifted the source switch from the mix to computer position while the output was being recorded. Closure of the switch contacts produced noticeable interference on the recorded output, but other switches and dial movements were free of noise.

You can replace computer video output with a VCR to produce video-on-video effects. However, one of the sources must always have an external synchronization signal present to keep the combined picture from rolling sideways. You can route computer video through the combiner with no other signals present by placing the source switch in the computer position. When this switch is in the video position, you can use camera input without a computer signal.

Color Correcting

When attempting to record the output of my 1000, I applied combiner output through the VCR video input connector.

Although the output appeared on the television receiver in color, images were displayed at gray levels when I played back the tape. I called Radio Shack and was informed that 1000s manufactured prior to December 1985 had voltage regulator VR1 installed backward in the video circuitry. This regulator drives the composite-video output. Without the benefit of proper voltage regulation, the composite signal might not deliver a stable color carrier to a VCR. Radio Shack Technical Bulletin 1000:24 identifies and addresses this problem.

The Telecomp 1000 is a good value. It has performed well in several months of heavy use. Video recordings made with the unit are of better quality than recordings made by connecting the computer directly to a VCR. Its inability to accept a video input source without an external synchronization signal might prevent its use with some types of home video equipment. The Telecomp 1000 provides an economical way to add a new dimension to your video and computer applications.

The Eyes Have It

ComputerEyes is a half-card-length expansion board that displays a single frame of information from a VCR, videodisk player, or video camera and digitizes the image display on a high-resolution monitor. The software provided lets you store and retrieve the frames from disk using standard BSave format. A complete system includes an optional high-resolution black-and-white camera available for $529.

The well-written manual details the card-installation procedure. Three cables terminating in RCA-type phono plugs provide connections for computer composite-video output, monitor output, and video source input. During installation, the thick strain-relief grommets kept the card from properly lining up with the 1000's expansion-card-retaining screw hole. The board became unseated from the backplane connector when I tightened the retaining screw, but trimming the inner grommet solved the problem.

Disk software includes a driver that controls most board functions. The board is addressed through three I/O ports with a base address of 220 hexadecimal (hex). In the event that other devices use these ports, you can reset a bank of DIP switches to readdress the board through alternate unused ports. The 1000 functioned normally at the factory setting.

Operation

ComputerEyes is a slow-scan analog-to-digital (A/D) converter. The frame presented through the video source to the board's input connector is scanned in 200 vertical rows of 640 columns each. The A/D hardware takes a 6-bit sample of each element and builds an image of the video frame in RAM. The video frame must remain relatively motionless during the 12-second scanning period to reproduce accurately. If you own a low-cost VCR, its signal in freeze-frame mode might be too unstable. Using a four-head industrial VCR is a better bet.

A menu-driven software interface provides selection of various card functions. Using a composite monitor, you can preview the video frame before acquisition. RGB-monitor users must attach a separate composite monitor to the card's video-output connector to preview the image, which is acquired in either high-contrast black-and-white or 16-level gray scale. Brightness and contrast are also software controllable through a second-level menu option.

To operate ComputerEyes, you point the camera at an object (or press the VCR pause button) and select the option to scan. The freeze frame will be displayed as the scan progresses. The resulting high-resolution image is a surprisingly good reproduction of the camera or VCR input.

Fine-Tuning

Brightness and contrast adjustments are critical to picture detail. An automatic-calibration routine provides initial brightness and contrast levels, but I found the routine to be of little value, choosing instead to manually fine-tune the image through a somewhat awkward second-level menu option. Only slight adjustments are necessary after you have established proper levels. Successively acquired frames remain sharp and detailed unless lighting conditions change drastically.

The versatility and usefulness of ComputerEyes becomes evident after you have an image safely stored on disk. You can access frame files from your Basic programs, and detailed information is provided for the assembly-language programmer wishing to gain direct control of the card for special applications. The file-storage format is identical to that used by most popular paint programs; therefore, you can retrieve and modify the frames to suit your taste. A program is provided that lets you present the frames in slide-show fashion.

I found ComputerEyes to be exceptional; it produces high-quality images that rival frame-grabbers costing five times as much. Aside from the awkward brightness- and contrast-control menu, its operation is straightforward and enjoyable.■

C Comes of Age On the Model 4

by Hardin Brothers

★★★★

The Pro-MC Compiler runs on the Model 4/4P/4D and requires at least two disk drives. Misosys Inc., 1 Tyler Lane, P.O. Box 239, Sterling, VA 22170, 703-450-4181. $124.95 plus shipping.

Pro-MC isn't small or inexpensive, but it is one of the best C compilers I have used on any computer. Its libraries are extensive, generating tight and generally fast code and giving programmers full access to all the resources of an operating system. And its documentation is easy to use.

The Model III version of Pro-MC fills nearly two disks, leaving only a small amount of room on the second disk for program development. All the essential files for the Model 4 version, which I tested, fit on a single disk with a minimal TRSDOS 6 system if you have a 128K computer and copy the Pro-MC library files to Memdisk. On a 64K computer, you must share your second disk drive between some Pro-MC files and the program you are writing.

Pro-MC requires at least a two-drive system, and if you have a third drive, double-sided drives, or a hard drive, it will be much easier to use. You also need an assembler and linker, such as Misosys's MRAS assembler (reviewed March 1986, p. 29), or the Microsoft M-80/L-80 assembler and linker supplied in the Radio Shack Fortran package. No other assembler will work with Pro-MC.

The Compiler

The Model 4 version of Pro-MC arrives on two disks, the first containing the Pro-MC preprocessor, two versions of the Pro-MC compiler, and the Pro-MC optimizer. Creating a program using Pro-MC is a multistep process. First, you write the source code using a text processor such as the SAID editor supplied with MRAS. The code file is sent through the preprocessor, which expands any macros you've included in the program and tokenizes the entire file for later processing by the compiler.

Several optional parameters are available with the preprocessor. You can create a pure text file with no tokenizing to debug your macro commands, or you can avoid output of any file at all from the preprocessor if you want to check the syntax of your definitions and macros. Define a substitution string or macro by invoking the preprocessor (which is handy for some kinds of debugging), and

you can direct the preprocessor to either stop or continue when it finds an error.

The compiler changes the tokenized output of the preprocessor into an assembly-language source-code file. Like the preprocessor, the compiler has several options: It generates code suitable for either the MRAS or M-80 assembler, can be set to stop when it encounters an error, and can either produce an output file or check its input file for errors. Perhaps the most interesting option for the compiler is one that performs all floating-point arithmetic in single-precision values instead of converting all floats to double-precision values. This results in a faster program with less numeric accuracy.

The Model 4 version of the Pro-MC includes two different versions of the compiler. The version most often used is a single program that performs error checking and then generates the assembly-code output. The other version contains two programs that you can run separately—the first checks for errors, the second generates the output code; you'll find them useful for error checking before final compilation and in compiling programs that are too large for the all-in-one version.

Test name	Pro-MC	Pro-MC Opt.	Aztec C	TRS-80 C
Empty/C				
Compilation time	42	45	36	43
CMD file size	1985	1985	4915	20504
Loop/C				
Compilation time	45	56	43	48
CMD file size	2117	2093	5947	20708
Execution time	12	10	23	117
Sieve/C				
Compilation time	63	134	62	127*
CMD file size	5520	5490	8785	30970
Execution time	67	63	43	52
Matrix/C				
Compilation time	142	266	103	61**
CMD file size	12401	12268	12379	32634
Execution time	61	61	155	82
Sort/C				
Compilation time	67	146	64	100
CMD file size	5560	5514	8785	24526
Execution time	26	6	6	43
Fibonacci				
Compilation time	58	75	62	66
CMD file size	5319	5284	8257	22325
Execution time	137	96	158	1296
Savage/C				
Compilation time	103	119	90	***
CMD file size	15677	15672	15493	
Execution time	279	219	298	
Answer:	†	†	‡	
Dhampstone				
Compilation time	235	456	151	219
CMD file size	13738	13518	14719	25321
Execution time	181	168	152	522

* Optimize pass failed.
** Both Optimize and CODEGEN passes failed.
*** Program would not compile or run because TRS-80 C lacks a tan( ) function.
† 251.000000000589
‡ 250.999999989941

Table. Comparison of benchmark tests on C compilers. All times are in seconds; file sizes are in bytes. Pro-MC and Pro-MC Opt. show results with and without the compiler's optimizing option. All TRS-80 C CMD files, except those noted, were optimized with Optimize/CMD and CODEGEN/CMD and then linked with CSupport/BIN to produce a stand-alone CMD file. Aztec C programs were compiled, assembled, linked, and converted without any special compiler options.

Like many C compilers, Pro-MC doesn't translate directly from source code to an executable program. You must assemble its output and link it with library routines before you can run it. You must purchase the two supported assemblers, MRAS and M-80, separately; each includes a linking loader. MRAS also contains a text editor and a librarian program to create libraries of your own routines.

You can directly assemble and link the compiler's assembly-code output. However, if you include another step in the process and run the assembly-code through the Pro-MC optimizer, your programs will often run much faster. The optimizer doesn't shorten programs much, but it can significantly reduce their running time. Like the compiler, the optimizer produces assembly output.

Unless you use the Pro-MC preprocessor, compiler, optimizer, and a compatible assembler and linker almost daily, it would be difficult to remember the command syntax and various options for each. To simplify the entire process, two JCL files are on the Pro-MC distribution disks. One drives the entire Pro-MC compilation process if you use the MRAS assembler; the other does the same if you use M-80. If you use the JCL files to develop Pro-MC programs, you need to learn only one set of parameters and, when writing most short programs, will not have to specify any parameters at all. With the JCL files, I found the Pro-MC compiler easy to use. As I became more comfortable with the system, I relied less on the JCL routine and started directly invoking each of the constituent programs.

The Libraries

Regardless of its ease of use, no C compiler can perform well without a good set of library functions. Pro-MC comes with four libraries containing nearly 250 functions, and you can easily specify inside the C source code the libraries that should be searched. Some compilers let you specify libraries only during the linking process.

The first Pro-MC library, LIBA, contains essential low-level operations such as simple arithmetic, logic operations, and stack-access routines. Generally, a programmer neither knows nor cares what routines are contained in LIBA.

The second library, LIBC, is the largest and contains the majority of the standard C functions described in most books and articles about C. A third library, MATHLIB, contains all the floating-point functions. Most of the functions supported by Pro-MC are included in MATHLIB twice: once for double-precision (64-bit) values (which is the C standard) and again for single-precision

(32-bit) values. The single-precision functions are unique to Pro-MC, but their use speeds up some programs considerably. You can also instruct the compiler to store and pass float variables in 32-bit representation if you wish.

Another library, INLIB, contains implementation-specific functions, meaning your programs won't be directly portable to other computers or C compilers. On the other hand, INLIB contains some useful functions, including calls to the operating system, TRS-80 graphics, and string-handling functions similar to those in Basic.

Completeness

Nearly all C compilers, including Pro-MC, are "K&R compatible"—they follow most or all the definitions of C contained in Brian Kernighan and Dennis Ritchie's *The C Programming Language* (Prentice-Hall). Pro-MC is also highly compatible with Unix System V. If you avoid using the INLIB functions, you can transfer practically all of Pro-MC programs to Unix System V and most other C compilers (and vice versa) with little or no alteration.

Pro-MC shares advanced features with other high-quality C compilers: It supports typedef, enum (both must be global in nature), and bit fields. It includes standard I/O (input/output) devices (stdin, stdout, and stderr) and redirection of all three standard devices. It supports command-line arguments, wild-card file specifications, and both stream and block file access. And Pro-MC error handling is compatible with System V, including a global "errno" error variable and exception structures for math errors.

Included with Pro-MC are 10 header files. CType/H defines macros for character tests (you can also perform the tests as library functions). ERRNO/H defines the Unix error numbers and math-error exception structure. FCNTL/H defines constants for the open( ) and fcntl( ) functions. Math/H defines error constants for low-level math errors and declares all math functions as extern. SETJMP/H defines the structures needed for the Unix-like functions setjmp() and longjmp(). SGTTY/H defines structures for the ioctl(), stty(), and gtty() functions. Stat/H defines the symbolic constants for the fstat() function. STDIO/H includes the constants and definitions that are necessary for the standard I/O library. Time/H defines the structures for the asctime() and localtime() functions, which interact with the computer's real-time clock. And Z80REGS/H allows easy definition of the Z80 registers for passing values to and from TRSDOS SVCs.

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Documentation

The Pro-MC documentation begins with an introduction to its programming environment, a definition of the C language, and instructions for running the preprocessor, compiler, and optimizer. All three chapters are aimed at experienced C programmers and beginners alike, although I imagine they would be confusing to someone with no experience writing in C. Included are sample C programs illustrating Pro-MC's many features. Each function of the Pro-MC libraries is described in detail, including return codes and any cautions associated with their use. A short program or program fragment illustrates how to use each function.

The last chapter of the Pro-MC documentation discusses a number of advanced topics, including building libraries of routines, writing assembly modules for use with Pro-MC, and using various Pro-MC options.

The documentation is excellent as a reference to the Pro-MC system but doesn't provide a satisfactory tutorial on the workings of C. Neophyte C programmers could use an introductory text along with the Pro-MC manual.

Comparisons

I am aware of two other full-featured compilers for the TRS-80: Manx Software's Aztec C and Radio Shack's TRS-80 C (also known as Alcor C and sold in CP/M and MS-DOS versions as Mix C). Although neither is as complete as Pro-MC, Aztec C probably comes closest. Also, neither the Aztec nor Alcor implementation makes use of the full power of the TRS-80's Z80 microprocessor; both are written for the 8080, which uses a subset of the Z80 instruction set.

Each compiler operates differently. Aztec C compiles source code into 8080 assembly code, which is then assembled into relocatable object code. This code is combined with library routines by a linker program, producing a memory-image file much like a CP/M COM program. Finally, another program translates the memory-image file into a TRSDOS CMD file. In contrast, the TRS-80/Alcor C package doesn't compile source-code files into either assembly or executable machine code; instead it uses an intermediate language called "p-code." Compiled Alcor C CMD files are much larger than similar programs developed using Pro-MC or Aztec C. The smallest possible file seems to be just over 20,000 bytes, which seems unreasonably large to me.

In testing Pro-MC against the other two compilers, I used an early-model desktop Model 4. Later versions of the Model 4, as well as the 4P and 4D, would run the benchmark tests faster because they don't have the wait states that were hardwired into the early models. For all the tests, I put the source code, all intermediate files, and the final CMD file on a 384K RAM disk running as drive zero. I stored the complete compiler, including libraries and header files, on a hard disk and ran it from a Diskdisk subdirectory as drive 1. I used a JCL program to both run and time all the benchmarks, relying on the Model 4's internal clock for the actual timings.

Most of all, I appreciate the completeness of Pro-MC's interface to TRSDOS 6.

Most of the benchmarks in the Table were adapted from the February 1986 issue of *Computer Language* magazine. The first, Empty/C, merely an empty main( ) function, is useful for seeing how fast a compiler can produce a short program. Aztec C compiled the program fastest; Pro-MC produced the shortest program.

The second test, Loop/C, uses two empty "for" loops to test a compiler's looping speed. Each loop was iterated a total of 50,000 times, the first using the postdecrement of the looping variable and the second using the predecrement operator. Again, Aztec C compiled the program fastest. Pro-MC produced the shortest and, in both its optimized and unoptimized forms, the fastest program.

The third test, Sieve/C, uses the Sieve of Eratosthenes algorithm to find a list of all prime numbers up to a certain maximum value. Again, Aztec C compiled the program fastest and Pro-MC produced the shortest program. Interestingly, TRS-80 C produced the fastest CMD file even though it found the program too large for its first optimizer.

The next test, Matrix/C, creates two 20-by-20 matrices of real numbers and then multiplies them to create a third 20-by-20 matrix. TRS-80 C compiled this test fastest, partly because both of its optimizers refused to handle the program. As usual, Pro-MC produced the smallest program and the fastest run time.

Sort/C, the fifth test, creates an array of 1,000 integers in numerical order, then sorts that array into reverse order using a modified Shell sort. Aztec C compiled the program fastest, Pro-MC produced the smallest program, and those two compilers tied in execution time.

The sixth test, Fibonacci, uses recursion to find the 24th number in the Fibonacci number series. Pro-MC, without its optimizer, compiled the program the fastest. Optimized Pro-MC code produced the smallest and fastest program. TRS-80 C apparently handles recursive calls inefficiently; its version of the program took an astounding 20 minutes more to run than did the Pro-MC version.

The seventh benchmark, Savage/C, tests the accuracy of floating-point functions. It uses the expression:

```
a = tan(atan(exp(log(sqrt(a*a))))) + 1.0
```

to count from 1 to 250. TRS-80 C could not run this test because it lacks a tan( ) function in its library (although it does have all the others). Aztec C compiled the program more quickly than Pro-MC and produced a smaller CMD file. However, the Pro-MC program ran more quickly. Neither program produced a "perfect" answer of 250.0 (almost an impossibility in any system); the Aztec C program produced an answer that was slightly more accurate.

The final benchmark that I used, Dhampstone, is meant to test many different facets of a C program. In some respects, it duplicates a few of the previous tests. All three compilers produced the same (and correct) results for the numerical tests and ran the entire benchmark successfully. Aztec C compiled the program fastest and produced the quickest CMD file. Pro-MC produced the smallest CMD program.

Benchmarks are only one guide to selecting a compiler. Ease of use, completeness of function libraries, and compatibility with other systems are also important considerations. I would not select TRS-80 C for any important work because it produces such unreasonably large (and slow) CMD files and is so different from the C compilers I use on other computers. It also does not run safely with a JCL program.

My favorite of the three compilers, Pro-MC used with the MRAS assembler, uses the Z80's full power, has the most comfortable working environment, optimizes its Unix-like features, and contains the largest library. I wish that its compiler ran a little faster, but since the entire process can be automated with a JCL file that Misosys supplies, I don't mind the wait.

Most of all, I appreciate the completeness of Pro-MC's interface to the TRSDOS 6 operating system. It is the only available C compiler I know of that was developed expressly for the Model 4, a quality that shows up in many subtle ways when Pro-MC and its related programs are running.■

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IBM Standard Bus:	YES	YES	NO	YES
Operating System:	MS-DOS 3.2	EXTRA	MS-DOS 2.11 (3.2)	MS-DOS 3.1
Disk BASIC:	YES	IN ROM	YES	YES
MS-DOS and BASIC Ref. manuals:	YES	EXTRA	EXTRA	YES
Standard System RAM:	640K	256K	256K (384K)	512K
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Video Monitor:	INCLUDED	EXTRA	EXTRA	INCLUDED
Video Outputs:	BW/NTSC/RGB	EXTRA	NTSC, RGB	B/W, RGB
Disk Drive Capacity:	1-360K	1-360K	1-360K (2-360K)	2-360K
Max Number of Internal Drives:	4	4	1 (2)	2
Internal Expansion Slots:	8	5	1 (5)	4
Accepts Standard IBM Cards:	YES	YES	NO (10" Only)	YES
8087 Math Co-Processor Option:	YES	YES	NO (YES)	YES
Sturdy Steel Case:	YES	YES	PLASTIC	PLASTIC
Standard Parallel Ports:	1	0	1	1
Standard Joystick and Light Pen Ports:	YES	NO	J (J/LP)	NO
Standard Serial Ports:	2 (1 Optional)	0	0	1
Warranty	1 YEAR	90 DAYS	90 DAYS	15 MONTHS
Clock/Calendar	YES	NO	NO	YES
Cost Ready-to-Run	$699	$3,063	$1,398 + ($1,683 +)	$1,295
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IBM XT cost figures*: Video Display Adapter $250; Video Display $275; IBM XT computer $2,145; Additional Ports, serial port, game port, parallel port, 640K RAM $308; DOS 3.2 and BASIC $85; Total $3,063. Does not include the battery back-up clock calendar. No light pen port.

Tandy 1000 cost figures*: DOS 2.11 and BASIC reference manuals $29 +; Memory Plus Expansion Board (to 384K) $129 +; 256K Additional RAM $129 +; One serial Port $79 +; Battery Back-up Clock Calendar $99 +; Composite Monochrome Monitor $129 +; Model 1000 EX Computer $799; Model 1000 SX Computer $1199; We were not able to equip the Tandy 1000 to directly compare with the Clone because of the 1000's inherent design limitations.

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Nothing Could Be Easier

by Harry Bee

★★★½

AI:Typist (version 1.16) runs on the Models 1000/1200/3000 (256K) and requires one disk drive. Airus Inc., 10200 S.W. Nimbus Ave., Suite G5, Portland, OR, 97223, 503-620-7000. $99.95.

It's hard to imagine a word processor easier to use than this one. For a month, I put AI:Typist to work on correspondence, several projects, and even some program code. I never opened the manual. I found everything I needed literally at my fingertips and every process clearly mapped. I never felt lost or in danger of dumping as much as a comma into the bit bucket.

Easy as it is, AI:Typist is full of features. It doesn't pretend to be a powerhouse but promises and delivers true word processing to anyone who writes often but not often enough to remember the command sequences of high-powered programs.

All on Board

AI:Typist is not copy-protected and comes with a 64-page manual, a quick-reference card, and an integrated spelling checker capable of operating while you type. When I finally read the manual, I found it clear and complete. The program takes good advantage of color while retaining legibility on a monochrome monitor. The vital status line displayed at the top of the screen also serves as an input prompt line, message line, and tab line.

The keys to AI:Typist's ease of use are its menus: Eight numbered blocks across the bottom of the screen correspond to the first eight function keys. If you ever feel uncertain about a procedure, press the F1 key at almost any point and a help screen pops up.

AI:Typist reads and writes files in ASCII or its own format and merges a file in either format with your current document. When working with disk files, you can search directories using all the MS-DOS wild-card options. While writing, you have good cursor control and a full complement of editing features, including search-and-replace and cut-and-paste operations. You also control a document's format to the extent that it's possible to have different margin, tab, and indent settings for each paragraph. Centering lines and marking words for boldface and underlining are single-key operations.

I found only one editing bug. After a block delete, the program sometimes doesn't reformat properly and might ap-

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pear to lose text. When you start to correct the problem manually, it's as if AI:Typist wakes up and makes it all better. Is it just lazy, I wonder?

Having the built-in dictionary follow my every keystroke was distracting at first. But I got used to this and decided that if you're going to use a spelling checker, it might as well work with you. If it's a bother, you can turn it off. I'm no 90-mile-an-hour typist and didn't notice a slowdown in the response of the program's other features with the spelling checker idled. As a separate function, it took about 30 seconds to check a 20K document and highlight words it didn't recognize. Although the 26,000-word dictionary is barely adequate for an average vocabulary, adding to it is as simple as placing the cursor at a new word and touching a function key.

Trade-Offs

While AI:Typist's menu structure is easy to follow, some functions can take several more keystrokes than sleeker word processors require. In return for the program's speed, impressive in most operations, you must settle for documents limited to 64K (about 30 double-spaced pages) and pages no more than 80 columns wide. Both trade-offs are reasonable. Less justifiable is the program's lowest-common-denominator approach to printing. I can understand leaving out headers and footers, but the lack of automatic page numbering baffles me. And the use of printer definitions—hardly more than form filters—instead of drivers mistakenly assumes that all printers behave more or less the same. For instance, AI:Typist creates the bottom margin of a page by sending a standard form feed (0CH). If you have a printer that doesn't react to that code, you're out of luck and have to somehow work around it.

In fairness, AI:Typist lets you imbed control codes in your text, so you can use the fanciest features of almost any printer if you want to take the trouble. Just printing words on paper is something I'd expect from a simple text editor, not a word processor. It's clumsy. If this weren't a very good program in every other respect, its imperfect output would not be such an obvious blight. In fact, the average user with a common printer will have no trouble, but who wants to be average and common?

AI:Typist is a fine, light-duty word processor and an excellent value. It's a good choice for the casual writer, the novice, and even the professional looking for an inexpensive alternative. If you want the benefits of true word processing without the often daunting complexities, you'll like AI:Typist.■

The Fixers

by Mark D. Goodwin

★★★

Profix IV runs on the Model 4/4P/4D (64K) with the Profile 4 Plus data-base program, plus two disk drives. Blue Ridge Software, 230 Chesterfield Road, Lynchburg, VA 24502, 804-239-0574. $49.95.

★★★

Proaid 4+ runs on the Model 4/4P/4D (64K) with Profile 4 Plus and two disk drives. Clay Watts Software, 68C North Loop, Cedar Hill, TX 75104, 214-291-1171. $49.

Radio Shack's Profile 4 Plus has admirably served the data-base management needs of Tandy computer owners (see November 1985, p. 114 for a review). While Profile 4 Plus is good, any program can be improved. With this in mind, Blue Ridge Software has released Profix IV, which adds many features to Profile 4 Plus, including rearrangement of fields across segments, changing of field lengths, addition or deletion of data-base fields, rearrangement of records in sorted order, and more.

Creating Maps

Profix's operation is simple. Every Profile data base has a map file holding information on the number of segments, field names, and field lengths. To start the Profix IV process, a program called Promap duplicates the map file, and you edit the resulting file using Profile's define-file function. To create the new data base, you rearrange, add, or delete the desired fields. Once you have defined the new map file, Profix compares the old and new map files, generating data records conforming to the new record format.

Profix does the job well, but it isn't an easy program to use. It requires frequent disk swaps for some functions, setting up potentially serious and often fatal errors in the program run. The Profix documentation isn't much help, either. The manual is useful, but its disorganization is compounded by the author's use of the term "run-time disk" for the data-base data disk. Throughout the Profile 4 Plus manual, run-time disk refers to the run-time system disk. The inconsistencies are maddening.

Pro Power Plus

A companion to Profix IV is Proaid 4+ from Clay Watts Software. Proaid 4+ offers greater report-printing capabilities than the standard Profile 4 Plus system. These enhancements include printing any number of fields and lines per record and printing of text anywhere on the report. It permits up to six title lines per page; left, top, and bottom margins; and specification of printer control codes (handy to turn on and off printer features such as compressed or emphasized print) and the number of lines between records.

Proaid's ability to print reports from up to three related files is its strong suit. For example, you could use a two-file system to generate invoices from a customer file and an order file. The customer file would contain the names, addresses, phone numbers, and credit information, and the order file would be a record of all the customers' unpaid invoices. From these separate files, Proaid easily generates invoices by comparing a common key in each file (say, customer account numbers). Proaid prints the customer's name and address at the top of the invoice; underneath it prints pertinent data for any unpaid orders with a matching account number.

How It Works

Creation of a Proaid report format starts when you specify a report's primary and secondary files. From there, a full-screen editor creates the actual format. With the format set, you must select certain options for the report: number of columns, lines per page, margins, and sort fields. The modified data is now ready to print out.

Proaid comes with an adequate 23-page manual, instructing you via a series of screen displays and a sample Proaid run. Accompanying each display is an explanation of its highlights. Perhaps the only problem with this kind of demonstration is that the illustrated files aren't included on the Proaid disk. Inclusion of these files would let you actually work through the sample screen displays. You could acquire familiarity with the program much faster via a hands-on approach.

Besides the manual's problems, Proaid has a few drawbacks. Its lack of speed can be attributed to the fact that Proaid is a Basic program. An operation such as movement of the editor's window is excruciatingly slow. Proaid's other problems include not recognizing lowercase menu responses, display errors by the editor, and improper responses to control keys by the editor.

Conclusion

Profile 4 Plus is a superior software package. That the makers of Profix IV and Proaid 4+ have expanded on Profile's features is admirable, but these achievements are not without flaws. Both programs could benefit greatly from improved documentation. Despite their problems, Profix IV and Proaid 4+ are welcome additions to the Profile system.■

Continued on p. 115

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Good-bye Floppy?

Photography by White/Packert

Today's mass-storage alternatives could make your 360K floppy obsolete.

by Mark J. Welch

Last December, I decided to take inventory of the floppy disks I owned. Here's what I uncovered: a dozen copies of my word processor, each sharing a disk with an article, a few letters, and some blank space; about a dozen copies of Turbo Pascal, one for each current or not-quite-aborted programming project; two copies of PC-Talk; 16 bulletin-board system (BBS) program disks; five spreadsheet disks; and dozens of utility disks and rarely used application programs, each with a master disk, a backup, and one or two working copies.

In all, I counted 150 floppy disks, each with 360K capacity, some full, some half-

full. The numbers told the story: I was disorganized.

Resolving to put things in order, I rushed out and bought the least-expensive 10-megabyte (MB) hard-disk drive I could find. Eight days after I installed my 10MB disk, I had copied about 8MB of programs and data onto it and still had dozens more I wanted to fit in. I then had to decide which programs to leave on floppy disks.

In retrospect, I might have made a wiser decision if I more carefully assessed my needs and compared products before making a purchase. Mass-storage devices exist for every computer make and model. They range from floppy-disk drives for about $100 to ultra-high-capacity hard-disk drives for $10,000. If one of these is on your shopping list for 1987, I'll try to help with your homework by pointing out some options. I'll also review cost and performance factors associated with current mass-storage products and preview new technologies. (See the sidebar titled "Challengers on the Horizon.")

Hard-Disk Help

Installing a hard disk is a popular route to mass-storage capability. With a hard disk, you can have all your programs and data files available, along with those utilities you've stored on a half-dozen other disks.

At one time, hard-disk drives were boxes you attached to your computer with wires and more than a little magic. To add a hard disk to some Tandy computers still requires a few wires, but Tandy's new MS-DOS models are designed, like the IBM PC/XT, with hard-disk drives as planned options. The Models III and 4 have an input/output bus to which you can attach a hard disk with the proper cabling. The Model I and the Color Computer, however, weren't designed to accommodate a hard disk; the only way to install one is by modifying the computers' hardware and operating-system software.

Early versions of MS-DOS and other operating systems require special device-driver software in order to work with hard disks. The operating systems themselves have no way of dealing with hard-disk drives. The device driver allows the operating system to treat a hard disk as if it were a large floppy disk.

Depending on the size of the drive, organizing information on a hard disk can be somewhat complicated. Because of logical disk-size limitations, some operating systems require that you divide the hard disk into logical units. For instance, MS-DOS 2.x and 3.x have a logical limit of 32MB; a 40MB hard drive, therefore, must be treated as two logical drives. (The drive vendors include special software with their products to help you do this.) A Model 4 TRSDOS directory has a limit of 240 file names; for the sake of organization, it's preferable to divide a 15MB Model 4 hard disk into several logical drives.

Current versions of MS-DOS and some other operating systems let you create multiple directories in which you can logically group programs on a hard disk. Each directory works like a large floppy disk. Utilities are available to help you locate files, as are menu programs that help you organize the disk and move around in it without using MS-DOS commands.

Copying data from your floppy disks to a hard disk is easy: You just copy each disk onto the proper hard-disk directory, taking care not to copy older versions of duplicate files over newer ones. (My approach is to stack up all my floppies by category and copy over the oldest ones first.) Sometimes a program's copy-protection scheme can interfere with transferring it to a hard disk. See the sidebar titled "Beware Copy-Protection" for more on this.

Once you've installed the device-driver program, you can refer to the hard drive as if it were another floppy drive, using MS-DOS directory commands to structure the files on disk. The Tandy 1000, 1200, and 3000 automatically boot from hard-disk drive C if there's no floppy disk in drive A.

All IBM PC/XT and AT hard disks should work in the Tandy 3000 models. Most that use half- or three-quarter-length controller boards also work in the Tandy 1000 with some modification. (For an account of one Tandy 1000 owner's experience installing a hard-disk system, see "A Hard Bargain," June 1986, p. 68.) The manufacturer must set the disk controller to use interrupt-request 2 rather than 5, which is the one the IBM PC/XT normally uses for the hard disk.

A new trend in hard disks is the hard-disk expansion card, an idea pioneered by Plus Development Corp. with a product called Hardcard. Hard-disk expansion cards combine a 10 or 20MB, half-height, 3½-inch hard-disk drive with a disk controller. Most, however, won't fit in a Tandy 1000. A few vendors have hard-disk cards that do work in the Tandy 1000, but some of them take up more than one of the coveted expansion slots.

Performance Points

Access speed is a primary motivation for buying a hard disk. Most hard disks have access times of 75 milliseconds (ms) or less. By comparison, the access time of a standard Tandy 1000 floppy-disk drive is about 150 ms (see Table 1 for a breakdown of access times among the different media). Hard disks also spin much faster than floppy disks—3,600 rpm compared to 500 rpm, respectively—further speeding data transfer. Hard drives designed for the IBM PC/AT have access times of 40 ms or less, and even newer drives, with capacities of 60MB and up, can access data in less than 30 ms.

Of course, actual performance depends on your application software. A word-processing or spreadsheet program that stores all of its text or data in RAM won't run any faster with a hard disk than it will with a floppy. (It will store the document faster, however.) A data-base manager, on the other hand, can search and sort records much faster with a hard disk.

As for price, you can spend as little or as much as you want (and certainly as much as you have) on a hard-disk drive. Prices of older models, especially 5MB ones, are often discounted (sometimes to less than $100), but the drives are usually less reliable and more difficult to connect to your system than newer ones. At the high end, several vendors offer 250MB external hard-disk subsystems for tens of thousands of dollars. Not surprisingly, most users settle for less capacity, with 10 and 20MB XT-type drives being the most popular.

States of Preparedness

Early hard disks were notoriously unreliable. Five years ago, a business that installed a hard disk could almost expect it to crash once or twice a year. Fortunately, manufacturing methods have improved over time, and the hard disks now on the market are fairly reliable. (They're certainly more reliable than floppies, which can be wiped out by sticky fingers.)

One indicator of quality is the manufacturer's warranty. Five years ago, 30-day warranties were common. Today the standard is 90 days, but you'll also find some vendors offering one- and even five-year warranties.

Better isn't the same as perfect, however.

Nearly every hard disk has bad sectors, but the operating system and disk-drive firmware hide them from you. Other parts of the disk might gradually deterioriate (you won't notice) and then suddenly fail (usually during the end-of-month billing cycle, or two weeks after the last backup, or whichever time is worst for you). Often, the only cure for an ailing hard disk is reformatting the disk, after which the drive will work again just long enough to make you overconfident.

Other catastrophes, such as power surges or failures, can cause the magnetic head to crash onto the disk surface. In such cases, you'll probably need to have the drive repaired or, more likely, replaced.

You've probably comforted friends (or snickered at enemies) whose hard disks crashed inexplicably. In fact, while I was preparing this article, my own 10MB drive began making loud noises and then stopped working altogether. I was able to use it again only after performing a low-level disk format, which erased all the data on the disk. I don't know why it failed, and I've had no problems since, but I'm now a bit more religious about backing up my data to floppies, just in case.

It doesn't take a hardware failure to lose your data, of course. More than once, I've erased entire hard-disk directories when I meant to erase all the files on a floppy disk instead. Inexperienced users often reformat the hard disk when they mean to format a new floppy disk.

Thus, despite the improvements in quality, it's a good idea to routinely back up your hard disk onto floppy disks or tape. Backing up a nearly full 10MB hard disk takes from 10 minutes to an hour and requires about 24 360K disks. If you have great faith in your hard disk, you might back up all the data onto a stack of floppies once a week (or month). More prudent (or paranoid) users prefer to store copies of each work file on floppy data disks.

Finally, you should recognize that hard disks, like computers, aren't built to last a lifetime. You'll use a hard disk far more often than you'll ever use a single floppy. Though newer hard disks are designed to withstand intensive use, most need to be replaced within five or 10 years.

Medium	Access time
Floppy disk	150 ms
XT hard disk	85 ms
Syquest	75 ms
Kodak/DTC	60 ms
AT hard disk	40 ms
Bernoulli Box	30 ms
RAM disk	10 ms

Table 1. Average access times (in milliseconds [ms]) for disk media.

Challengers on the Horizon

Most analysts agree that optical discs will eventually challenge and probably replace magnetic disks. Already, write-once optical disc drives are available, storing hundreds of megabytes of data on a single removable cartridge. At least three drives are now available for the IBM PC and compatibles, with prices ranging from $4,000 to $15,000.

Optical-drive sales have been slow due to production and software problems and because data written on the discs can't be replaced—hence the name "write-once, read-many" (WORM). Since erasable optical discs are expected in a few years, it's doubtful that write-once discs will gain wide acceptance except in specialized niches. Auditors, for example, might prefer the security of discs that can't be altered.

The optical-disc technology used in audio compact discs is now being used in CD-ROM drives costing under $800. You can already buy dozens of specialized read-only data bases to use on a PC, although such discs cost more than $1,000. Two general-purpose discs—an encyclopedia and a collection of MS-DOS public-domain and user-supported programs—are available for $200 each.

Naturally, magnetic-disk technology isn't just standing still. Perpendicular magnetic-recording technology, which stores data vertically *through* a single-sided disk (as compared to conventional magnetic recording, which stores bits of data by creating magnetic fields along the surface of the disk) is being used in several prototype disks with capacities ranging from 4 to 12MB.

The two technologies aren't mutually exclusive, either. Kodak's Verbatim subsidiary last year showed a 40MB disk that combined perpendicular magnetic and optical technologies, and other vendors are working on similar projects.

Despite the promise of these new technologies, none has yet found its way into the marketplace. One of these new designs will probably be standard equipment in the computers of the 1990s, but most disks sold in the next few years will be magnetic.■

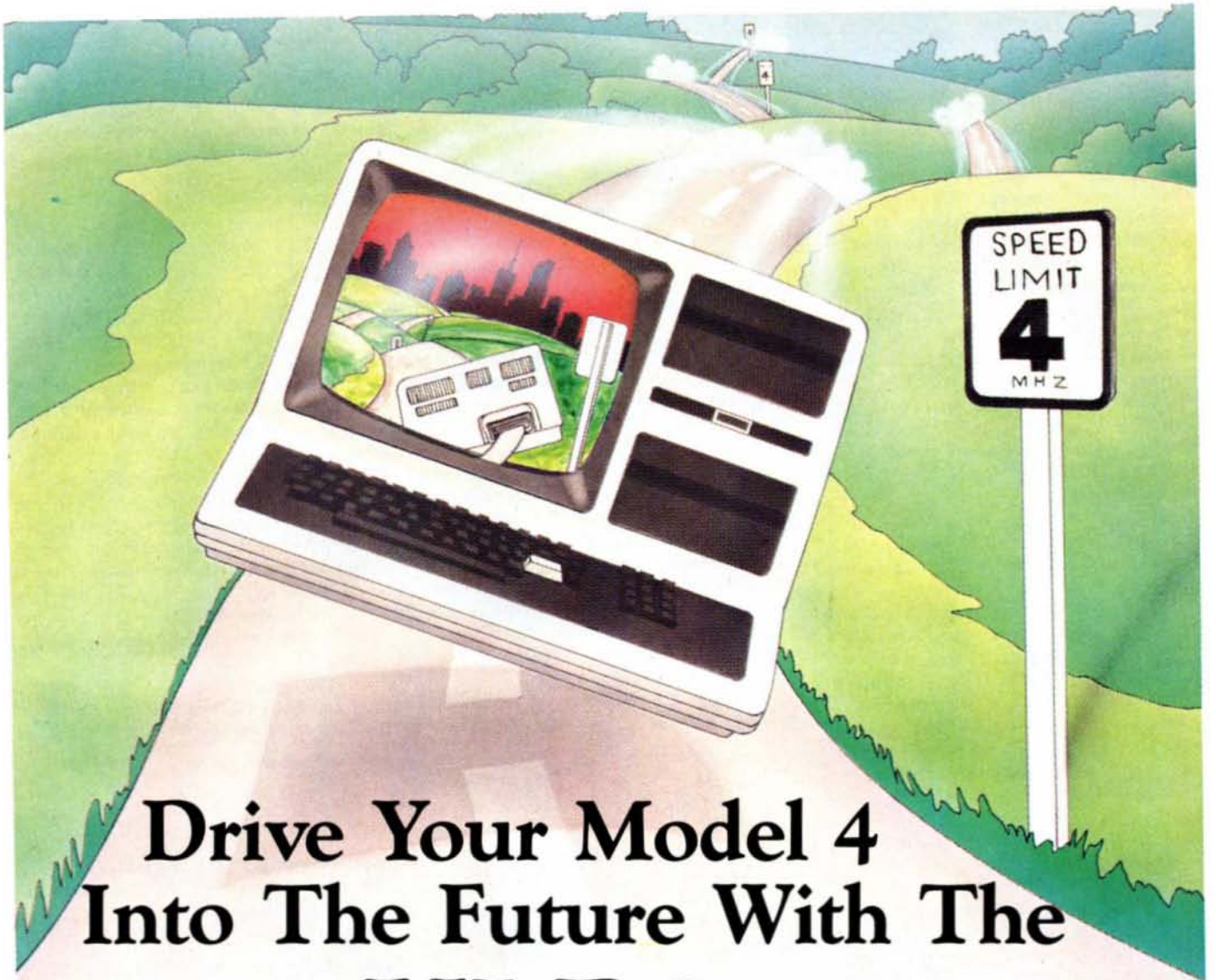
Beware Copy-Protection

If you use copy-protected software, you'll probably have problems adapting an uncommon mass-storage option. Most copy-protection schemes rigorously follow the hardware characteristics of 360K floppy-disk drives and standard hard-disk drives, and often won't work properly on other devices. Some vendors have moved to accommodate popular options like the Bernoulli Box, but few will sympathize with your inability to run their programs from more obscure formats—even 720K 5¼-inch floppies. Some hard-disk back-up programs and other disk utilities (Fastbak, for example) won't work on nonstandard hard-disk drives and computers because they rely on direct hardware access to run faster.

Beware: If you use the vendor's procedure to install a copy-protected program on your disk, you should use the software vendor's "uninstall" program before backing up to a floppy, since hard-disk back-up programs can't properly read or restore the copy-protected file on the hard disk. If the hard disk crashes and you need to reformat it without uninstalling the copy-protected program, that installation will be lost. Most vendors provide three installations.

I prefer not to install any copy-protected software on my hard disk. In fact, I no longer use it at all, except to test the compatibility of hardware I'm evaluating. Fortunately, fewer vendors are using copy-protection each month. As copy-protection disappears, most packages should work with even the most obscure disk drives.

When I do use copy-protected software, I install the program's copy-protection file on a floppy disk (called a "key" disk) and insert that disk in drive A whenever I load the program. Many copy-protection schemes confuse (or are confused by) the various disk-utility programs and other strange programs I run, and I would quickly run out of proper installations. The same applies to unusual drive formats: The program usually can't be *installed* on such disks, but program and data files can be stored on them as long as the installed version is in the 360K A drive.■



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Unflappable Floppies

Floppy-disk technology has come a long way since the early days of computing. The first add-on floppy drives for the Model I could access only 90K of data. On the Model III, Tandy installed double-density, 180K, single-sided disk drives. The Model 4D comes standard with full-height, double-sided, 368K disk drives, identical in design to those used in the original IBM PC and PC/XT.

Tandy made a technological leap forward with the Tandy 2000, which uses 720K (800K unformatted; see the sidebar, "The Numbers Game") quad-density disk drives. IBM then leapfrogged Tandy by installing 1.2MB floppy drives in the PC/AT. Tandy followed by using the same drives in the Tandy 3000.

A number of vendors offer add-on floppy drives with more than 1.2MB capacity. Several years ago, Drivetec, a now-defunct peripherals manufacturer, unveiled 1.6 and 3.3MB floppy drives under a technology agreement with Eastman Kodak Co. Currently, Data Technology Corp. manufactures a 3.3MB drive (with a formatted capacity of 2.78MB), which Pacific Micro Systems markets as the Pelican. (For a brief review of this drive, see "Tandy 1000 Add-Ons," September 1986, p. 44.)

Meanwhile, Eastman Kodak and Data Technology Corp. (DTC) have teamed up to design a 10MB drive. It uses a 5¼-inch, high-density floppy disk enclosed in a case resembling a 3½-inch floppy disk's. Performance is comparable to that of some slower hard disks. (Keep in mind, however, that operating systems differ in how they handle floppy-disk data. Different software can affect the speed at which you can access data.)

A unique aspect of the Kodak/DTC disk is that it has two write-protect tabs. One prevents the user from overwriting or erasing the first 3MB; the other blocks all attempts to write to the disk. This keeps users from altering important data or erasing program files, while allowing them to alter other files on the remaining 7MB.

DTC originally planned to begin marketing the drive last fall. However, production fell behind and, as of press time, the drive was still not available in stores. It isn't known yet whether DTC or another vendor will design a version specifically for Tandy computers.

Be Practical

If you're satisfied with the performance of floppies but your data has outgrown a single disk (or a pair), you might be tempted to buy a 720K drive. Resourceful users have added 720K 5¼-inch floppy drives to a wide range of computers. Many BBS system operators (sysops), for example, use 720K drives because they can hold twice as many messages and files as 360K systems, and they are easier to back up.

If you've outgrown a 180K or 360K disk, however, chances are you'll fill a 720K disk in no time. A better reason to buy a 720K drive is if you need more room to store programs. Unlike data, programs don't expand with regular use.

Some popular application programs for MS-DOS computers, such as Microsoft's Word and Borland International's Reflex, require more than 360K, which means floppy-disk users must swap disks regularly. Users of these packages might think a higher-capacity floppy drive is the answer, but unfortunately, neither program fits comfortably in 720K, either.

Although high-capacity, high-density floppy disks might seem like bargains at first, you should beware. The floppy-disk industry makes its money from selling disks, not the drives that run them. Though you can buy 360K, double-sided, double-density disks for the Tandy 1000 for as little as 39 cents from mail-order firms, you'll have a much more difficult time finding and affording 720K, 1.2MB, and 3.3MB floppy disks. The Kodak/DTC 10MB floppies cost $30–$40 each. That might seem a small price to pay for 10MB of disk space, but the cost adds up if you wear out or fill more than a few in a year (see Table 2 for a cost-per-megabyte breakdown among the mass-storage choices).

If you buy a drive using one of the more obscure formats, like the 3-inch or 3¼-inch floppy, your options are even narrower. Few vendors make or sell these disks, and even fewer will be supporting them next year.

There are other pitfalls, too. One is that most MS-DOS computers cannot use the new, high-capacity floppy drives without the help of device-driver software. The device driver allows the operating system to recognize, format, and use the new drive. Usually, the software is included with the drive. Even with this software, however, you need to start your system from a standard drive, since the operating system doesn't recognize the new drive until it loads the driver software. A few vendors also offer ROMs that allow you to boot the computer from higher-capacity floppy drives.

Another problem is that high-capacity floppies often require a different controller from the one a standard 360K floppy uses.

The Numbers Game

Most computer buyers quickly discover that disk capacities come in different varieties. Manufacturers wanting to sell drives emphasize "unformatted capacity," which is the amount of data that could theoretically be packed onto a disk by a "perfect" disk drive.

Unfortunately, there are no perfect disks or drives, so you have to format your disks. Formatting information lets drives read and write to the same disk despite slight variations in temperature, humidity, and other factors, but it also consumes part of the disk's capacity. A standard Tandy 1000/IBM PC disk with an unformatted capacity of 400K stores just 360K bytes of data. If you want to be able to boot from the disk, the operating system will take up more space, leaving about 320K on a Tandy 1000 disk.

The same problems apply to higher-capacity disks. In most computers, an 800K floppy disk (including both the 5¼-inch disk used in the Tandy 2000 and the 3½-inch disk used in the Macintosh) holds only 720K of data, and a 1.6MB drive stores only 1.2MB. A 3.3MB floppy stores 2.78MB.

Hard-disk drives and higher-capacity floppies are usually sold on the basis of their "formatted capacity." When you buy a new drive, make sure you compare the amount of real storage space you'll have, not theoretical capacities available only if you write your own operating system.

Squeezing Data

A recent buzzword of hard-disk vendors is run-length limited (RLL) encoding, a technique for writing and reading data on a hard disk that differs from standard multifrequency modulation (MFM) encoding. RLL has the obvious benefit of squeezing 50 percent more data on the same hard disk. Unfortunately, many older drives, and a few still being made, can't reliably handle RLL encoding.

RLL isn't new: It is used in the Bernoulli Box and in Plus Development's Hardcard 20. The "new" aspect is that many vendors are selling RLL controller cards with standard 20MB hard-disk drives and calling the result a "30MB disk-drive subsystem."

When you buy a hard-disk controller card, find out whether it uses RLL. If it does, make sure the drive you'll be using supports this scheme. Adaptec and OMTI, which make RLL chip sets, have released lists of supported hard-disk drives, and Western Digital will probably do the same. If the drive you're buying isn't on the chip maker's list, be sure to get a long warranty from a reliable dealer.■

This is always the case with 3.3MB and 10MB drives. When buying any floppy or hard-disk drive, be sure to find out whether a disk controller is needed, and if so, whether it is included in the price of the drive.

For many applications, a 3.3MB floppy drive is ideal, as long as no single task requires more than 2MB. The problem with 3.3MB drives is their cost, which is usually twice that of a 10MB hard disk. Of course, with the floppy drive, you can have as many disks as you can afford (a single disk costs less than $15). The amount of data you can store, therefore, far exceeds 10MB.

The Best of Two Worlds

Though the high capacity and fast access times of hard disks are appealing, the convenience of removable floppy disks might be essential to you. If your applications require all these features, you probably should consider a removable disk-cartridge system like Iomega Corp.'s Bernoulli Box. Tandy markets the same product as the Disk Cartridge System.

Like a hard-disk drive, the Bernoulli Box has two parts: an external disk drive and a controller card that fits in one of the computer's expansion slots. The Bernoulli Box cartridge consists of a hard case containing a very-high-capacity, 8-inch, floppy-type disk and the magnetic read/write head.

The Bernoulli Box uses the fluid dynamic principle discovered by David Bernoulli in the 1700s. Air flow holds the spinning flexible disk at a stable and frictionless 10 microinches from the aerodynamically shaped head. The result is a very fast access time, high capacity (5, 10, and 20MB, depending on the model), media portability, and reliability.

Though Tandy 1000 and 2000 owners are limited to installing Tandy's version ($2,195), 1200 and 3000 owners can install the Iomega model, which was designed for the IBM PC and is widely available at a discount.

After receiving complaints that its 8-inch cartridges and drives were too bulky for many offices, Iomega announced the Beta-5, a less-expensive, 20MB, 5¼-inch version of the Bernoulli Box. Tandy sells an internally mounted version of this system—the 20-Megabyte 5¼-inch Internal DCS—for $1,799 (catalog no. 25-4064).

Syquest Technology also makes a removable cartridge drive, but instead of using floppy-disk media, the product contains a 3.9-inch diameter hard disk. Syquest markets 5 and 10MB versions of the drive. For IBM compatibles, Syquest makes a 15MB model that uses run-length limited (RLL) encoding techniques (see the sidebar titled "The Numbers Game").

Cartridge-disk systems are not cheap. The least expensive Bernoulli Box costs about $1,800, and the cartridges cost $80–$120 (see Table 2). By comparison, you can buy a 10 or 20MB hard disk for well under $500.

Last Words

Most add-in disk-storage systems come with installation instructions; though the directions are often cryptic, it's usually easy to figure out what goes where. The greatest risk of something going wrong is with the vendor. Many companies that sell add-in storage systems are unfamiliar with Tandy computers. It's a good idea, therefore, to check with the manufacturer before you buy a mass-storage device to make sure it will be compatible with your Tandy system.

No matter which mass-storage device you purchase—a hard-disk, a high-capacity floppy drive, or a removable cartridge system—the benefits of owning one are quickly realized. You'll be surprised to discover how little space your documents and programs really need to take up.■

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	Capacity	Drive* price	Drive $/MB	Disk price	Disk $/MB
3½-inch floppy disk	720K	$ 250	$ 347	$ 2	$ 2.78
5¼-inch floppy disk	360K	100	278	1	2.78
Pelican floppy disk (Pacific Micro Systems)	3.3MB	695	211	13	3.94
5¼-inch floppy disk	720K	100	139	3	4.17
Bernoulli Beta-5** (Iomega)	20MB	1,800	90	85	4.25
Bernoulli Box† (Iomega)	40MB	3,500	88	120	3.00
Write-once optical	115MB	5,000	43	100	0.87
10MB XT hard disk	10MB	400	40	N/A	N/A
20MB XT hard disk	20MB	500	25	N/A	N/A
30MB AT hard disk	30MB	650	22	N/A	N/A
70MB AT hard disk	70MB	1,250	18	N/A	N/A
CD-ROM‡	550MB	800	1.5	200**	0.36

* includes disk drive and controller (except AT hard-disk price).
** sold by Tandy as 20-Megabyte 5¼-inch Internal DCS.
† sold by Tandy as 20+20-Megabyte DCS.
‡ since CD-ROM drives cannot write data to disk, you can only buy disks that already contain data.

Table 2. Comparative drive and disk prices. (Estimates based on typical dealer prices.)

Manufacturer's Index

Adaptec Inc.
580 Cottonwood Drive
Milpitas, CA 95035
408-946-8600

Data Technology Corp.
2551 Walsh Ave.
Santa Clara, CA 95051
408-727-8899

Eastman Kodak Co.
343 State St.
Rochester, NY 14650
716-724-4731

Iomega Corp.
Holly Pond Plaza
1281 E. Main St.
Stamford, CT 06902
203-359-9858

OMTI
Div. of Scientific Micro Systems Inc.
339 N. Bernardo Ave.
Mountain View, CA 94039
415-964-5700

Pacific Micro Systems Inc.
160 Gate 5 Road
Sausalito, CA 94965
415-331-2525

Plus Development Corp.
1778 McCarthy
Milpitas, CA 95035
408-434-6900

Syquest Technology Inc.
47923 Warm Springs Blvd.
Fremont, CA 94539
415-490-7511

Tandy Corp.
One Tandy Center
Fort Worth, TX 76102
817-390-3011

Western Digital Corp.
Enhanced Peripherals Div.
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Irvine, CA 92714
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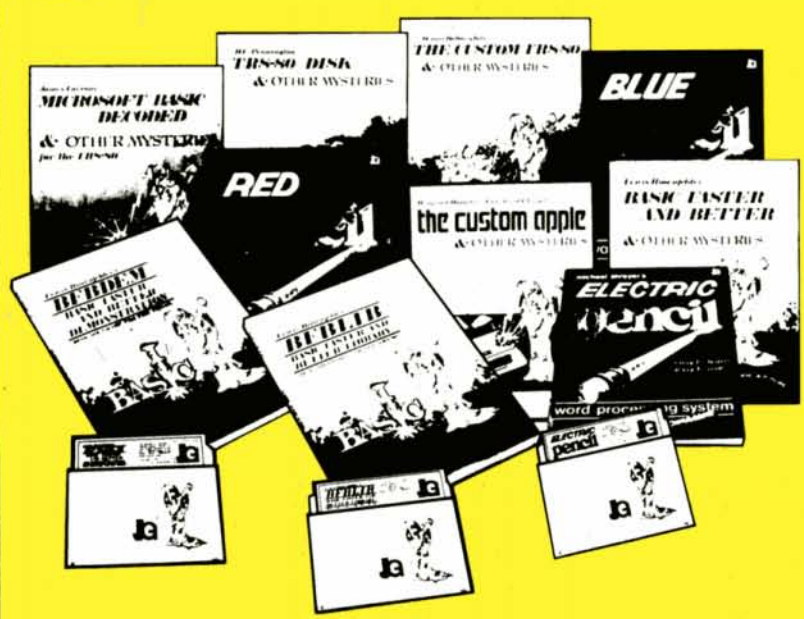

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Illustration by Steve Lyons

Checking References

Turn your magazine collection into a reference library with this keyword-indexed data-base program.

by Larry E. Fosdick

Tired of scouring back issues of *80 Micro* for that article on disk utilities you read two months back? (Or was it three months?) If so, I have just the remedy: a data-base program for organizing bibliographic information on your Tandy 1000, 1200, or 3000. You can use the program to reference magazine articles, records, recipes, and any other work contained in a collection. The program maintains a separate data base of keywords—up to 2,000—for extracting references.

With Reference Library, you can create nine files of reference information, with up to 1,000 entries in each file. The program stores references in the order that you type them in and assigns each a number corresponding to its sequential placement in the data base. You extract references by performing a search on keywords. All nine reference data bases can share a single keyword file.

The program also provides several methods for outputting reference information. You can print out a complete list of references organized alphabetically, or you can print lists of selected references extracted through a keyword search. A bibliographic option allows you to choose references by number for printing out or writing to disk. (Students might use this feature to create bibliographic notes in a thesis or term paper.) A summary of all keywords and the number of references associated with them can be printed, as well.

Make a List

To install Reference Library, type in the Basic code contained in the Program Listing. On the Tandy 3000, you must enter Basic with the command:

```
BASIC /S:256/I
```

The program requires 256K RAM and either two floppy-disk drives or a hard disk.

During the initialization sequence, the program prompts you for a reference-set number from 1–9. Type in the number 1 to create your first reference file. Do *not* press the enter key. The program asks you to specify path information for reference storage. If you're using a hard-disk system, type in the appropriate path name. If you are using a two-drive system and want your data stored on drive B, type B:. If you are using a single keyword data base for several reference files, be sure to specify the same path for the keyword file.

When the initialization process is complete, the program presents you with a menu of seven options. The number of references and keywords in the data base appear at the top of the screen. Select option A (add references) to build a reference file. The program displays a reference form for entering a source description, author's name, article title, and keywords.

You are allowed to enter source descriptions up to 46 characters in length. Since the program stores references by source—and will not accept duplicates—make sure the source description is unique for each reference you enter. For magazine articles, I advise including the magazine's name, the issue year, the volume number, and page number. This level of detail is essential if your library will contain multiple references from a single source—for example, more than one article from the same issue of *80 Micro*.

After you enter the source description, type in the author's name (up to 70 characters), the title of the reference (up to two lines, no more than 70 characters to a line), and a list of keywords (up to 10). Keywords can be up to 20 characters in length; all 20 characters are significant. The program is case-sensitive, so take care when typing in your list. A good rule of thumb is to use lowercase except to indicate proper names or special notation, such as in the abbreviations pH and MHz. Keywords may contain any ASCII character, including spaces and marks of punctuation.

When you enter keywords, the program checks to see if the word already exists in its data base. If it does, the program

LOAD 80

System Requirements

Tandy 1000/1200/3000
256K RAM
Basic
Printer

moves on to the next entry. If the keyword does not exist, the program asks if you want the keyword "learned" (added to the keyword list) or "changed" (to correct misspellings or to delete the keyword).

Typing a null keyword (by pressing the enter key at the keyword prompt) informs the program that you've finished inputting data. It then automatically adds the reference to the data base and prints its number on screen. The reference number corresponds to the record in the data file. Later, the program will refer to this number to extract the reference. So that you will be able to match the number with an actual title, I advise copying it onto the first page of the magazine article or whatever item you are referencing. You'll also need this number to take advantage of the program's bibliographic function.

After it adds the reference to the data base, the program presents you with a new form. You can either add another reference or return to the main menu by pressing F1.

Extracting References

After you've built up a reference data base, you'll eventually want to search it for a specific entry. Through its extraction option, Reference Library allows you to print out entries associated with keywords. To access this function, type E at the main menu selection prompt.

You can search the Reference Library data base for the number of entries associated with single keywords, pairs of keywords related by the And/Or logical operators, and combinations of previous keywords connected with And/Or. The program lets you keep track of eight searches (called extractions) using different keywords or keyword combinations. If you make more than eight extractions, the program displays the message:

8 Extracts. Delete which?

Type in a number from 1–8; the program then deletes that extraction and allows you to execute a new one.

An example best explains how the extraction process works. Suppose you want to search a file of computer-related articles for references to the use of artificial intelligence in medical research. Three keywords associated with the needed references would be artificial intelligence, medicine, and research. One way to locate the needed articles would be to perform separate searches on all three keywords. Depending on the size of the data base, this could take quite a bit of time. More importantly, the results might not be very satisfying: You could uncover numerous articles on each subject, but perhaps none that deals with all three.

A more effective method of finding the needed articles is to combine the keywords through a series of extractions. The first extraction might be on the single keyword "artificial intelligence." The second might be on the keywords "medicine" and "research" (connected with the And operator). The third extraction might combine the two previous ones: At the keywords prompt, you'd type the number 1, the letter A for And, and the number 2.

When you execute an extraction (by pressing the enter key after you've typed in a keyword), the program lists the number of extractions on screen, along with the keyword and the number of references associated with it. If the keyword does not exist, the program beeps and asks you to enter the keyword again. Entering a null keyword returns you to the extraction menu.

When you locate the desired reference or references, type L (for list). The program first asks which extraction you want to list and, after you make your choice,

Program Listing. Reference Library. (See p. 116 for information on using the checksums in this listing.)

```
 40 CLS:CLEAR ,&HFE00                                                    '*  1196
 50 DEFINT A-Y:DEFSTR Z:PRINT TAB(30);"* Initializing *"                 '*  3858
 60 DIM PA(5),I(1000),K(10,1000),R(18),C(18),L(18),E(8),KI(2000),
    KL(200)                                                              '*  3642
 70 DIM Z1(10),ZM(9),ZD(18),ZE(8),ZDEX(10),ZPATH(2),ZFILE(10)            '*  3482
 80 GOTO 2820 ' Skip to initialization section                           '*   685
 90 '       Keyboard Input Routines                                      '*   105
100 LOCATE R,C:LSET ZF=Z9:Sl=0                                           '*  1911
110 PRINT STRING$(S,46);:LOCATE R,C,1,4,7                                '*  2498
120 GOSUB 180:B=INSTR(ZT,ZI):IF FL=1 THEN 160 ELSE IF B>4 OR (B>
    0 AND Sl=0) THEN ON B GOTO 160,160,160,160,140,150 ELSE IF A
    SC(ZI)<32 OR Sl=S THEN 120                                           '*  8809
130 Sl=Sl+1:PRINT ZI;:MID$(ZF,Sl,1)=ZI:GOTO 120                          '*  2902
140 IF Sl=0 THEN 120 ELSE MID$(ZF,Sl,1)=" ":Sl=Sl-1:PRINT CHR$(2
    9);CHR$(46);CHR$(29);:GOTO 120                                       '*  5422
150 B=4:PRINT SPC(S-Sl+1);                                               '*  1570
160 S=0:FL=0:RETURN                                                      '*  1226
170 '   Get character from keyboard                                      '*   152
180 LOCATE ,,1:ZI="":WHILE ZI="":ZI=INKEY$:WEND:IF LEN(ZI)=1 THE
    N RETURN                                                             '*  4622
190 B=ASC(MID$(ZI,2)) ' Read 2nd byte extended ASCII                     '*  1201
200 IF B=72 THEN ZI=CHR$(4):RETURN ' Up Arrow                            '*  2104
210 IF B=80 THEN ZI=CHR$(5):RETURN ELSE ZI="":GOTO 180 ' Dn Arrow        '*  3314
220 '       Menu Selection Input                                         '*   148
230 GOSUB 180:B=INT(INSTR(T$,ZI)/2):IF B=0 THEN BEEP:GOTO 230 EL
    SE PRINT ZI;:RETURN                                                  '*  5317
240 '       Keyword Handling Routines                                    '*   150
250 '       Add New Keyword                                              '*   151
260 LSET ZKW=ZK:PUT 1,KI(0)+1:GOSUB 330                                  '*  2431
270 FOR J=KI(0)+1 TO BC STEP -1:KI(J)=KI(J-1):NEXT J                     '*  3088
280 KI(0)=KI(0)+1:KI(BC)=KI(0):MODFLG=1:RETURN                           '*  2798
290 '       Test keyword during Add or Edit                              '*   155
300 GOSUB 330:IF BF THEN RETURN ELSE GOSUB 460:PRINT "New Keywor
    d:";ZK;". [C]hange or [L]earn it? ";                                 '*  7149
310 T$="*cC1L":GOSUB 230:IF B=2 AND KI(0)>=2000 THEN GOSUB 460:P
    RINT "Keyword File FULL":GOSUB 480:B=1:RETURN                        '*  7113
320 '       Keyword Search Routine                                       '*   149
330 BF=0:BL=0:BH=KI(0)+1:BC=INT(BH/2):IF KI(0)<1 THEN BC=1:RETUR
    N ELSE IF BC<1 THEN BC=1                                             '*  5320
340 GET 1,KI(BC):IF ZK=ZKW THEN BF=KI(BC):RETURN ELSE IF ZK > ZK
    W THEN BL=BC ELSE BH=BC                                              '*  5544
350 BC=BL+(BH-BL)/2:IF BL=BC OR BH=BC THEN IF BC>1 THEN BC=BC-1
    ELSE ELSE 340                                                        '*  4607
360 GET 1,KI(BC):IF ZK>ZKW THEN BC=BC+1:IF BC>KI(0) THEN RETURN
    ELSE 360 ELSE RETURN                                                 '*  5301
370 '       List Keywords on Display                                     '*   154
380 CLS:J=0                                                              '*   654
390 J=J+1:IF J>KI(0) THEN 420 ELSE GET 1,KI(J):PRINT "     ";ZKW
    ;                                                                    '*  3750
400 IF (J MOD 3)=0 THEN PRINT                                            '*  1722
410 IF (J MOD 60)>0 THEN 390                                             '*  1534
420 JL=23:GOSUB 470:PRINT "[F1] to continue";TAB(45);"[F3] to ex
    it ";                                                                '*  4857
430 T$="*"+STRING$(2,1)+STRING$(2,2):GOSUB 230:IF B=2 OR J>KI(0)
     THEN RETURN                                                         '*  4541
440 CLS:GOTO 390                                                         '*   969
450 '       Miscellaneous Subroutines                                    '*   153
460 JL=21                                                                '*   496
470 VIEW PRINT JL TO 24:CLS:VIEW PRINT 1 TO 24:LOCATE JL,1:RETUR
    N                                                                    '*  4249
480 BEEP:TIM!=TIMER+3:WHILE TIM!>TIMER:WEND:RETURN                       '*  3416
490 LOCATE JL,1:PRINT SPC(79);:LOCATE JL,1:RETURN                        '*  3184
500 FOR JL=1 TO Q1:LOCATE R(JL),C(JL):PRINT SPC(L(JL));:NEXT JL:
    RETURN                                                               '*  4507
510 '       Display Reference Form                                       '*   150
520 J=(78-LEN(ZTITL))/2:CLS:COLOR 11:PRINT TAB(J);ZTITL                  '*  3541
530 FOR J = 1 TO Q2+1:LOCATE R(J),1:PRINT ZD(J):NEXT J                   '*  3288
540 LOCATE 18,1:PRINT STRING$(79,45):COLOR 14:RETURN                     '*  3303
550 '       Display Record Subroutine                                    '*   154
560 GET 2,I:FOR X=1 TO 10:K(X,0)=K(X,I):NEXT X                           '*  2766
570 FOR JJ=1 TO Q2:LOCATE R(JJ),C(JJ):PRINT Z1(JJ):NEXT                  '*  3480
580 FOR JJ=1 TO 10:B=K(JJ,0):LOCATE R(JJ+Q2),C(JJ+Q2)                    '*  3144
590 IF B>0 THEN GET 1,B:PRINT ZKW; ELSE PRINT SPC(L(JJ+Q2));             '*  3760
600 NEXT JJ:RETURN                                                       '*  1219
610 '       Reference Search Subroutine                                  '*   151
620 BL=0:BH=I(0)+1:BC=INT(BH/2):BF=0:IF I(0)<1 THEN BC=1:RETURN
    ELSE IF BC=0 THEN BC=1                                               '*  5172
630 GET 2,I(BC):IF INSTR(Z1(1),LEFT$(ZF,Sl))=1 THEN BF=BC:GOTO 6
    60 ELSE IF ZF>Z1(1) THEN BL=BC ELSE BH=BC                            '*  6390
640 BC=BL+INT((BH-BL)/2):IF BH=BC OR BL=BC THEN IF BC>1 THEN BC=
    BC-1 ELSE IF BC=0 THEN BC=1 ELSE ELSE 630                            '*  6315
650 GET 2,I(BC):IF Z1(1)<ZF THEN BC=BC+1:IF BC<=I(0) THEN 650 EL
    SE RETURN ELSE RETURN                                                '*  5225
```

Listing continued

Circle 175 on Reader Service card.

TANDY Model 1000 & MS-DOS TRS-80™ Models 1, 3 & 4 SOFTWARE

SMALL BUSINESS ACCOUNTING with PAYROLL $99.95

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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A complete checkbook program together with budgeting, income and expense analysis, comparisons, and projections. Enter and print checks, enter deposits, and compute your current checking balance. Program also handles non-check expenses, bank debits, and income. Monthly and year-to-date summaries and yearly projections based on data through a known month. Monthly expenses compared to a pre-established budget.

SMALL BUSINESS MANAGEMENT SYSTEM $299.95

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Order desk handles order entry and invoicing. Items ordered are automatically deducted from inventory, accounts receivable updated. Includes up to 999 8-character part numbers (1,999 for MS-DOS). Handles both customer accounts and single orders. Invoices printed on forms or plain paper and include discounts, sales taxes, and shipping and handling charges.

Bookkeeper keeps general ledger, accounts receivable and payable, produces customer statements. General ledger produces monthly and year-to-date totals. Receivables tracked to invoices, automatically updated as income entered.

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Installation tailors program to your business.

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June 1986 Issue

PCM Magazine

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FOR TANDY 1000

2002	$109	Memory Board with 256K
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2004	49	Clock/Calendar
2008	249	Multifunction Board with 512K + Serial + ZDISK + ZSPOOL + Clock

PURCHASE ANY OF THE ABOVE BOARDS AND RECEIVE A FREE CLOCK CALENDAR.

2016	549	Internal Half Height 20MBYTE Hard Disk inc. Controller and Cables (1000SX Compatible)
2017	599	20MBYTE Drive Board (1000SX Compatible)

FOR TANDY 1000SX

2006	129	Memory Board with 256K
2027	199	Multifucntion Board with 256K + Serial + ZDISK + ZSPOOL + Clock
2020	219	Monochrome Text Upgrade (TTL monitor and cable included)

FOR TANDY 1000EX

2025	99	Memory Board with 256K
2026	129	Memory Board with 384K

FOR TANDY 3000HL

2029	149	1 Serial Port
2031	79	2nd Serial Port (Includes Clock Calendar)
2032	799	Internal Half Height 20MBYTE Hard Disk inc. Controller and Cables
2033	799	20MBYTE DRIVE BOARD
2021	249	Monochrome graphics....(TTL Monitor and connecting cable included)
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FOR TANDY 1000SX and 1000EX

2028	99	1st Serial Port
2030	49	2nd Serial Port (Includes Clock Calendar)

FOR TANDY 1000, 1000SX, 1000EX, and 3000HL

2023	79	MS DOS 3.2 with GW Basic
2024	49	ZDISK + ZSPOOL Software

Model	Qty.	Unit Price	Ext. Price
FOR TANDY 1000			
2002	_____	$109	_____
2003	_____	149	_____
2004	_____	49	_____
2008	_____	249	_____
2016	_____	549	_____
2017	_____	599	_____
FOR TANDY 1000SX			
2006	_____	129	_____
2027	_____	199	_____
2020	_____	219	_____
FOR TANDY 1000EX			
2025	_____	99	_____
2026	_____	129	_____
FOR TANDY 3000HL			
2029	_____	149	_____
2031	_____	79	_____
2032	_____	799	_____
2033	_____	799	_____
2021	_____	249	_____
2022	_____	129	_____
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2028	_____	99	_____
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2004	_____	49	_____
2008	_____	249	_____
2016	_____	549	_____
2017	_____	599	_____
FOR TANDY 1000SX			
2006	_____	129	_____
2027	_____	199	_____
2020	_____	219	_____
FOR TANDY 1000EX			
2025	_____	99	_____
2026	_____	129	_____
FOR TANDY 3000HL			
2029	_____	149	_____
2031	_____	79	_____
2032	_____	799	_____
2033	_____	799	_____
2021	_____	249	_____
2022	_____	129	_____
FOR TANDY 1000SX and TANDY 1000EX			
2028	_____	99	_____
2030	_____	49	_____
FOR TANDY 1000, 1000SX, 1000EX and 3000HL			
2023	_____	79	_____
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FOR TANDY 1000

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2003	149	Memory Board with 512K
2004	49	Clock/Calendar
2008	249	Multifunction Board with 512K + Serial + ZDISK + ZSPOOL + Clock

PURCHASE ANY OF THE ABOVE BOARDS AND RECEIVE A FREE CLOCK CALENDAR.

2016	549	Internal Half Height 20MBYTE Hard Disk inc. Controller and Cables (1000SX Compatible)
2017	599	20MBYTE Drive Board (1000SX Compatible)

FOR TANDY 1000SX

2006	129	Memory Board with 256K
2027	199	Multifucntion Board with 256K + Serial + ZDISK + ZSPOOL + Clock
2020	219	Monochrome Text Upgrade (TTL monitor and cable included)

FOR TANDY 1000EX

2025	99	Memory Board with 256K
2026	129	Memory Board with 384K

FOR TANDY 3000HL

2029	149	1 Serial Port
2031	79	2nd Serial Port (Includes Clock Calendar)
2032	799	Internal Half Height 20MBYTE Hard Disk inc. Controller and Cables
2033	799	20MBYTE DRIVE BOARD
2021	249	Monochrome graphics. . . . (TTL Monitor and connecting cable included)
2022	129	Color graphics. . . . (Monitor not inc.)

FOR TANDY 1000SX and 1000EX

2028	99	1st Serial Port
2030	49	2nd Serial Port (Includes Clock Calendar)

FOR TANDY 1000, 1000SX, 1000EX, and 3000HL

2023	79	MS DOS 3.2 with GW Basic
2024	49	ZDISK + ZSPOOL Software

Listing continued

```
660 BC=BC-1:IF BC<1 THEN RETURN ELSE GET 2,I(BC):IF INSTR(Z1(1),
    LEFT$(ZF,S1))=1 THEN BF=BC:GOTO 660 ELSE RETURN                '*  6915
670 '       Insert Index Element                                   '*   157
680 FOR JL=I(0)+1 TO BC STEP -1:I(JL)=I(JL-1):NEXT:I(0)=I(0)+1:R
    ETURN                                                          '*  4143
690 '       Delete Index Element                                   '*   159
700 FOR JL=BC TO I(0):I(JL)=I(JL+1):NEXT JL:I(0)=I(0)-1:RETURN     '*  3752
710 '       Printer Subroutines                                    '*   152
720 '       Page Header                                            '*   153
730 S=S+1:LPRINT DATE$;ZW;TAB(72)"Page:"S:LPRINT TAB(XE);ZE(B)     '*  4057
740 LPRINT STRING$(79,45):LPRINT " ":R=4:RETURN                    '*  2995
750 '       Print a reference                                      '*   156
760 LPRINT USING ZU;X;                                             '*  1497
770 FOR C=1 TO Q2:IF " " <> MID$(Z1(C),1,1) THEN LPRINT TAB(10);
    Z1(C):R=R+1                                                    '*  4301
780 NEXT C:LPRINT " ":R=R+1                                        '*  1647
790 '       Test for end of page                                   '*   160
800 IF R>55 THEN LPRINT CHR$(12):GOTO 730 ELSE RETURN              '*  3316
810 '       End of Report Line                                     '*   153
820 LPRINT " "                                                     '*   791
830 LPRINT TAB(10);RECS;" Records of ";I(0);" in Reflib No. ";MI
    D$(ZCON,7,1)                                                   '*  5065
840 LPRINT CHR$(12):RETURN                                         '*  1668
850 '       Test Printer Status                                    '*   157
860 ON ERROR GOTO 880:LPRINT " "                                   '*  1973
870 ON ERROR GOTO 0:RETURN                                         '*  1737
880 GOSUB 460:PRINT" Printer NOT Ready ":GOSUB 480:RESUME 2520     '*  4281
890 '       Printing Message Display                               '*   161
900 COLOR 11:PRINT TAB(33);"* Printing *":RETURN                   '*  3239
910 '   ***  Edit References  ***                                  '*   154
920 M=1:RFLG=0:I=I(M):GOSUB 1260:GOSUB 1270:GOSUB 1330             '*  3287
930 XE=1:T$="*nNpPsSeEgGmM":GOSUB 1360:GOSUB 230                   '*  3211
940 IF B=6 THEN 2520 ELSE JE=M:ON B GOSUB 950,970,980,1040,1220:
    GOTO 930                                                       '*  4124
950 IF M=I(0) THEN RETURN ELSE M=M+1                               '*  2220
960 I=I(M):GOTO 1270                                               '*  1161
970 IF M=1 THEN RETURN ELSE M=M-1:GOTO 960                         '*  2633
980 GOSUB 460:COLOR 11:PRINT TAB(20);"[F1] to Cancel":GOSUB 500    '*  4141
990 COLOR 14:R=R(1):C=C(1):S=L(1):GOSUB 100                        '*  2533
1000 JL=22:GOSUB 490:IF B=1 OR S1=0 THEN GOSUB 1330:GOTO 1270 EL
     SE I=I(0):GOSUB 620                                           '*  4952
1010 IF BF THEN M=BF:GOSUB 1330:GOTO 960                           '*  2413
1020 LOCATE R(2),C(2):COLOR 11:PRINT "* Not Found *":GOSUB 480:M
     =JE                                                           '*  4242
1030 COLOR 14:GOSUB 1330:GOTO 960                                  '*  1979
1040 GOSUB 1290                                                    '*   849
1050 S=0:JL=23:GOSUB 470:FL=1:R=R(XE):C=C(XE)-1:GOSUB 100          '*  3460
1060 IF B=6 THEN 1210 ELSE IF B THEN 1160                          '*  2319
1070 IF XE<=Q2 THEN JL=23:GOSUB 470:PRINT Z1(XE) ELSE B=K(XE-Q2,
     0):IF B THEN GET 1,B:JL=23:GOSUB 470:PRINT ZKW                '*  6876
1080 LOCATE R(XE),C(XE):PRINT ZI;:LSET ZF=ZI:R=R(XE):C=C(XE)+1:S
     =L(XE)                                                        '*  4489
1090 S1=1:GOSUB 110:IF XE=1 THEN RFLG=1                            '*  2372
1100 IF XE<=Q2 THEN LSET Z1(XE)=ZF:GOTO 1210                       '*  2718
1110 IF S1=0 THEN K(XE-Q2,0)=0:GOTO 1210                           '*  2299
1120 LSET ZK=ZF:GOSUB 300:IF BF THEN K(XE-Q2,0)=BF:GOTO 1210       '*  3692
1130 ON B GOTO 1140,1150                                           '*  1302
1140 S=L(XE):R=R(XE):C=C(XE):GOSUB 100:GOSUB 1290:GOTO 1100        '*  3594
1150 GOSUB 260:K(XE-Q2,0)=KI(0):B=4:GOSUB 1290                     '*  2691
1160 ON B GOTO 1170,1180,1200,1210                                 '*  1790
1170 GOSUB 1330:GOTO 1270                                          '*  1453
1180 FOR X=1 TO 10:K(X,I)=K(X,0):NEXT X:PUT 2,I:MODFLG=1:GOSUB 1
     330                                                           '*  4120
1190 IF RFLG THEN GOSUB 1310:GOTO 1270 ELSE 1270                   '*  2857
1200 XE=XE-1:IF XE<1 THEN XE=Q1:GOTO 1050 ELSE 1050                '*  3070
1210 XE=XE+1:IF XE>Q1 THEN XE=1:GOTO 1050 ELSE 1050                '*  3071
1220 GOSUB 460:PRINT "Record No. > ";:S=4:R=21:C=14:GOSUB 100      '*  3873
1230 BF=VAL(ZF):IF BF=0 OR BF>I(0) THEN 960                        '*  2524
1240 M=1:WHILE BF<>I(M):M=M+1:WEND:GOSUB 1330:GOTO 960             '*  3334
1250 '       Edit Mode Subroutines                                 '*   200
1260 ZTITL="Review/Update References":GOTO 520                     '*  3665
1270 GOSUB 560:COLOR 11:LOCATE 19,8:PRINT "Reference:";I;          '*  3827
1280 PRINT TAB(39);"Listing";M;" of";I(0):COLOR 14:RETURN          '*  3806
1290 GOSUB 460:PRINT "[";CHR$(24);"] and [";CHR$(25);"] to move
     cursor",,;                                                    '*  4932
1300 PRINT "[F1] to ABORT,  [F3] to SAVE";:RETURN                  '*  3299
1310 BC=M:GOSUB 700:LSET ZF=Z1(1):S1=L(1):GOSUB 620                '*  3100
1320 GOSUB 680:I(BC)=I:M=BC:RETURN                                 '*  2150
1330 GOSUB 460:COLOR 11                                            '*  1372
1340 PRINT "[G]et   [N]ext   [P]revious   [S]earch   [E]dit   [M
     ]enu > ";                                                     '*  5455
1350 COLOR 14:RETURN                                               '*  1287
1360 LOCATE 21,62:PRINT"   ";:LOCATE 21,62:RETURN                  '*  2946
1370 '   ***  Add References  ***                                  '*   203
1380 NA=0:I=I(0):GOSUB 1590:IF I=1000 THEN 1620                    '*  2691
1390 FOR X=1 TO Q2:LSET Z1(X)=Z9:NEXT X:FOR X=1 TO 10:K(X,0)=0:N
     EXT X                                                         '*  4314
1400 GOSUB 500:GOSUB 460:COLOR 11:PRINT TAB(33);"[F1] to EXIT";:
     COLOR 14                                                      '*  4546
1410 FOR X=1 TO Q1:IF X=2 THEN GOSUB 1600                          '*  2462
1420 S=L(X):R=R(X):C=C(X):GOSUB 100:IF X=1 AND B=1 THEN X=89:GOT
     O 1520                                                        '*  4227
1430 IF B=2 AND X>1 THEN GOSUB 380:GOSUB 1590:GOSUB 1600:GOSUB 5
     70:GOTO 1420                                                  '*  4582
1440 IF B=1 THEN IF X=2 THEN X=99:GOTO 1520 ELSE GOSUB 1630:GOTO
      1420                                                         '*  4139
1450 IF X<2 AND S1=0 THEN 1420                                     '*  1689
1460 IF X=1 THEN GOSUB 1640:IF X=99 THEN GOTO 1520                 '*  3002
1470 IF X<=Q2 THEN LSET Z1(X)=ZF:GOTO 1520                         '*  2594
1480 IF S1 THEN LSET ZK=ZF:S1=20:GOSUB 300:ELSE LSET ZK="":BF=0:
     X=Q1:GOTO 1520                                                '*  4879
1490 GOSUB 1600:IF BF=0 THEN ON B GOTO 1420,1500 ELSE 1510         '*  3331
1500 GOSUB 260:BF=KI(0)                                            '*  1330
```

Listing continued

sends the data to your printer. (Reference Library does not print the actual reference data on screen with the extraction option.)

Explore Your Options

The main menu includes several other options to help you organize and make use of your reference library. The L (list) option prints out all of the articles contained in the data base (references are sorted alphabetically by source). The K (keyword list/summary) option prints a list of all keywords in the data base, along with the number of references associated with them.

You can edit references and change keywords by selecting the R (review/update reference) option. This option is also useful for viewing reference data on screen. You can scroll through the references sequentially or specify one that you want to examine by typing its source description or reference number. Entering a partial source yields the first matching reference.

A useful feature of Reference Library is the C (create bibliography) option. It allows students and professional writers to create bibliographies for inclusion in a term paper or technical article. To use it, you must keep a record of the reference numbers assigned to articles in the data base. These numbers should then be used to identify bibliographic sources in the body of your paper or article. When you finish writing the paper, you can print out a list of the references using the C option in Reference Library.

The program will not delete references. Since the file record number is also the reference number, you could not delete a reference and recover disk space without a high probability of corrupting the data base. Fortunately, the only time you should want to delete a reference is when a typing error produces a duplicate entry. In this case, you can eliminate the duplicate entry by inserting new reference data with the review/update option.

Behind the Stacks

Reference Library maintains two data bases: one for keywords and one for the references. Keywords are matched with the source descriptions through cross-indexing. As you add references to the data base, the program adds new keywords to the keyword list and stores the index with the reference description. Rather than using separate sort routines to maintain the indexes, the program uses binary sort routines to update them. (For a discussion of binary sorts, see The Art of Programming, October 1986, p. 140.) Keywords are indexed in array K(10,1000). Only the keyword number is stored with the reference. The program performs extractions by creating a mask of keyword numbers and then scanning each record. Matches are marked in record element zero, enabling

the program to identify matches during later extractions. The extraction step is performed in machine language, and thus executes very quickly.

The program uses several special subroutines to control operation and minimize the chances of a program crash. The keyboard-input routine displays a line of periods, which indicates the number of characters you may enter. You cannot exceed the allowed length. If you try, the program will let you type on indefinitely, but it recognizes only the backspace and enter keys. This routine uses LSET and MID$ functions to minimize garbage collection.

The menu-selection routine accepts either upper- or lowercase input and sets variable B to the number of the menu selection. This allows word-based instead of number-based menus. Illegal keystrokes produce a beep to tell you that the input is invalid. You do not have to press the enter key to execute a selection.

Since only the indexes are memory-resident during program operation, they are most susceptible to loss as a result of a power failure or some other catastrophe. To minimize such losses, the program sets a flag (MODFLG) whenever you add or edit references. When you change a reference, it is automatically written to disk. If MODFLG is set, the index files are saved to disk and the direct-access files containing reference data are closed and reopened whenever you return to the main menu. This ensures that the end-of-file markers are always up to date. In the event of a power or computer failure, you'll lose only the changes made since the last branch from the main menu.■

You can write to Larry E. Fosdick at 552 Huntington Road, Athens, GA 30606.

Attention Model 4 Users

Reference Library is also available in a Model 4 version, which we were unable to include with the 1000 listing because of space limitations. The Model 4 version lets you reference up to 500 articles and store up to 1,500 keywords. According to author Larry Fosdick, the TRSDOS version runs faster than the MS-DOS version, owing to its greater use of machine-language subroutines and the Model 4's faster display characteristics.

To obtain a printout of the Model 4 program, send a self-addressed, stamped envelope to Reference Library, *80 Micro*, 80 Pine St., Peterborough, NH 03458. The Model 4 version is also included in this month's Load 80 package. Turn to p. 6 for order information.■

Listing continued

```
1510 K(X-Q2,0)=BF                                                    '*  940
1520 NEXT X:IF X=90 THEN 1570 ELSE IF X=100 THEN 1390 ELSE NA=NA
     +1:I=I(0)+1                                                     '* 4418
1530 FOR X=1 TO 10:K(X,I)=K(X,0):NEXT X:PUT 2,I:MODFLG=1             '* 3446
1540 JL=19:GOSUB 470:COLOR 11:PRINT"Added:";NA;TAB(50);"Total:";
     I                                                               '* 4289
1550 COLOR 14:S1=L(1):LSET ZF=Z1(1):GOSUB 620                        '* 2726
1560 GOSUB 680:I(BC)=I:IF I=RMAX THEN 1620 ELSE 1390                 '* 3102
1570 GOTO 2520                                                       '*  783
1580 '       Add Mode Subroutines                                    '*  206
1590 ZTITL ="Add References":GOTO 520                                '* 2684
1600 GOSUB 460:COLOR 11:PRINT "[F1] to REDO Last Line"; TAB(55);
     "[F3] for Keyword List";:COLOR 14:RETURN                        '* 7351
1610 IF X<=Q2 THEN LSET Z1(X)="":RETURN ELSE K(X-Q2,0)=0:RETURN      '* 3953
1620 GOSUB 460:PRINT"Sorry, Reference File is Full":GOSUB 480:I(
     0)=I:GOTO 2520                                                  '* 5587
1630 LOCATE R,C:PRINT SPC(L(X));:X=X-1:GOSUB 1610:RETURN             '* 3602
1640 S1=L(1):GOSUB 620                                               '* 1260
1650 IF BF THEN LOCATE R(2),C(2):PRINT " Already Exists ":X=99:G
     OSUB 480                                                        '* 4789
1660 RETURN                                                          '*  717
1670 '       Extract References                                      '*  206
1680 CLS:K(5,0)=0:COLOR 11:PRINT TAB(31);"Extract References":CO
     LOR 14:PRINT                                                    '* 5332
1690 FOR X=0 TO NE:IF ZE(X)<>"" THEN PRINT X;USING ZU;E(X);:PRIN
     T" "ZE(X)                                                       '* 4604
1700 NEXT:GOSUB 460:COLOR 11                                         '* 1750
1710 PRINT TAB(15)"[1] Keyword   [2] Keywords   [L]ist   [M]enu
     ";:COLOR 14                                                     '* 5394
1720 T$="*11221LmM":GOSUB 230:ON B GOTO 1740,1780,1920,2520          '* 3355
1730 '       1 Keyword extraction                                    '*  203
1740 GOSUB 2000:R=20:GOSUB 2030:IF B=1 OR S1=0 THEN 1680             '* 3265
1750 LSET ZK=ZF:GOSUB 330:IF BF=0 THEN GOSUB 2040:GOTO 1740          '* 3657
1760 ZE(I)=LEFT$(ZK,S1):K(3,0)=BF:K(1,0)=0:GOTO 1890                 '* 3000
1770 '       2 Keyword extraction                                    '*  207
1780 GOSUB 2000:R=20:GOSUB 2030:IF B=1 OR S1=0 THEN 1680 ELSE BF
     =VAL(ZF)                                                        '* 4295
1790 IF BF>0 AND ZE(BF)<>"" THEN J=4:Z0="("+ZE(BF)+")":BF=2^(BF-
     1):GOTO 1810                                                    '* 4308
1800 J=0:LSET ZK=ZF:Z0=LEFT$(ZK,S1):GOSUB 330:IF BF=0 THEN GOSUB
      2040:GOTO 1780                                                 '* 4912
1810 K(3,0)=BF:LOCATE 21,1:PRINT"[A]nd  or  [O]r > ";:T$="*oOaA"
     :GOSUB 230                                                      '* 4673
1820 IF B=1 THEN T$="OR" ELSE T$="AND"                               '* 2184
1830 K(1,0)=B:JL=21:GOSUB 490:PRINT TAB(10);T$                       '* 2718
1840 R=22:GOSUB 2030:IF B=1 THEN 1680 ELSE IF S1=0 THEN 1840 ELS
     E BF=VAL(ZF)                                                    '* 4509
1850 IF J=4 AND BF>0 AND ZE(BF)<>"" THEN Z1="("+ZE(BF)+")":BF=2^
     (VAL(ZF)-1):GOTO 1880                                           '* 4862
1860 IF J=4 THEN GOSUB 2040:GOTO 1780                                '* 2193
1870 Z1=LEFT$(ZF,S1):LSET ZK=Z1:GOSUB 330:IF BF=0 THEN GOSUB 204
     0:GOTO 1840                                                     '* 4650
1880 K(4,0)=BF:ZE(I)=Z0+" "+T$+" "+Z1:K(1,0)=K(1,0)+J                '* 2769
1890 K(2,0)=2^(I-1):K(0,0)=I(0):CALL EXTRACT (K(0,0))                '* 2932
1900 E(I)=K(5,0):GOTO 1680                                           '* 1429
1910 '       List extraction                                         '*  203
1920 GOSUB 460:COLOR 11:PRINT "Extract to List? ";:T$="*11223344
     55667788"                                                       '* 4709
1930 COLOR 14:GOSUB 230:IF B>NE THEN 1920                            '* 2455
1940 GOSUB 460:GOSUB 900                                             '* 1435
1950 IF B=8 THEN I=-2^15 ELSE I=2^(B+7)                              '* 2273
1960 S=0:GOSUB 860:XE=INT((80-LEN(ZE(B)))/2)                         '* 2593
1970 GOSUB 730:FOR X=1 TO I(0):IF I AND K(0,X) THEN GET 2,X:GOSU
     B 760                                                           '* 4112
1980 NEXT X:RECS=E(B):GOSUB 820:GOTO 1680                            '* 2555
1990 '       Extract Mode Subroutines                                '*  211
2000 IF ZE(NE)="" AND NE>0 THEN RETURN ELSE IF NE<8 THEN NE=NE+1
     :I=NE:RETURN                                                    '* 4786
2010 GOSUB 460:PRINT"8 Extracts. Replace which? ";                   '* 3749
2020 T$="*1122334455667788":GOSUB 230:I=B:RETURN                     '* 2778
2030 JL=R:GOSUB 470:COLOR 11:PRINT"Keyword >";:COLOR 14:C=12:S=2
     0:GOTO 100                                                      '* 4846
2040 LOCATE JL,50:COLOR 11:PRINT" Does Not Exist ":GOSUB 480:COL
     OR 14:RETURN                                                    '* 5186
2050 '   ***  Summarize Keywords  ***                                '*  199
2060 CLS:IF KI(0)=0 THEN 2520 ELSE COLOR 11:PRINT TAB(30)"Summar
     ize Keywords"                                                   '* 5314
2070 S=0:T=0:LOCATE 10,10:PRINT"Processing Keyword:":COLOR 14        '* 4425
2080 GOSUB 860                                                       '*  808
2090 GOSUB 2100:FOR J=1 TO KI(0):GET 1,KI(J):LOCATE 10,30:PRINT
     ZKW                                                             '* 4082
2100 K(5,0)=0:K(0,0)=I(0):K(2,0)=1:K(3,0)=KI(J):K(1,0)=0             '* 2905
2110 CALL EXTRACT (K(0,0))                                           '* 1492
2120 LPRINT USING "####";K(5,0);:LPRINT " ";ZKW;:T=T+27              '* 3251
2130 IF T>55 THEN LPRINT " ":T=0:XE=XE+1                             '* 2405
2140 IF XE=>55 THEN LPRINT CHR$(12):GOSUB 2100                       '* 2778
2150 NEXT J:LPRINT " ":LPRINT" Total Keywords:";KI(0)                '* 3749
2160 LPRINT CHR$(12):GOTO 2520                                       '* 1779
2170 '       Header for Keyword Summary                              '*  202
2180 S=S+1:LPRINT DATE$;TAB(32);"Keyword Summary";TAB(72);"Page:
     ";S                                                             '* 4713
2190 LPRINT STRING$(79,45):LPRINT " ":XE=3:RETURN                    '* 3118
2200 '  ***  Complete Reference List  ***                            '*  196
2210 S=0:B=0:ZE(B)="Complete Reference List":XE=28                   '* 3741
2220 GOSUB 460:GOSUB 900:GOSUB 860:GOSUB 730                         '* 2687
2230 FOR J=1 TO I(0):X=I(J):GET 2,X:GOSUB 760:NEXT J                 '* 3152
2240 RECS = I(0):GOSUB 820:GOTO 2520                                 '* 2092
2250 '  ***  Create Bibliography List  ***                           '*  201
2260 GOSUB 460:JR=0:JK=0:S=0:B=0                                     '* 1926
2270 PRINT "Output to [D]isk or [P]rinter? ";:T$="*pPdD":GOSUB 2
     30                                                              '* 4958
2280 ON B GOTO 2300,2350                                             '* 1311
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2290 '       Bibliography on Printer                                '*  205
2300 CLS:JR=0:JK=0:S=0:B=0:ZE(B)="Bibliography List":XE=32:GOSUB
      860                                                           '*  4767
2310 GOSUB 2450:IF JR=0 THEN 2520:' No references entered           '*  1973
2320 GOSUB 730:FOR J=1 TO JR:X=KL(J):GET 2,X:GOSUB 760              '*  3329
2330 NEXT J:RECS = JR:GOSUB 820:GOTO 2520                           '*  2529
2340 '       Bibliography on Disk                                   '*  201
2350 CLS:JR=0:JK=0:S=0:B=0:ZE(B)="Bibliography List":XE=32           '*  4140
2360 GOSUB 460:PRINT"Output File Name > ";                          '*  3003
2370 R=20:S=12:C=20:GOSUB 100:IF S1=0 THEN 2520 ELSE ZBIB=LEFT$(
     ZF,S1)                                                         '*  4192
2380 GOSUB 2450:IF JR=0 THEN 2520 ' No references entered           '*  1922
2390 OPEN"O",3,ZBIB                                                 '*  1125
2400 FOR J=1 TO JR:X=KL(J):GET 2,X:PRINT #3,X;". "                  '*  2979
2410 FOR JJ=1 TO Q2:IF ASC(Z1(JJ))<>32 THEN PRINT #3,Z1(JJ)         '*  3524
2420 NEXT JJ:PRINT #3," "                                           '*  1448
2430 NEXT J:CLOSE 3:GOTO 2520                                       '*  1777
2440 '       Bibliography List Input                                '*  202
2450 GOSUB 460:PRINT "Enter Reference Numbers in Sequence (null
     to end)"                                                       '*  5839
2460 JL=22:GOSUB 470:PRINT"Reference No. >";:R=22:C=17:S=4:GOSUB
      100                                                           '*  4494
2470 B=VAL(ZF):IF B=0 THEN RETURN                                   '*  2087
2480 IF B>I(0) THEN LOCATE 22,1:PRINT"Bad Reference No.":GOSUB 4
     80:GOTO 2460                                                   '*  5008
2490 IF JR=200 THEN PRINT "Bibliography Full":RETURN ELSE JR=JR+
     1:KL(JR)=B                                                     '*  5257
2500 LOCATE 1+(5*JR)/80,1+(5*JR) MOD 80:PRINT USING ZU;B;:GOTO 2
     460                                                            '*  4013
2510 '   ***  Menu  ***                                             '*  200
2520 CLS:PRINT DATE$;TAB(30);"Reference Library ";MID$(ZCON,7,1)
     :PRINT:PRINT                                                   '*  5359
2530 PRINT TAB(23);"References on File.....";USING ZU;I(0)          '*  4259
2540 PRINT TAB(23);"Keywords   on File.....";USING ZU;KI(0)         '*  4229
2550 ON ERROR GOTO 0                                                '*  1244
2560 IF MODFLG=0 THEN 2660:' Skip saving index files if no changes  '*  1593
2570 OPEN "R",3,ZFILE(2),2:FIELD 3,2 AS ZINDX:LSET ZINDX=MKI$(I(
     0)):PUT 3,1                                                    '*  4555
2580 FOR J=1 TO I(0):LSET ZINDX=MKI$(I(J)):PUT 3,J+1:NEXT J:CLOS
     E 3                                                            '*  4143
2590 OPEN "R",3,ZFILE(3),20:T=0                                     '*  1770
2600 FOR J=1 TO 10:FIELD 3, (T) AS ZINDX,2 AS ZDEX(J):T=T+2:NEXT
      J                                                             '*  3989
2610 FOR J=1 TO I(0):FOR JJ=1 TO 10:LSET ZDEX(JJ)=MKI$(K(JJ,J)):
     NEXT JJ                                                        '*  4340
2620 PUT 3,J:NEXT J:CLOSE 3                                         '*  1682
2630 OPEN "R",3,ZFILE(5),2:FIELD 3,2 AS ZINDX                       '*  2668
2640 FOR J=0 TO KI(0):LSET ZINDX=MKI$(KI(J)):PUT 3,J+1:NEXT J:CL
     OSE 3                                                          '*  4289
2650 GOSUB 3070:MODFLG=0                                            '*  1463
2660 PRINT:PRINT STRING$(79,45):PRINT                               '*  2426
2670 I=28:PRINT TAB(I);"[E]xtract References"                       '*  3435
2680 PRINT TAB(I);"[L]ist References"                               '*  2819
2690 PRINT TAB(I);"[C]reate Bibliography"                           '*  3222
2700 PRINT TAB(I);"[R]eview/Update References"                      '*  3684
2710 PRINT TAB(I);"[A]dd References"                                '*  2666
2720 PRINT TAB(I);"[K]eyword List/Summary"                          '*  3326
2730 PRINT TAB(I);"[T]erminate Program"                             '*  3042
2740 PRINT:PRINT TAB(I-17);"Enter Selection > ";                    '*  3427
2750 T$="*EeLlCcRrAaKkTt":GOSUB 230:LOCATE 8+B,25:PRINT">>";        '*  3960
2760 IF I(0)<>0 OR (B=5 OR B=7) THEN ON B GOTO 1680,2210,2260,92
     0,1380,2060,2790                                               '*  4317
2770 LOCATE 22,20:PRINT "Sorry, No References on File":GOSUB 480
     :GOTO 2520                                                     '*  5278
2780 '  ***  Terminate Program  ***                                 '*  209
2790 GOSUB 460:PRINT TAB(27);"* Program Terminated *"               '*  3772
2800 CLOSE:END                                                      '*  881
2810 '  ***  Initialize Program  ***                                '*  203
2820 ZT=CHR$(1)+CHR$(2)+CHR$(4)+CHR$(5)+CHR$(8)+CHR$(13):ZNUL=CH
     R$(0):TIMER ON                                                 '*  4540
2830 LOCATE 10,1:PRINT"Enter Reference Set Number (1 - 9) ";        '*  4275
2840 T$="*1122334455667788 99":GOSUB 230:ZCON="config"+ZI+".ref"    '*  3917
2850 ZU=STRING$(4,35):ZF=STRING$(70,32):ZK=STRING$(20,32):Z9=ZF     '*  3919
2860 RESTORE:READ Q1,Q2:FOR I=1 TO Q1:READ R(I),C(I),L(I):NEXT I    '*  3959
2870 FOR I=1 TO Q2+1:READ ZD(I):NEXT I:JL=10:GOSUB 470              '*  3300
2880 ON ERROR GOTO 3120 'If no config file present                  '*  1400
2890 OPEN"I",1,ZCON:FOR J=1 TO 2:INPUT #1,ZPATH(J):NEXT J:CLOSE
     1                                                              '*  4083
2900 FOR J=1 TO 3:READ T$:ZFILE(J)=ZPATH(1)+T$+MID$(ZCON,7,1):NE
     XT J                                                           '*  4157
2910 READ T$:ZFILE(4)=ZPATH(2)+T$:READ T$:ZFILE(5)=ZPATH(2)+T$      '*  3797
2920 '       Read Index Files                                       '*  205
2930 ON ERROR GOTO 3050:CLOSE                                       '*  1830
2940 OPEN "R",3,ZFILE(2),2:FIELD 3,2 AS ZINDX:GET 3,1:I(0)=CVI(Z
     INDX)                                                          '*  4152
2950 FOR J=1 TO I(0):GET 3,J+1:I(J)=CVI(ZINDX):NEXT J:CLOSE 3       '*  3740
2960 OPEN "R",3,ZFILE(3),20:FIELD 3,20 AS ZINDX                     '*  2768
2970 FOR J=1 TO I(0):GET 3,J:FOR JJ=1 TO 10:K(JJ,J)=CVI(MID$(ZIN
     DX,2*JJ-1,2))                                                  '*  4556
2980 NEXT JJ:NEXT J:CLOSE 3                                         '*  1740
2990 OPEN "R",3,ZFILE(5),2:FIELD 3,2 AS ZINDX:GET 3,1:KI(0)=CVI(
     ZINDX)                                                         '*  4235
3000 FOR J=1 TO KI(0):GET 3,J+1:KI(J)=CVI(ZINDX):NEXT J:CLOSE 3     '*  3877
3010 ON ERROR GOTO 0                                                '*  1236
3020 KEY 1,CHR$(1):KEY 3,CHR$(2)                                    '*  1780
3030 GOSUB 3300                                                     '*  902
3040 GOSUB 3070:GOTO 2520                                           '*  1453
3050 RESUME NEXT                                                    '*  1048
3060 '       Open Keyword and Reference Files                       '*  201
3070 CLOSE 1,2:OPEN "R",1,ZFILE(4),22:FIELD 1,20 AS ZKW,2 AS ZDW    '*  3773
3080 RLEN = 0:FOR J=1 TO Q2:RLEN=RLEN+L(J):NEXT J:OPEN"R",2,ZFIL
     E(1),RLEN                                                      '*  4571
3090 T=0:FOR J=1 TO Q2:FIELD 2, (T) AS T$, L(J) AS Z1(J):T=T+L(J
```

Listing continued

Listing continued

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    '):NEXT J                                                    '*  4218
3100 RETURN                                                      '*   708
3110 '       Request data file paths from user                   '*   197
3120 CLS:PRINT TAB(20);"Reference Library Configuration"         '*  4532
3130 LOCATE 10,1:PRINT"Enter path for Reference storage (355 Kby
     tes required)"                                              '*  6303
3140 R=11:C=1:S=63:GOSUB 100:ZPATH(1)=LEFT$(ZF,S1)               '*  3026
3150 IF LEN(ZPATH(1))>0 AND RIGHT$(ZPATH(1),1)<>"\" THEN ZPATH(1
     )=ZPATH(1)+"\"                                              '*  4686
3160 LOCATE 13,1:PRINT"Enter path for keyword storage (50 Kbytes
      required)"                                                 '*  6115
3170 R=14:C=1:S=63:GOSUB 100:ZPATH(2)=LEFT$(ZF,S1)               '*  3033
3180 IF LEN(ZPATH(2))>0 AND RIGHT$(ZPATH(2),1)<>"\" THEN ZPATH(2
     )=ZPATH(2)+"\"                                              '*  4693
3190 OPEN"O",1,ZCON:PRINT #1,ZPATH(1):PRINT #1,ZPATH(2):CLOSE 1  '*  3927
3200 RESUME 2890                                                 '*   937
3210 ' Data statements defining field lengths, labels, and files '*   198
3220 DATA 14,4                                                   '*   742
3230 DATA 3,10,46,5,10,70,8,10,70,9,10,70                        '*  2050
3240 DATA 12,13,20,13,13,20,14,13,20,15,13,20,16,13,20           '*  2658
3250 DATA 12,40,20,13,40,20,14,40,20,15,40,20,16,40,20           '*  2659
3260 DATA "Source","Author","Title","","Keywords"                '*  3687
3270 DATA "record.rf","recindx.rf","refkey.rf"                   '*  3662
3280 DATA "keyword.ref","keyindx.ref"                            '*  2994
3290 '       Poke EXTRACT code into memory                       '*   206
3300 EXTRACT = &HFE00                                            '*  1239
3310 FOR JB=0 TO &HEB:READ BYTE                                  '*  1897
3320 POKE EXTRACT+JB,BYTE                                        '*  1641
3330 NEXT JB                                                     '*   724
3340 RETURN                                                      '*   714
3350 '      Data statements containing extract machine code      '*   203
3360 DATA 85,139,236,139,118,6,139,222,139,12,138,68,2,168,4,117 '*  3239
3370 DATA 101,186,22,0,3,218,50,192,136,7,138,68,4,246,208,34    '*  3067
3380 DATA 71,1,136,71,1,139,84,6,232,141,0,138,7,168,128,116     '*  3017
3390 DATA 13,36,127,12,2,136,7,138,100,2,10,228,116,48,138,100   '*  3095
3400 DATA 2,10,228,116,44,139,84,8,232,109,0,138,39,138,196,36   '*  3123
3410 DATA 127,136,7,246,196,128,116,8,12,4,136,7,60,6,116,14     '*  3017
3420 DATA 138,68,2,60,2,116,10,138,39,128,252,0,116,3,232,106    '*  3043
3430 DATA 0,73,227,62,235,155,36,3,116,56,136,68,2,138,68,6      '*  2979
3440 DATA 2,68,8,136,68,3,186,22,0,3,218,138,68,4,246,208        '*  2881
3450 DATA 34,71,1,136,71,1,138,68,3,34,71,1,116,15,58,68         '*  2819
3460 DATA 3,116,7,138,68,2,60,2,116,3,232,40,0,73,227,2          '*  2750
3470 DATA 235,212,139,229,93,202,2,0,81,83,185,10,0,67,67,139    '*  3073
3480 DATA 194,59,7,224,248,116,3,235,9,144,91,138,7,12,128,136   '*  3138
3490 DATA 7,83,91,89,195,138,7,12,1,136,7,138,100,4,2,103        '*  2873
3500 DATA 1,136,103,1,139,68,10,64,137,68,10,195                 '*  2421
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End

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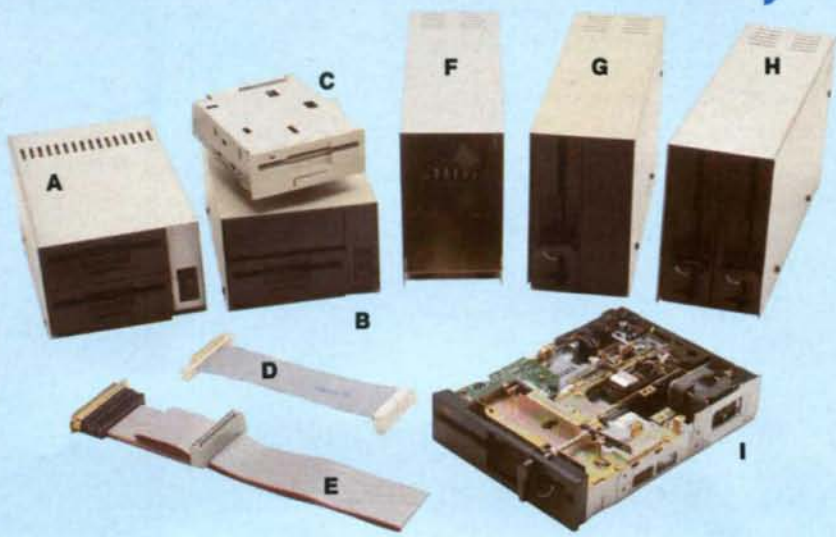

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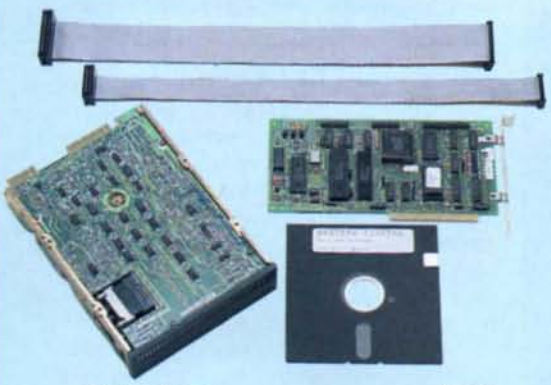

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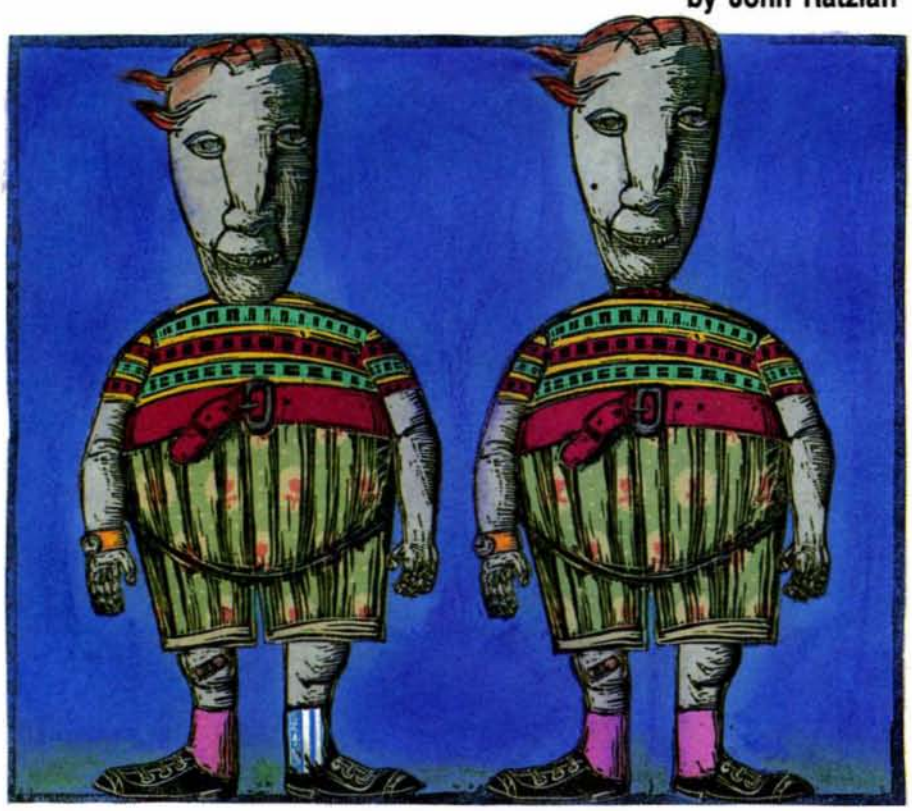
Imperfect Matches

by John Ratzlaff



Let the computer find the differences between two similar files via a byte-by-byte comparison.

All programmers occasionally need help determining which version of a program file is the latest. Though you can make byte-by-byte comparisons of memory blocks in Basic, the process might take hours. I've written a utility for the Model 4 that does the job in seconds.

Compare is an assembly-language utility running under TRSDOS 6.x or Dosplus 4. It checks the lengths of files to determine if they are the same; if they are not, the program announces that and quits. If the lengths are equal, the program compares the files byte by byte and displays the differences on screen. If no differences exist, Compare ends with the message "Files are identical."

Quick Comparisons

Type the code in the Program Listing into your editor/assembler and assemble it to disk as Compare/CMD. To call the utility, type:

```
COMPARE file1 file2
```

where the parameters are the names of the two files you want to compare.

Compare checks the ending sector numbers and end-of-file (EOF) bytes of both files. If the files are the same length, the program compares them byte for byte to find discrepancies. When it encounters a discrepancy, the program prints the record number (or sector number) of the discrepancy, the byte number, the byte at that position in the first file (along with its ASCII representation), and the corresponding byte in the second file (with its ASCII representation). (See the Photo.) All numbers are in hexadecimal; the utility replaces unprintable characters with a period.

A sample line of output might be:

```
Record 0003 Byte 4D --- 41 A - 61 a
```

This shows that byte number 4D hex in sector 3 is an uppercase "A" in the first file and a lowercase "a" in the second file.

If the files contain many differing bytes, Compare scrolls them on screen. To pause, press the spacebar. Press any key to resume. Pressing the break key at any time terminates the program and returns you to DOS.

Open and Shut Case

Program operation is relatively straightforward. The utility uses the @FSPEC SVC (supervisor call) to move the file names into their device-control blocks (DCBs). Any error returned by @FSPEC is interpreted as an improper file name. The program then opens the files and compares the EOF sector and byte numbers (as found in the open files' DCBs). If the numbers match, the program enters the main loop, which uses the @GET SVC to retrieve and compare the next byte from each file. If the bytes are not the same, the program calls the NOTSAM subroutine and displays the appropriate information.

Compare does not calculate the number of bytes and read each one individually; rather, it reads until the @GET SVC returns with an error. If it encounters a "Past EOF" error, the program knows it has reached the end of both files. As long as the files are the same length, the "Past EOF" error will occur on the first file; no check need be made for that error after a

LOAD 80

System Requirements

Model 4
64K RAM
Assembly language
Editor/assembler

Illustration by Frances Jetter

```
File Compare Utility  by John Ratzlaff

Record 0001  Byte 4F  ---  50 P  -  4C L
Record 0001  Byte 50  ---  52 R  -  49 I
Record 0001  Byte 51  ---  4F O  -  53 S
Record 0001  Byte 52  ---  47 G  -  54 T
Record 0001  Byte 53  ---  52 R  -  49 I
Record 0001  Byte 54  ---  41 A  -  4E N
Record 0001  Byte 55  ---  4D M  -  47 G
Record 0002  Byte B7  ---  4B K  -  4E N
Record 0002  Byte DD  ---  4B K  -  4E N
Record 0002  Byte E8  ---  2A *  -  23 #
Record 0003  Byte 01  ---  2A *  -  23 #
Record 0003  Byte 1A  ---  2A *  -  23 #
Record 0004  Byte 4E  ---  30 0  -  32 2
Record 0004  Byte 4F  ---  30 0  -  35 5
Record 0004  Byte 8A  ---  36 6  -  38 8
Record 0004  Byte 8B  ---  34 4  -  30 0
Record 0005  Byte D1  ---  36 6  -  37 7
Record 0005  Byte D2  ---  30 0  -  35 5

TRSDOS Ready
```

Photo. Comparison of differing bytes in two files of equal length.

byte is read from the second file.

When the utility reaches the end of the files, it closes them and checks the flag location to see if it is still zero. If it is, the program displays the "Files are identical" message. If a difference is found between the files, Compare changes the flag byte to 1. If an error occurs (other than "Past EOF"), the routine closes both files and uses the @ERROR SVC to display the error and return to DOS.■

You can write to John Ratzlaff at 75 Academy Drive, Candler, NC 28715. Enclose a self-addressed, stamped envelope for a reply. You can also contact him on CompuServe (73125,746).

Program Listing. Compare.

```
00100 ;COMPARE  by John Ratzlaff  6-18-86
00110 ;File Compare Utility for Model 4 under TRSDOS 6.x and DOSPLUS IV
00120 ;
00130 ;to use, type COMPARE file1 file2
00140 ;(files must be the same length to be compared)
00150 ;
00160 SVC     MACRO   #NUM
00170         LD      A,#NUM
00180         RST     28H
00190         ENDM
00200 ;
00210 @FSPEC  EQU     4EH
00220 @DSPLY  EQU     0AH
00230 @KBD    EQU     8
00240 @KEY    EQU     1
00250 @GET    EQU     3
00260 @OPEN   EQU     3BH
00270 @CLOSE  EQU     3CH
00280 @HEX8   EQU     62H
00290 @HEX16  EQU     63H
00300 @ERROR  EQU     1AH
00310 @EXIT   EQU     16H
00320 PEOF    EQU     1CH
00330 ;
00340         ORG     3000H
00350 START   PUSH    HL              ;save fspec ptr
00360         LD      HL,MSG1         ;intro msg
00370         SVC     @DSPLY
00380         POP     HL
00390         LD      DE,FCB1
00400         SVC     @FSPEC          ;get filespec1
00410         JR      Z,SKIP1
00420 IFERR   LD      HL,MSG2         ;'Improper filespec'
00430         SVC     @DSPLY
00440         SVC     @EXIT
00450 SKIP1   LD      DE,FCB2
00460         SVC     @FSPEC          ;get filespec2
00470         JR      NZ,IFERR
00480         LD      DE,FCB1
00490         LD      HL,BUFF1
00500         LD      B,0             ;LRL=256
00510         SVC     @OPEN           ;open file1
00520         JR      NZ,ERROR
00530         LD      DE,FCB2
00540         LD      HL,BUFF2
00550         SVC     @OPEN           ;open file2
00560         JR      Z,CKLEN
00570         PUSH    AF              ;save error #
00580         LD      DE,FCB1
00590         SVC     @CLOSE          ;close file1
00600         POP     AF
00610         JR      ERROR           ;display error msg
00620 CKLEN   LD      IX,FCB1
00630         LD      IY,FCB2
00640         LD      A,(IX+0CH)      ;get lo byte of file1 length
00650         CP      (IY+0CH)        ;compare w/ lo byte of file2 length
00660         JR      NZ,LNERR        ;not same--error
00670         LD      A,(IX+0DH)      ;repeat for hi byte
00680         CP      (IY+0DH)
00690         JR      NZ,LNERR
00700         LD      A,(IX+8)        ;repeat for EOF byte
00710         CP      (IY+8)
00720         JR      Z,MLOOP
00730 LNERR   LD      A,1
00740         LD      (FLAG),A        ;flag difference
00750         LD      HL,MSG3         ;'files not same length!'
00760         JR      DONE            ;end
00770 MLOOP   LD      DE,FCB1
00780         SVC     @GET            ;get char from file1
00790         JR      NZ,ERROR1
00800         LD      C,A             ;transfer char to C
00810         LD      DE,FCB2
```

Listing continued

Circle 357 on Reader Service card.

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Listing continued

```
00820           SVC     @GET            ;get char from file2
00830           JR      NZ,C2ERR
00840           CP      C               ;compare with char from file1
00850           CALL    NZ,NOTSAM       ;not same--display each
00860           LD      HL,BYTE
00870           INC     (HL)            ;increment byte counter
00880           SVC     @KBD            ;check keyboard
00890           JR      NZ,MLOOP        ;no key--get next byte
00900           CP      80H             ;<break>?
00910           JR      Z,ABORT
00920           CP      ' '             ;<space>?
00930           JR      NZ,MLOOP        ;ignore anything else
00940 PAUSE     SVC     @KEY            ;wait for key
00950           CP      80H             ;<break>?
00960           JR      NZ,MLOOP        ;if not, continue compare
00970 ABORT     LD      HL,MSG4         ;'aborted'
00980           JR      DONE
00990 ERROR     SET     6,A             ;normal error msg
01000           LD      C,A             ;err # in C
01010           SVC     @ERROR          ;return to DOS after error display
01020 ERROR1    CP      PEOF            ;attempted to read past EOF?
01030           JR      NZ,C2ERR        ;no--close them both, display error
01040           LD      A,0
01050 FLAG      EQU     $-1
01060           OR      A
01070           JR      NZ,SKIP2
01080           LD      HL,MSG5         ;'Files are identical'
01090 DONE      SVC     @DSPLY
01100 SKIP2     CALL    CLOSE           ;close both files
01110           SVC     @EXIT           ;end
01120 C2ERR     PUSH    AF              ;save error #
01130           CALL    CLOSE           ;close both files
01140           POP     AF
01150           JR      ERROR
01160 CLOSE     LD      DE,FCB1
01170           SVC     @CLOSE          ;close file1
01180           LD      DE,FCB2
01190           SVC     @CLOSE          ;close file2
01200           RET
01210 NOTSAM    PUSH    BC              ;save char from file1
01220           LD      C,A             ;char from file2 now in C
01230           LD      HL,HEX4         ;point to buffer for char2
01240           SVC     @HEX8           ;convert to ASCII
01250           CALL    CHECK           ;make sure it is displayable
01260           LD      (CHR2),A
01270           POP     BC              ;retrieve char1
01280           LD      HL,HEX3         ;point to buffer for char1
01290           SVC     @HEX8           ;convert to ASCII
01300           CALL    CHECK
01310           LD      (CHR1),A
01320           LD      IY,FCB1
01330           LD      E,(IY+0AH)      ;get next
01340           LD      D,(IY+0BH)      ; record number
01350           LD      HL,HEX1
01360           SVC     @HEX16          ;convert record # to ASCII
01370           LD      A,(BYTE)        ;get byte counter
01380           LD      C,A
01390           LD      HL,HEX2
01400           SVC     @HEX8           ;convert to ASCII
01410           LD      HL,MSG6
01420           SVC     @DSPLY          ;display difference
01430           LD      A,1
01440           LD      (FLAG),A        ;flag difference
01450           RET
01460 CHECK     LD      A,C
01470           CP      ' '             ;control code?
01480           JR      C,REPL          ;if so, replace with '.'
01490           CP      80H             ;above ASCII?
01500           RET     C               ;no--leave it
01510 REPL      LD      A,'.'           ;replace it
01520           RET
01530 BYTE      DEFB    0
01540 MSG1      DEFB    0AH
01550           DEFM    'File Compare Utility  by John Ratzlaff'
01560           DEFB    0AH
01570           DEFB    0DH
01580 MSG2      DEFM    'Improper filespec'
01590           DEFB    0DH
01600 MSG3      DEFM    '*** Files are not same length! ***'
01610           DEFB    0DH
01620 MSG4      DEFM    '(aborted)'
01630           DEFB    0DH
01640 MSG5      DEFM    '** Files are identical **'
01650           DEFB    0DH
01660 MSG6      DEFM    'Record '
01670 HEX1      DEFM    'XXXX  Byte '
01680 HEX2      DEFM    'XX  ---  '
01690 HEX3      DEFM    'XX '
01700 CHR1      DEFM    'C  -  '
01710 HEX4      DEFM    'XX '
01720 CHR2      DEFM    'C'
01730           DEFB    0DH
01740 FCB1      DEFS    32
01750 FCB2      DEFS    32
01760 BUFF1     DEFS    256
01770 BUFF2     DEFS    256
01780 ;
01790           END     START
01800           DEFM    '** File
```

End

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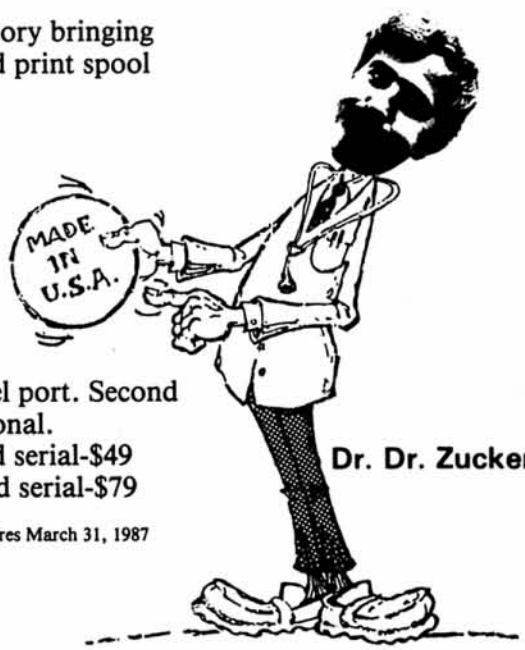

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Hidden Attributes

Keep floppy- or hard-disk files private by hiding them from the directory.

Secure is a file-protection program that lets you hide subdirectory files on a floppy or hard disk. It changes a file's attribute byte to hidden status so the file can't be seen by the directory (DIR) command—the same protection given the BIOS (basic input/output system) ROM and operating-system files that are required on all MS-DOS disks.

Hide-and-Seek

Type in and assemble Secure. When you have an error-free EXE file, type SECURE at the MS-DOS command prompt and press the enter key. The program asks if you want to hide or "unhide" a subdirectory. Type H for hide or U for unhide.

At the next prompt, type in the name of the subdirectory you want to protect and press enter. Secure searches the root (main) directory for the name and changes its file attribute to hidden status.

You can still look at the hidden subdirectory by invoking the change-directory command (CHDIR) with the exact spelling of the file name followed by the directory command.

Once you've hidden the file, no one else will know it exists. You can reverse its hidden status by rerunning Secure, or leave it there for regular use as long as you can remember its name.■

System Requirements

Tandy 1000
MS-DOS
Editor/assembler

Contact Debbie Cooper at 2466 W. 13th Ave., Vancouver, British Columbia V6K 2S8.

Program Listing. Secure.

```
;SECURE.ASM
;(c) 1986 by Deborah L. Cooper
stcksg  segment para stack 'stack'
        db      256 dup(0)
stcksg  ends
datasg  segment para 'data'
fname   db      10              ;maximum # bytes allowed
        db      ?               ;actual # bytes entered
        db      11 dup(0)       ;sub-dir name entered
err1    db      0dh,0ah,'No such sub-dir name found!','$'
err1a   db      0dh,0ah,'Access denied error','$'
err1b   db      0dh,0ah,'Path not found','$'
msg1    db      0dh,0ah,'Enter name of sub-dir to hide: ','$'
msg2    db      0dh,0ah,'Select (H=hide, U=Unhide, E=exit : ','$'
msg3    db      0dh,0ah,'Sub-dir has been hidden!','$'
msg4    db      0dh,0ah,'Sub-dir has been returned to normal','$'
msg5    db      0dh,0ah,'SECURE : A Sub-Dir Hide/Un-hide Utility'
        db      0dh,0ah,'(c) 1986 by Deborah L. Cooper','$'
msg6    db      0dh,0ah,'Enter name of sub-dir to un-hide : ','$'
msg7    db      0dh,0ah,'Sub-dir has been un-hidden','$'
datasg  ends
codesg  segment para 'code'
start   proc    far             ;set
        push    ds              ;up
        xor     ax,ax           ;return
        push    ax              ;to
        mov     ax,datasg       ;dos
        mov     ds,ax           ;for
        mov     es,ax           ;later
        assume  cs:codesg,ds:datasg,es:datasg,ss:stcksg
        lea     dx,msg5         ;copyright notice
        mov     ah,09h          ;display function
        int     21h             ;call dos
        lea     dx,msg2         ;point to menu selection msg
        mov     ah,09h          ;display function
        int     21h             ;call dos
menu:   mov     ah,00h          ;wait for inkey
        int     16h             ;call bios
        and     al,5fh          ;make it uppercase
        cmp     al,'H'          ;hide a sub-directory?
        je      hide            ;go if so
        cmp     al,'U'          ;un-hide a sub-directory?
        je      uhide           ;go if so
        cmp     al,'E'          ;exit program?
        je      exit            ;go if so
        jmp     menu            ;back if not valid
exit:   mov     ah,4ch          ;terminate process
        int     21h             ;to return to MSDSO
;Hide a sub-directory so it cant be seen with the DIR command
hide:   lea     dx,msg1         ;prompt for directory name
        mov     ah,09h          ;display function
        int     21h             ;call dos
        mov     dx,offset fname ;point to input buffer
        mov     ah,0ah          ;line input function
        int     21h             ;call ods
        mov     bl,fname+1      ;now make it an
        mov     bh,0            ;ASCIIZ string
        mov     [fname+bx+2],0  ;now
        cmp     bx,00h          ;was a name entered?
        jne     cont            ;continue if there is one
        jmp     exit            ;go end program
cont:   mov     dx,offset fname+2
        mov     ah,43h          ;change attribute function
        mov     al,01h          ;set it
        mov     cx,02h          ;for hidden attribute
        int     21h             ;call dos
        jnc     good            ;go if it was successful
error:  cmp     ax,5            ;access denied?
        je      noacc           ;go if so
        cmp     ax,3            ;path not found?
        je      nopath          ;go if so
        lea     dx,err1         ;else error occured
        jmp     err5            ;and continue
noacc:  lea     dx,err1a        ;access denied msg
        jmp     err5
nopath: lea     dx,err1b        ;path not found
err5:   mov     ah,09h          ;display function
        int     21h             ;call dos
        jmp     exit            ;and exit to MSDOS
good:   lea     dx,msg3         ;file has been hidden
        mov     ah,09h          ;display function
        int     21h             ;call dos
        jmp     exit            ;and exit to MSDOS
;un-hide a hidden sub-directory routine
uhide:  lea     dx,msg6         ;prompt for unhide
        mov     ah,09h          ;display function
        int     21h             ;call dos
        mov     dx,offset fname ;point to input buffer
        mov     ah,0ah          ;line input function
        int     21h             ;call dos
        mov     bl,fname+1      ;now make it an
        mov     bh,0            ;ASCIIZ string
        mov     [fname+bx+2],0  ;now
        cmp     bx,0            ;was a name entered?
        je      nhide           ;go if bad one
        jmp     chide           ;else just continue
nhide:  jmp     exit            ;go exit program
chide:  mov     dx,offset fname+2
        mov     ah,43h          ;change attribute function
        mov     al,01h          ;set it
        mov     cx,00h          ;for normal attribute
        int     21h             ;call dos
        jnc     ghide           ;go if attribute set ok
        jmp     error           ;else error occured
ghide:  lea     dx,msg7         ;file has been unhidden
        mov     ah,09h          ;display function
        int     21h             ;call dos
        jmp     exit            ;and exit to MSDOS
start   endp
codesg  ends
        end     start
```

End

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Screen Border—Draw a border around your screen.
Screen Locator—Use PEEKs and POKEs to locate screen positions when speed is a necessity.
Screen PRINT—Use the arrow keys to move a nondestructive cursor while each PRINT location is displayed.
Screen Dump—Model I/III graphics screen dump program for an Epson MX-80 with Graftrax Plus or an RX-80.
Screen Fill—Fill the screen in assorted ways to create the effect you desire.
Screen Save and Restore—Save and restore the screen contents whenever you wish.
Screen Invert—Reverse the content of your Model I or III screen.

AND MORE...

SORTS

VisiCalc Sort—Sort alpha or numeric data in ascending order, and numeric data in descending order.
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Upgraded Graphics—Add the Point, Set and Reset commands to Model 4 Basic.
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Set Drive Zero Free

Gain an extra drive—without paying for it.

TRSDOS 6.x is a powerful operating system that unfortunately ties up most of drive zero. Owners of the Model 4, 4P, and 4D with 128K of RAM can use Memdisk to create a pseudo-drive in extended memory, partially offsetting the loss of memory space, but if they could make Memdisk handle *every* system task, drive zero would be totally free.

Memdos, my job-control language (JCL) utility containing a dozen TRSDOS commands, neatly turns the trick. It provides the convenience of an extra drive without the expense of a peripheral.

The Mechanics of Memory

Memdos (Program Listing 1) has several advantages over the alternative method of loading selected system files into high memory with the System command (Sysres=n). Even a minimal system residing there cuts down on the memory available for application programs and Basic. Moreover, Format, Backup, and most of the TRSDOS library commands are unavailable in Sysres configurations unless you put them on a disk in drive zero.

Although you can transfer data files to Memdisk and access them instantly, you must copy files modified in memory to a real disk before turning off the machine. It is impossible to do a fast, mirror-image backup to or from Memdisk because Memdisk's cylinder count (13) differs from that of the real drives. Any backup by class requires a system disk in drive zero, and you can't use the Backup command's X parameter. Worst of all, you'll lose Memdisk data if the the system crashes before you've backed up the Memdisk files. The upshot is that Memdisk, while useful on the 128K Model 4, still doesn't completely compensate you for dedicating the full-featured drive zero to TRSDOS.

LOAD 80

System Requirements

Model 4/4P/4D
128K RAM
TRSDOS 6
Disk Basic and Scripsit (optional)

Program Listing 1. Memdos.

```
.*** JCL Program MEMDOS installs MEMDISK in extended memory, transfers
.***   system files and utilities (FORMAT, BACKUP, and CONV) to MEMDISK,
.***   and redefines MEMDISK as write-protected system Drive 0.
.
SYSTEM (DRIVE=2,DRIVER="MEMDISK")
D
D
Y
BACKUP /SYS:0 :2 (S)
PURGE SYS0:2 (S,Q=N)
PURGE SYS8:2 (S,Q=N)
PURGE SYS13:2 (S,Q=N)
BACKUP BACKUP:0 :2 (I)
BACKUP FORMAT:0 :2 (I)
BACKUP CONV:0 :2
SYSTEM (DRIVE=2,WP)
DIR :2 (S,I,A=N)
.
.*** TRSDOS 6.x is now installed in extended memory (MEMDISK).
.*** BACKUP, FORMAT, CONV, and DEBUG utilities are included.
.*** BASIC, SPOOL, FORMS, and SYSTEM are not available.
.*** The system disk can be removed from Drive 0 (now Drive 2).
.*** If BASIC is needed, load it before removing the system disk,
.***    and execute TRSDOS commands from BASIC using SYSTEM "Command".
.*** Both Drives 1 and 2 may contain non-system disks at all times.
.*** Ignore any "Job aborted" message appearing below.
SYSTEM (SYSTEM=2)
```

End

Program Listing 2. Membasic.

```
.*** JCL Program MEMBASIC installs MEMDISK in extended memory, transfers
.***   system files, and BASIC to MEMDISK, and redefines MEMDISK
.***   as write-protected system Drive 0.
.
SYSTEM (DRIVE=2,DRIVER="MEMDISK")
D
D
Y
BACKUP /SYS:0 :2 (S)
PURGE SYS0:2 (S,Q=N)
PURGE SYS5:2 (S,Q=N)
PURGE SYS7:2 (S,Q=N)
PURGE SYS8:2 (S,Q=N)
PURGE SYS9:2 (S,Q=N)
PURGE SYS13:2 (S,Q=N)
BACKUP BASIC:0 :2 (I)
SYSTEM (DRIVE=2,WP)
DIR :2 (S,I,A=N)
.*** TRSDOS 6.x is now installed in extended memory (MEMDISK),
.***    along with disk BASIC.
.*** BACKUP, FORMAT and Libraries B and C are not available.
.*** The system disk can be removed from Drive 0 (now Drive 2).
.*** Both Drives 1 and 2 may contain non-system disks.
.*** Ignore any "Job aborted" message appearing below.
SYSTEM (SYSTEM=2)
```

End

Program Listing 3. Memscrip.

```
.*** JCL Program MEMSCRIP installs MEMDISK in extended memory,
.***   transfers system files, BACKUP, SPOOL, and SCRIPSIT to MEMDISK,
.***   and write-protects and redefines MEMDISK as system Drive 0.
.
SYSTEM (DRIVE=2,DRIVER="MEMDISK")
D
D
Y
BACKUP /SYS:0 :2 (S)
PURGE SYS0:2 (S,Q=N)
PURGE SYS5:2 (S,Q=N)
PURGE SYS7:2 (S,Q=N)
PURGE SYS9:2 (S,Q=N)
PURGE SYS13:2 (S,Q=N)
BACKUP BACKUP:0 :2 (I)
BACKUP SCRIPSIT:0 :2
SYSTEM (DRIVE=2,WP)
DIR :2 (S,I,A=N)
```

Listing 3 continued

Brain Surgery

The system (SYS) files on a TRSDOS 6.2 disk amount to 61.5K (earlier TRSDOS 6.x versions might take slightly less). Since a Memdisk drive can provide 63K of storage, the entire TRSDOS operating system—not just a skimpy version—should fit there. Format and Backup, two indispensable utility programs, aren't SYS files and require another 12K. If you want to include them, you must first remove little-used but memory-greedy system files from Memdisk with the Purge command.

The first file to purge is SYS0 (6K), the resident portion of TRSDOS. SYS0 is always loaded into low memory when you boot up the system disk and stays there until you turn off or reset the machine. You can also purge SYS13 (1.5K), an empty file reserved for programmers.

This leaves SYS6 (13.5K), SYS7 (7.5K), and SYS8 (10.5K), which contain TRSDOS libraries A, B, and C. All the commands needed for normal file handling are in library A. You can eliminate library B or C, or both, to make enough room in Memdisk for utility programs. Other SYS files you can eliminate are SYS4, SYS5, and SYS9 (1.5K each), which provide the optional system-error messages, regular Debug, and extended Debug, respectively.

The trick now is to fool the Model 4 into thinking that Memdisk is really drive zero and that this pseudo-drive contains a system disk. Listing 1 does this by creating pseudo-drive 2 with the Memdisk program, backing up system files to the Memdisk drive, and issuing the System command (System = 2).

Here's a guided tour through Memdos:

1. Memdisk is installed in both banks of extended memory (allocation D), creating and formatting pseudo-drive 2 (13 cylinders, double density) with 63K of storage.
2. System files are copied from drive zero to pseudo-drive 2 using backup by class.
3. System files SYS0 (resident portion), SYS8 (library C), and SYS13 (blank file) are purged from pseudo-drive 2 to make room for selected utilities.
4. Utility files Format/CMD, Backup/CMD, and CONV/CMD are copied from the system disk to pseudo-drive 2 with the Backup command.
5. A directory of the final Memdos on pseudo-drive 2 is displayed (optional).
6. Pseudo-drive 2 is write-protected to prevent accidental erasing of Memdisk system files (optional).
7. Pseudo-drive 2 is redefined as system pseudo-drive zero (the original drive zero becomes drive 2 and drive 1 is unchanged).

After setting up Memdos, remove the system disk from drive zero and see what it's like to use all 180K on each of your built-in drives. You can use Format, Backup, CONV, and all the TRSDOS 6 commands in Memdos as long as you leave the power on and do not reboot. With a normal dual-drive Model 4, you can

Listing 3 continued

```
.*** TRSDOS and SCRIPSIT are now installed in MEMDISK.
.*** BACKUP (without FORMAT) utility is included.
.*** Library C commands (SPOOL, FORMS, and SYSTEM) are included.
.*** BASIC and Library B system commands are not available.
.*** The system disk can be removed from Drive 0 (now Drive 2).
.*** Both Drives 1 and 2 may contain non-system disks.
.*** Ignore any "Job aborted" message appearing below.
SYSTEM (SYSTEM=2)
```

End

Drive zero, Memdisk, 14 cylinders, double density, 4.5/63K free

Filespec	Attribute	Number of records	File size	Comments
Backup/CMD	IP	26	7.5K	Full or partial disk backup
CONV/CMD	P	7	3.0K	Reformats TRSDOS 1.3 files to 6.x
Format/CMD	IP	18	4.5K	Formats blank disks to order
SYS4/SYS	SIP	6	1.5K	Error-message dictionary
SYS5/SYS	SIP	6	1.5K	TRSDOS Debug utility
SYS6/SYS	SIP	50	13.5K	Library A (disk-file handling)
SYS7/SYS	SIP	26	7.5K	Library B (Free, Dump, Purge)
SYS9/SYS	SIP	3	1.5K	Extended Debug commands
Boot/SYS*	SIP	16	4.5K	Tandy says this one must stay
DIR/SYS*	SIP	18	4.5K	System directory—always required
SYS1/SYS*	SIP	6	1.5K	TRSDOS command interpreter
SYS2/SYS*	SIP	6	1.5K	Opens and initializes disk files
SYS3/SYS*	SIP	4	1.5K	Gets file names; closes files
SYS10/SYS*	SIP	2	1.5K	File-removal procedures
SYS11/SYS*	SIP	4	1.5K	JCL execution—must stay
SYS12/SYS*	SIP	4	1.5K	Processes directory; scans memory

Total RAM 58.5K

*These files must be part of any operating system

Table 1. Memdos directory.

Drive zero, Memdisk, 14 cylinders, double density, 4.5/63K free

Filespec	Attribute	Number of records	File size	Comments
Basic/CMD	IP	85	22.5K	Model 4 Disk Basic
Basic/OV1	IP	11	3.0K	Basic overlay
SYS4/SYS	SIP	6	1.5K	Error-message dictionary
SYS6/SYS	SIP	50	13.5K	Library A (disk-file handling)
*	SIP	60	18.0K	Minimum system configuration

Total RAM 58.5K

*These are the eight files marked with an asterisk (*) in Table 1

Table 2. Membasic directory.

Drive zero, Memdisk, 14 cylinders, double density, 1.5/63K free

Filespec	Attribute	Number of records	File size	Comments
Backup/CMD	IP	26	7.5K	Full or partial disk backup
Scripsit/CMD		40	10.5K	Tandy's word processor
SYS4/SYS	SIP	6	1.5K	Error-message dictionary
SYS6/SYS	SIP	50	13.5K	Library A (disk-file handling)
SYS8/SYS	SIP	37	10.5K	Library C (Spool, Forms, System)
*	SIP	60	18.0K	Minimum system configuration

Total RAM 61.5K

*These are the eight files marked with an asterisk (*) in Table 1

Table 3. Memscrip directory.

put an empty Model 4 data disk (TRSDOS 6.x format) in one drive and a filled-to-the-brim Model III data disk (TRSDOS 1.3 format) in the other, and use the CONV utility in Memdos to translate and transfer every Model III file to the Model 4 disk.

That should convince you that having a memory-resident version of TRSDOS justifies creating Memdos, which lets you install the system with a single Do command. You can generate the JCL file with the Build command or create it as a Scripsit ASCII file saved with the A parameter. Regardless of how you create the file, execute it by typing DO = MEMDOS. To install it automatically each time you boot up the system disk, type AUTO DO = MEMDOS.

After the final JCL command is executed, TRSDOS displays the message "Job aborted." The error won't affect operation; it is the result of moving drive zero to Memdisk from within a JCL file, but the command executes properly before the message is encountered. If the error message bothers you, eliminate the last command from the JCL program and execute it from TRSDOS Ready instead.

Exploring Space

You can move freely between Disk Basic and TRSDOS, or between Scripsit and TRSDOS, with no system disk in drive zero by using Membasic (Program Listing 2) or Memscrip (Program Listing 3). Remember that the Basic files for setting up Membasic are already on your TRSDOS 6.x disk, and that you must have Scripsit on your bootup disk to install Memscrip.

Tables 1, 2, and 3 are annotated Memdisk directories for the three memory-resident operating systems I've described. Note that Memscrip includes library C (SYS9) instead of B (SYS8). I designed it that way because the commands in library C (Forms, Setcom, Setki, Spool, Sysgen, and System) are more useful for word processing than the library B commands (ATTRIB, Auto, Build, Create, Date, Debug, Dump, Free, Purge, Time, and Verify). Similarly, you might find Memdos more useful if it includes library C instead of library B, especially if you frequently use the System or Sysgen command. You can easily change the JCL files to create a customized operating system.

Any command file can share Memdisk with a portion of TRSDOS in the same manner, as long as the required modules occupy 63K or less. Bulletin-board and communications programs are good applications of the technique because they leave more space for downloading files while performing the terminal operations quickly in Memdisk and primary memory. ■

Don O. Coffin is a research scientist and has been a TRS-80 hobbyist since 1977. Contact him at 316 Cheryl Ave., Los Alamos, NM 87544.

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Remote Possibilities

Give yourself remote access to your Model III.

Remote-access capability to an office data base is a common need among professionals who often work at home. Though you can buy commercial telecommunications packages that include this capability, the cost might seem extravagant if all you need is the host program. For users who want remote access to data bases on the Model III, my Remote program offers a cheaper solution.

Remote alters the keyboard and video drivers on a Model III host computer, enabling it to accept remote input/output (I/O) via the RS-232 interface. The program runs under any Model III DOS and supports the x-on/x-off protocol. (Under x-on/x-off protocol, pressing control-S pauses data transmission while control-Q resumes it.) When connected to a remote terminal running smart-terminal software, data-transmission rates of up to 9,600 baud are possible.

Terminal Lines

To install the utility, type in and assemble Remote/ASM (see the Program Listing). Remote assumes that the RS-232 interface is initialized. If your terminal software requires another setting, use the TRSDOS Setcom command or an equivalent RS-232 initializing utility to set the proper line conditions before running Remote. Refer to your TRSDOS manual for syntax.

Typing REMOTE and then pressing the enter key enables remote I/O (RS-232) while disabling local I/O (keyboard and video), thus ensuring that your data remains secure when you access it from home. Alternatively, you could type REMOTE LOCAL before pressing the enter key. This enables remote I/O while leaving local I/O enabled as well. The latter option is intended to let you interact with a local user from a remote location.

Run Remote whenever you leave your office and think you might want to access the host from your remote terminal. Any computer can serve as the remote terminal, as long as it is equipped with an RS-232 interface, smart-terminal software, and a direct-connect cable for attaching a modem. You also have the option of using Remote to create a local-area network in your office. In this case, attach the remote terminal directly to the host computer using either a terminal-to-terminal cable or a direct-connect cable and a null modem. If you plan to communicate with the host over phone lines, set your modem to auto-answer mode.

Though most software packages will run from the remote terminal, the following types do not function properly:

- Programs that do not use keyboard and video device-control blocks (DCBs) for I/O. Examples include Scripsit, Visicalc, and most video games.
- Basic programs that use the Set, Reset, Point, and Print@ keywords.
- Programs that produce sounds.

The only way to be sure if a software package works is to test it.

Once the remote terminal is equipped, load the smart-terminal package and initialize the RS-232 interface to the same settings as the host. If you're using a modem, dial the host. You should then have full access to the host computer. ■

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

LOAD 80

System Requirements

Model III
32K RAM
Assembly language
Editor/assembler

Program Listing. Remote/ASM.

```
00010 ;*****************************************************
00020 ;* Remote Control TRS-80       (REMOTE/ASM, REMOTE/CMD) *
00030 ;* by Craig Chaiken                                    *
00040 ;* This utility allows the TRS-80 Model III or Model 4  *
00050 ;* (in Model III mode) to be controlled by a remote    *
00060 ;* terminal over an RS232 line. XON/XOFF protocol      *
00070 ;* is supported.                                       *
00080 ;*                                                     *
00090 ;* Example #1:                                         *
00100 ;*      REMOTE                                         *
00110 ;*      (Remote I/O enabled, local I/O disabled        *
00120 ;*       for security purposes)                        *
00130 ;*                                                     *
00140 ;* Example #2:                                         *
00150 ;*      REMOTE LOCAL                                   *
00160 ;*      (Remote I/O enabled, local I/O enabled         *
00170 ;*       allows local user and remote user to          *
00180 ;*       interact)                                     *
00190 ;*****************************************************
00200 ;-------------- CONSTANTS -------------------------------
00210 RSINIT  EQU     005AH
00220 CLS     EQU     01C9H
00230 PRINT   EQU     021BH
00240 KEYDCB  EQU     4016H
00250 VIDDCB  EQU     401EH
00260 HIMEM   EQU     4411H
00270 START   EQU     0FF5BH
00280 CONTRL  EQU     0EAH
00290 DATA    EQU     0EBH
00300 XOFF    EQU     17      ;CONTROL-S
00310 XON     EQU     13      ;CONTROL-Q
00320 ;-------------- INSTALL NEW DRIVERS ---------------------
00330         ORG     START
00340         LD      A,(HL)          ;Get Local/No Local Param
00350         PUSH    AF
00360         CALL    CLS
00370         LD      HL,MESS
00380         CALL    PRINT
00390         POP     AF
00400         CP      'L'
00410         CALL    NZ,NOLOC
00420         CALL    Z,LOCAL
00430         LD      HL,(KEYDCB)     ;Reroute I/O
00440         LD      (PATCH1+1),HL
00450         LD      HL,NEWKEY
00460         LD      (KEYDCB),HL
00470         LD      HL,(VIDDCB)
00480         LD      (PATCH2+1),HL
00490         LD      HL,NEWVID
00500         LD      (VIDDCB),HL
```

Listing continued

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Listing continued

```
00510           LD      HL,NEWKEY-1     ;Protect Memory
00520           LD      (HIMEM),HL
00530           JP      RSINIT          ;Initialize RS232
00540 NOLOC     PUSH    AF              ;Disable Local I/O
00550           LD      HL,DISABL
00560           CALL    PRINT
00570           LD      A,0C9H          ;RET Opcode
00580           LD      (PATCH1),A
00590           LD      (PATCH2),A
00600           POP     AF
00610           RET
00620 LOCAL     LD      HL,ENABLE       ;local I/O Enabled mess
00630           JP      PRINT
00640 ;---------------- MESSAGE AREA ----------------------------
00650 MESS      DEFB    10
00660           DEFM    'Remote I/O Enabled'
00670           DEFB    10
00680           DEFM    'Local I/O '
00690           DEFB    03
00700 DISABL    DEFM    'Disabled'
00710           DEFB    10
00720           DEFB    13
00730 ENABLE    DEFM    'Enabled'
00740           DEFB    10
00750           DEFB    13
00760 ;---------------- NEW I/O DRIVERS -------------------------
00770 NEWKEY    IN      A,(CONTRL)      ;RS232 Input
00780           RLA
00790           JR      C,GETBYT
00800           XOR     A
00910           JR      PATCH1
00820 GETBYT    IN      A,(DATA)        ;If Carry, Read Byte
00830           CP      XOFF
00840           JP      Z,WAITX         ;Support XON/XOFF
00850           RET
00860 PATCH1    JP      0               ;Else Get Keyboard Byte
00870 NEWVID    IN      A,(CONTRL)      ;RS232 Output
00880           BIT     6,A             ;Loop Till Transmit
00890           JR      Z,NEWVID        ;  Register Empty
00900           LD      A,C
00910           OUT     (DATA),A        ;Transmit Character
00920 PATCH2    JP      0               ;Display Character
00930 WAITX     CALL    NEWKEY          ;wait for XON (ctrl-Q)
00940           CP      XON
00950           RET     Z
00960           JR      WAITX
00970 ;-----------------------------------------------------------
00980           END     START                                   End
```

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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 menus 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 linefeeds 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

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Model 4 or 4P

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Once Upon A Time,

Monte Zuma, our Founder, President and King, has always had trouble keeping his desk organized. The Sidekick™ from Borland 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 hisself) 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 fumbling 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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Circle 524 on Reader Service card.

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 computers 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 "leftovers" 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 linefeed 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.**

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Specifications/prices are subject to change without notice.

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

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All About Allwrite

Squeeze more utility out of Prosoft's popular word processor.

Allwrite, Prosoft's word processor for TRS-80 computers, will do nearly anything you want. The trick is figuring out how to do it; the program is large and complicated and the manual is short on practical examples.

Here's a little know-how I picked up in many hours of using Allwrite on my 128K Model 4P running under TRSDOS 6.2 with a Radio Shack Daisy Wheel II printer. Much of what follows applies to other operating systems and printers.

Starting Lineup

Printing horizontal lines in tables and document titles is easy: Hold down the clear and hyphen keys. The trick is to properly space the surrounding text above and below the lines. Figure 1 shows the code for doing that with a document title. The half-line-skip control codes (SK -.5 and SK .5) place the line midway between the title and subtitle. Control codes may be upper- or lowercase.

Figure 2 shows the code for creating and spacing the lines in a table heading. The BR control word prevents the program from running two lines together—an annoying quirk left over from Newscript, Prosoft's earlier word processor.

For table totals, try the layout in Fig. 3. Amazingly, the spacing stays in proportion when you change the overall line spacing of the document. Try it and see.

A final point on drawing lines: You *can* print lines wider than the editing screen, but there will be a one-character gap where the line wrapped around the screen. You can avoid the gap by widening the screen with the LE (length) command. You must do this each time you format the file.

Another way is to underline hard spaces. First, type the emphasis code for underlining (@$) followed by the clear key and equals sign (=) to put the first hard space on screen. (On the Model 4 it appears as the plus/minus symbol.) To continue the line, press clear-K, which repeats the hard-space symbol until released. Finally, press @% to stop underlining.

```
;ce 3
HOW TO PAY FOR YOUR NEW WORD-PROCESSING PROGRAM
;sk -.5
_____________________________________________________
;sk .5
Write an article about it for a computer magazine.
```

Fig. 1. Allwrite codes for spacing text above and below a line.

```
Time wasted on computers in the Gadd household
;sk -.5
_____________________________________________________
;sk .5
DATE        NAME        TIME LOST      REASON
;sk -.5
_____________________________________________________
;sk .5
May 5       Ben         18 hrs         Looking for program bug
;br
May 5       Toby         5 min         Explaining bug to his dad


 582        2511        3020        4371        5970
;br
 820         435         691         228         744
;sk -.5
_____________________________________________________
;sk .5
1402        2946        3711        4599        6714
```

Fig. 2. Allwrite codes for spacing lines in a table heading.

Trade Secrets

Here are my suggestions for tackling problems you might encounter while editing with Allwrite:

- Cursor disappears and computer seems to hang up. You've accidentally pressed clear-* (asterisk) and the program is trying to print while the printer isn't ready. Don't reset; within about 20 seconds, the cursor will return and things will be back to normal.

Even if you have pressed reset, there's a silver lining: Allwrite provides a way to recover the text in memory. Hold down the enter key while pressing reset. At TRSDOS Ready, enter AL *. The space is important; you'll lose the file if you type AL*.

The text should reappear after you've entered the AL * command, but without your custom screen width, cursor, and end-paragraph markers. Check the text carefully without scrolling up—a bug here will scramble the file if you do. Go to the top of the file and scroll *down* only. Save the file if it looks good and restart Allwrite to bring the file back in normal form.

- Cursor moves too slowly. The CONFIG/SYS file is muddled. Copying over the CONFIG/SYS file from the master to the working disk won't solve the problem. You have to regenerate the file with the TRSDOS Sysgen command.

Put the Allwrite side 1 backup in drive zero and reset. Hold down the enter key to head off the installation routine (repeatedly press the break key if it starts anyway). At TRSDOS Ready, call Allwrite and load a document file. If the cursor (which won't be customized) is moving at the right speed, exit to Ready, remove the side

System Requirements

Models I, III, 4, and 4P
48K RAM (64K on 4 and 4P)
Two disk drives

1 backup, and insert the working disk with the slow cursor. Type SYSGEN = YES to rebuild CONFIG/SYS, and reset.

- Text jumps off screen occasionally when you press clear-J to join lines after inserting something. Place the cursor at the top of the screen and the document will scroll into view.
- Search command can't find end-paragraph symbol. Search instead for ASCII 013, regardless of which end-of-paragraph symbol you've chosen. To search for any ASCII value, enter the sequence break-/-clear-:-(three-digit ASCII value).
- Can't change tab settings on grid line. You're in the insert mode. Move the cursor to another line and switch to overlay mode.
- Clear-enter won't split a line. The clear key will not work as the control key for this function unless you press and release it before pressing the enter key (the same goes for the word-reversal and point-marking keys). Alternatively, substitute F1 for the clear key.

```
    582   2511   3020   4371   5970
;br
 820    435    691    228    744
;sk -.5
-------------------------------------
;sk .5
1402   2946   3711   4599   6714
```

Fig. 3. Allwrite codes for spacing lines in table totals.

Printing Foibles

- Formatter runs strangely. You might have called up the formatter from TRS-DOS. Always go through the editor first.
- Formatter won't print to screen (VI [video] or VS [video stop] control words don't work). The printer default file contains the PP (new-paragraph) control word without D (delay). Add the D.
- Index won't format on screen. This is a bug. You must run the ALINDEX program separately after the formatter is finished. Then format the file whose name has the IDX extension.
- Lines formatted with occasional large spaces between words. You might have turned off the tabbing feature by using the TB control word without modifiers, which is fine if TB is the last item on the line. Give each control word its own line.
- Tabs go strange in formatting. You might not have put the R (right-justification) and C (centering) commands in the proper format. They must come after the tab setting (TB + 5R, for example). You might also have forgotten to put an extra tab symbol ahead of the next item when skipping a column.
- Formatter won't print on top line of page when TM (top margin) is set to zero. The "Margins conflict" error message appears. You've specified other information about headings in either the text or the printer default file. Use LGO instead.
- Page numbers printed in wrong place. If you've correctly positioned the print-page-number symbol ($) in the BT (bottom titles) or TT (top titles) control words, check to see if you've set a new left margin or line length for the document. If the page-number specification comes before the change, the page numbers are printing according to the older (default) margins. Put BT or TT after control words for margins and line-length changes.
- Printer leaves a space before first character in file. This occurs when the IM (embed another file) control word begins the file. Move it down a bit.
- Printer leaves a space before entry in automatically generated table of contents. You left a space between the TC (table of contents) control word and the entry. It's okay to put spaces after most control words, but not after TC and IX (index).
- Some lines formatted too short. Remove the end-paragraph marker from the end of each line. You might have put them there inadvertently by using the enter key to move the cursor beyond a spot containing an insert space that hasn't closed up yet. If the text has table-of-contents (TC) entries, check to see if some were inserted in mid-paragraph. Index (IX) entries can go in mid-paragraph without producing short lines, but TC entries must be between paragraphs.
- Printer stuck in 10-pitch mode. SD 0 was removed from the printer default file. (Allwrite automatically puts the obscure microspacing control word SD 0 in daisy-wheel printer default files, and with good reason: You can't use anything other than 10-pitch mode without it.) Note that when printing directly from the editing screen (clear-*) you must control the pitch from the printer. In this case the formatter doesn't run, and the program prints at the currently designated pitch.
- Anti-widowing doesn't work. Allwrite is supposed to suppress widows (the last line of a paragraph hanging at the top of a page) and orphans (the first line of a paragraph at the bottom of a page). The routine doesn't work when FO (formatting) or CO (connect) is off. Turn one of them on. Type FO ON for full formatting with justification; type CO ON for formatting without justification.

Allwrite, Prosoft's word processor, will do nearly anything you want.

- Automatic footnote numbers or numbered points (FN and PT control words) aren't on same lines as following text. FO is set to OFF, but it has to be on for the two functions to work properly. Use JU OFF to prevent justification. Another common error is forgetting to insert FN END after a footnote.
- CP (conditional page) doesn't keep the specified number of lines together. There's a conflict with the anti-widowing feature. To keep headings from ending up at the bottoms of pages, specify CP to be several lines greater than the minimum.
- Allwrite won't find label (LB control word) in text. Reason: The label comes on the line after a solitary end-paragraph marker. Use SK instead of the paragraph marker to skip a line.
- IF control word appears not to work. It *doesn't* work—at least not as explained in the manual. Prosoft insists that IF works fine, allowing you to set up If. . .Then situations. Everything I've tried with it gives inconsistent results. I'd like to hear from readers who can figure IF out, because it would let me use Allwrite as a simple data base as well as a word processor. ■

Ben Gadd is a Canadian writer and naturalist. You can contact him at Box 245, Jasper, Alberta T0E 1E0.

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Circle 46 on Reader Service card.

New for MS-DOS from Hypersoft

PCXZ 1.0 Cross-Zap Utility for PC/MS-DOS

Now, from The Author that brought you **Hypercross, HyperZap and SuperCross** comes an amazing new program for owners of Tandy 1000, 1200, 3000 and true PC compatibles. **PC Cross-Zap** allows you to read all double density TRS-80 type disks **on your PC.** Not only that, PCXZ offers many of the features that TRS-80 owners have long enjoyed with Hypercross and Hyperzap.

PC Cross-Zap is a utility program that runs on your PC or PC-compatible. With it you can copy files to or from TRS-80 disks at will. You can also format a disk, copy disks, explore, read and write sector data, repair bad directories and much more. Long after your TRS-80 is gone you will still be able to read your old disks. Even when your TRS-80 disks are gone you can continue to use PCXZ to read, fix and modify MS-DOS and other disks so your investment will never be lost.

Formats Supported Model I mixed density: DOS+ 3.4, DoubleDOS, LDOS (SOLE), MultiDOS, NEWDOS 80 V2, TRSDOS 2.7/8. Model I/III Double Density: DOS+ 3.5, LDOS 5.1. Model III: DOS+ 3.4, MultiDOS, NewDOS 80, TRSDOS 1.3 Model 4/4P: MultiDOS, DOS+ 4, TRSDOS 6. Max-80: LDOS 5.1. All formats also supported in double sided, 35, 40 and 80 tracks where appropriate. For 80 track formats you must have an 80 track drive on your PC.

Main Features

With PCXZ you can format a TRS-80 disk (not the mixed density Model I types). You can copy files from a TRS-80 disk error free, without losing any data. Just like HyperCross 3.0 you can instruct **PCXZ** to convert your BASIC files on the fly as they are copied. ASCII and word processor text files are converted so they are in the correct format for your PC. Copying can be by file or using wild cards. You can also copy files from PC format back to your TRS-80 disks.

The disk zap, fix and copy features are perhaps the most exciting feature in any program ever offered in support of TRS-80 and MS-DOS disk formats. For the first time when you examine a disk the program tells you what you are looking at. For instance if you are inspecting a directory entry you will be told what each byte means as you move your cursor over it. This makes repair and modification a snap because you see the results of the change as you make it. Among the many things you can do are: remove passwords, rename, delete and undelete files. All is easy with the helpful prompts and action keys of **PC Cross-Zap.** The program comes with a manual that, also for the first time in one place, explains TRS-80 and MSDOS disk formats for all the different DOS versions.

System Requirements PC, XT, AT or compatible, Tandy 1000 or 1000Ex (needs DMA), 100 SX, 1200, 3000 with at least one 40 track drive and 256K minimum memory.

Only from Hypersoft: Get PCXZ - not half a program! ..... **$79.95 ppd**

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by Keith E. Risler

The Old Shell Game

Make your Model 4 friendlier and faster by automating TRSDOS commands with this customized shell.

Hiding under a shell is behavior meant for turtles, but sometimes it makes sense for humans to seek extra protection, too. My TRSDOS 6 Shell System provides a layer of insulation for computer users who don't need, or don't understand, the Model 4's TRSDOS 6 commands. It's ideal when you're rushed for time or when you want to let a friend who has no computer experience use your Model 4.

The system comprises several modular programs that eliminate the complexities of TRSDOS and make your Model 4 completely automatic. Here's what it does, in a nutshell:

- Automatically boots your Model 4.
- Provides automatic selection of five DOS procedures.
- Lets you choose to enter DOS or Basic by pressing a key.
- Provides automatic identification of data or program disks.
- Lets you select any Basic program at a special prompt.
- Provides automatic print-mode selection for the Epson FX-100 dot-matrix printer.

Shell is completely compatible with my other automation aid, Setup/JCL (see "Extra Strength DOS," June 1985, p. 48), which provides automatic keyboard redefinition and other useful features. Some of Shell's functions assume you have previously installed and run Setup, though you can modify the system to work without it. Most importantly, the Shell System allows you to add special applications of your own for automating the Model 4. It provides a debugged structure on which to build a complete automation package.

The Inner Shell

The Shell System has three distinct components: a master JCL file called Init (Program Listing 1), a Basic program called Powerup (Program Listing 2), and five modular JCL files (Program Listings 3–7).

LOAD 80

System Requirements

Model 4
64K RAM
Disk Basic

Program Listing 1. Init.

```
%1F.TRSDOS 6 SHELL SYSTEM FOR TANDY/RADIO SHACK TRS-80 MODEL4
.-------------------------------------------------------------
.
.Init/Jcl
.by Keith E. Risler, M.A.
.Type HELP <ENTER> for complete online assistance at TRSDOS Ready
.
.
.                --- SHELL SYSTEM OPTION MENU ---
.
.1 - System introduction (via Powerup/Bas)
.2 - Terminal communications and data transfer
.3 - Configure high speed RAM as drive 3
.4 - Turn TRSDOS command logging system on
.5 - Turn TRSDOS command logging system off
.6 - Use your Model 100 as a laptop Model 4 keyboard
.
//ALERT 4,0,5,0,4,0,5,0
//KEYIN Select any option as listed above, 1 - 6
//1
%1FBASIC POWERUP/BAS
//STOP
//2
%1FDO=TERM/JCL
//STOP
//3
%1FDO=MDISK/JCL
//STOP
//4
%1FDO=LOGFILE/JCL
//STOP
//5
%1FDO=NOLOG/JCL
//STOP
//6
%1FDO=BOARD2/JCL
//STOP
///
//ALERT 4,0,5,0
//INPUT Enter your own command choice and <ENTER>
//STOP
```

End

Program Listing 2. Powerup. See p. 116 for information on using the checksums in this listing.

```
10 ' POWERUP/BAS 2.2.2 FOR TRS-80 MODEL 4, TRSDOS 6                '*   97
20 ' OPERATING SYSTEM 'SHELL' PROGRAM                              '*   98
30 '                                                               '*   99
40 ' By Keith E. Risler, M.A.                                      '*  100
50 '                                                               '*  101
60 '                                                               '*  173
70 ' INSTRUCTIONS: PLACE THIS PROGRAM                              '*  103
80 '    ON ANY DATA DISK (OR A SYSTEM                              '*  104
90 '    DISK  IF  YOU  HAVE JUST  ONE                              '*  105
100 '   DRIVE).   IT  WILL  BE CALLED                              '*  145
110 '   OPTIONALLY BY INIT/JCL.                                    '*  146
120 '                                                              '*  218
130 ' ERROR ACTION/MESSAGE IF NON EXISTENT PROG RUN                '*  148
140 '                                                              '*  220
150 ON ERROR GOTO 750                                              '* 1298
160 '                                                              '*  222
170 ' MENU 1: IDENTIFICATION, SYSTEM CONTROL CHOICES               '*  152
180 '                                                              '*  224
190 PRINT"Welcome to TRS-80 Model 4 Computing...."                 '* 3835
200 '                                                              '*  217
210 ' MODIFY PRINT LINES TO INCLUDE YOUR DISK#                     '*  147
220 ' DATE, NAME OR CHANGE TO SUIT YOURSELF                        '*  148
230 '                                                              '*  220
240 PRINT CHR$ (16) :PRINT"You are logged onto Disk #000, a syst
    em development disk. Established DD/MM/YY":PRINT"by YOUR NAM
    E HERE.";:PRINT CHR$ (17)                                      '* 11256
250 PRINT:PRINT"This is a TRSDOS 6 data disk only. TRSDOS 6.2 re
    ads and writes to all":PRINT"LDOS 5.1.3 and 5.1.4 disks and
    will run format-modified Model III Basic pro-"                 '* 13563
```

Listing 2 continued

which you can call from TRSDOS or optionally from the master JCL file. Both the master and the secondary JCL files should be copied to your DOS disk, but you can store them on any drive in your system.

Init is a menu of Shell System functions. Install it by copying it to your TRSDOS disks. Then at TRSDOS Ready type in:

AUTO DO = INIT/JCL

and press the enter key. You can leave the /JCL extension off a Do command, since TRSDOS 6 assumes you're running a JCL file. The equals sign tells TRSDOS not to compile the file before execution. Because it's a simple JCL file, compilation isn't necessary. Skipping this step allows for speedier performance.

Once installed, Init displays the menu of Shell System options (see the Photo). The first option is Powerup, a utility that automates the identification of Basic program or data disks. Powerup also automates the entry of control-code sequences for the Epson FX-100 dot-matrix printer.

I designed Powerup to work on drive 1. To use it on a different drive, change lines 520 and 730 in Listing 2. Ideally, the program should be stored on a data disk containing Basic programs you have under development. On multiple-drive systems, however, you can store Powerup on any disk in any drive.

When called, the program displays an introductory screen with details concerning the limitations of Model 4 Basic and room for you to enter your name and the disk's date of creation. Lines 240–290 in Listing 2 contain the print descriptions for the screen, which you can change to reflect what you have on your disk.

At the bottom of the screen, Powerup displays a menu with three options. Pressing the letter T returns you to TRSDOS and B puts you in Basic. Pressing O brings up another menu with three special Powerup options.

The first option lets you run any Basic program by typing its name without the usual, annoying quotation marks. If you make a typing mistake, or if the program doesn't exist, Powerup detects the error and reports "No such program" in reverse video. It then prompts you to try again.

The second option on this menu lets you take a directory of drive 1. After listing the directory, Powerup terminates. If you want, you can modify the program to print the directory, pause momentarily or until a key is pressed, and then return to the menu.

The third option is the print-mode selector. I designed this option to work with an Epson FX-100 or Epson-compatible printer, but you can tailor it to work with other printers or ASCII-controlled peripherals. If you use the Epson, set the DIP (dual in-line package) switches as follows.

SW1: 1-1, OFF; 1-2, ON; 1-3, ON; 1-4, ON; 1-5, ON.
SW2: 2-1, ON; 2-2, OFF; 2-3, OFF; 2-4, OFF.

Listing 2 continued

```
260 PRINT"grams not using hardware specific Model III code. Mode
    l III machine language":PRINT"programs cannot be loaded or r
    un under TRSDOS 6.":PRINT                                    '* 12815
270 PRINT CHR$ (16) ; " IMPORTANT "; CHR$ (17);"  ";             '*  2859
280 PRINT"All Model 4 Basic keywords require spaces to be":PRINT
    "placed around them. For this reason, otherwise acceptable c
    ode already avail-":PRINT"able on the Model III will not run
     in TRSDOS 6 Basic on the Model 4. Be care-"                 '* 19519
290 PRINT"ful to follow the Model 4 Basic syntax requirements."  '*  5514
300 '                                                            '*   147
310 ' CHANGE NEXT PRINT LINES TO ADD NAME AND DATE               '*   148
320 '                                                            '*   220
330 PRINT:PRINT"YOUR NAME HERE, SYSTEM OPERATOR":PRINT"DD/MM/YY" '*  4380
340 PRINT:PRINT"<T>RSDOS      <O>PTIONS        <B>ASIC FOR MODEL
    4 ONLY"                                                      '*  4376
350 '                                                            '*   223
360 ' EXAMINE KEYBOARD FOR USER RESPONSE/ERROR TRAP              '*   153
370 '                                                            '*   225
380 LET C$ = INKEY$                                              '*  1096
390 IF C$ = "" THEN 380                                          '*  1181
400 IF C$ = "T" OR C$ = "t" THEN CLS : SYSTEM                    '*  2572
410 IF C$ = "B" OR C$ = "b" THEN CLS : NEW                       '*  2286
420 IF C$ = "O" OR C$ = "o" THEN CLS : GOTO 490                  '*  2581
430 '                                                            '*   222
440 GOTO 380                                                     '*   684
450 '                                                            '*   224
460 ' MENU 2: OPTIONS                                            '*   154
470 ' CHANGE OR ADD MENU OPTIONS IF DESIRED                      '*   155
480 '                                                            '*   227
490 PRINT "TRSDOS 6 Options: Select an option as required"       '*  4806
500 PRINT STRING$(79, "_"):PRINT                                 '*  2004
510 PRINT"<R>un a BASIC program                                  '*  2351
520 PRINT"<D>rive 1 Directory"                                   '*  2338
530 PRINT"<E>pson FX-100 print mode selection"                   '*  3708
540 PRINT"<T>RSDOS"                                              '*  1251
550 PRINT:PRINT STRING$ (79,"_")                                 '*  2009
560 PRINT:PRINT  "KSM functions available in BASIC include these
     commands:"                                                  '*  6330
570 PRINT:PRINT"L = List, V= Load, T = Run, U = Run Immediately,
     S = Save":PRINT"To actuate, hold down <CLEAR> and the speci
    fic key.":PRINT:PRINT"KSM as defined available only by runni
    ng Keith E. Risler's Setup/JCL"                              '* 16356
580 '                                                            '*   228
590 ' ABOVE KSM FUNCTIONS ENABLED ONLY                           '*   158
600 ' VIA KEITH E. RISLER'S SETUP/JCL                            '*   150
610 ' PUBLISHED P. 48, JUNE 85                                   '*   151
620 ' 80 MICRO MAGAZINE                                          '*   152
630 '                                                            '*   224
640 ' EXAMINE KEYBOARD USER RESPONSE/ERROR TRAP                  '*   154
650 '                                                            '*   226
660 LET C$ = INKEY$                                              '*  1097
670 IF C$ = ""THEN 660                                           '*  1151
680 IF C$ = "R" OR C$ = "r" THEN PRINT @ 1440, "State program to
     run without quotes, please...." : GOTO 710                  '*  7590
690 IF C$ = "E" OR C$ = "e" THEN 820                             '*  1874
700 GOTO 720                                                     '*   681
710 LINE INPUT P$:RUN P$                                         '*  1511
720 IF C$ = "T" OR C$ = "t" THEN CLS: PRINT"RETURN TO TRSDOS OPE
    RATING SYSTEM....":SYSTEM                                    '*  5668
730 IF C$ = "D" OR C$ = "d" THEN SYSTEM "DIR :1 (A)":END         '*  3111
740 GOTO 660                                                     '*   688
750 PRINT @ 1680, CHR$ (16); " NO SUCH PROGRAM "; CHR$ (17):FOR
    I = 1 TO 1000:NEXT I:PRINT @ 1680 , "                 ":ON
     ERROR GOTO 750 :PRINT @ 1440,"":RESUME 710                  '*  9174
760 '                                                            '*   228
770 '                                                            '*   229
780 ' MENU 3: EPSON FX-100 MODES 29/09/84                        '*   159
790 ' CAN BE MODIFIED FOR ANOTHER PRINTER                        '*   160
800 ' SEE YOUR PRINTER MANUAL                                    '*   152
810 '                                                            '*   224
820 CLS: PRINT"EPSON FX-100 PRINT MODE SELECTION":PRINT STRING$
    (79,"_"): PRINT                                              '*  5113
830 PRINT @ 720, "0  = Normal 10 pitch"                          '*  2528
840 PRINT @ 800, "1  = Normal 12 pitch"                          '*  2531
850 PRINT @ 880, "4  = Normal condensed (maximum density)"       '*  4502
860 PRINT @ 960, "8  = Emphasized 10 pitch (16 for double strike
    , 24 for BOTH)"                                              '*  5764
870 PRINT @ 1040, "17 = Double strike elite (no emphasis for eli
    te)"                                                         '*  5288
880 PRINT @ 1120, "20 = Double strike condensed (no emphasis for
     condensed)"                                                 '*  6114
890 PRINT @ 1200, "32 = Enlarged 10 pitch (40 with emphasis, 58
    adds double strike)"                                         '*  6347
900 PRINT @ 1280, "33 = Enlarged elite (49 with double strike)"  '*  4704
910 PRINT @ 1360, "38 = Condensed enlarged (52 with double strik
    e, no emphasis)"                                             '*  6306
920 PRINT @ 400, "Please type the Epson MODE number (Epson man.
    p. 3-22 / range 0-63)....."                                  '*  6534
930 '                                                            '*   227
940 ' ABOVE REFERENCE IS TO CANADIAN                             '*   157
950 ' FX-100 MANUAL; YOURS MAY DIFFER                            '*   158
960 '                                                            '*   230
970 INPUT "# ---->"; MODE                                        '*  1385
980 IF MODE < 0 OR MODE > 63  THEN PRINT "<< MODE SELECTED NOT I
    N RANGE >>": FOR I = 1 TO 1500 :NEXT I: GOTO 820             '*  6677
990 LPRINT CHR$(27);"!";CHR$(MODE);                              '*  2051
1000 PRINT"Print mode";MODE;"is enabled.":FOR I = 1 TO 2000:NEXT
     I                                                           '*  4631
1010 CLS: GOTO 490                                               '*  1044
1020 '                                                           '*   266
1030 ' END OF POWERUP/BAS BY KEITH E. RISLER, M.A.               '*   196
```

End

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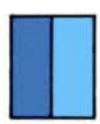

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Like most dot-matrix printers, the FX-100 requires that you type in ASCII print codes to select pitches, type thicknesses, and sizes. The Basic code line required by the Epson FX-100 generally takes the form:

LPRINT CHR$(27); "!"; CHR$ (MODE)

where Mode is a variable with a value from zero to 63. In Powerup, this variable is determined by the Input statement in line 970. The program then feeds the proper code (line 990) to the printer.

I programmed Powerup with a print-code menu that appears during Epson mode selection (lines 830–920). This allows you to select a mode without having to consult the print-mode table in the Epson FX-100 manual. Though all modes are not listed, I included the ones I felt were most useful.

Modular Functions

In addition to Powerup, the Init menu also lists the five modular JCL files as options. The first file, Term, is a terminal program for telecommunications or hard-wired computer-to-computer data transfer. Term assumes that you have already configured the Model 4's RS-232C hardware, which is one of the tasks accomplished by Setup. If you haven't run Setup or don't have a copy, insert the following line of code into Term (just before the line containing the Setcom parameters) before you call it from Init:

SET *CL TO COM/DVR

Term sets the baud rate at 1,200 and the system for 8 data bits and 1 stop bit. The even-parity default values and control-C break value are not changed. Term finishes processing by calling the TRSDOS 6 terminal program. The code phrase //Stop is a JCL instruction telling the Model 4 to remain in the application program—in this case COMM—after termination of the JCL. Without this statement, control would revert to TRSDOS Ready when the JCL file ends.

The second JCL module is Mdisk, which automatically answers the prompts generated by the TRSDOS System command that defines Memdisk. As programmed, Mdisk uses both upper memory banks in a 128K Model 4 (by answering D to the bank-select prompt); defines the drive as double-density (answering D to the single- or double-density prompt); and instructs the computer to format it (answering Y to the format prompt). You can modify the file by replacing the letters with any of the alternate responses listed in your TRSDOS 6 manual.

The JCL file configures Memdisk as drive 3. You can set up Memdisk as another drive by changing the drive number in the following Mdisk line:

SYSTEM (DRIVE = 3,DRIVER = "MEMDISK")

Logfile, the third JCL module on the Init menu, allows you to monitor keyboard performance by keeping a log of DOS commands entered. You might use this feature to check the work of someone who has used your computer (for security purposes) or to reconstruct work you performed. Logfile stores DOS commands in an ASCII file called Log4 on drive 1. To store Log4 on a different drive, substitute the appropriate drive number in the following program line:

ROUTE *JL TO LOG4:1

Nolog, the fourth JCL module, is Logfile's counterpart: It turns off automatic command logging. Select this option when you want to read the command log. To then display the log, type LIST LOG4 at TRSDOS Ready.

Init's last menu option is Board2, which allows you to use a Radio Shack Model 100 as a laptop keyboard for the Model 4. I wrote this JCL file because I like to sit back with my feet propped up when I work at the computer. I have not included a JCL file to unlink the Model 100, since I usually just turn off the Model 4 when I finish a session at the keyboard.

Board2 works at the DOS level and with programs honoring the TRSDOS keyboard driver. You can modify it to allow keyboard control of your Model 4 from any other computer that has terminal communications capability. The TRSDOS 6 manual even states that you can control the Model 4 over phone lines by using a modem. In this case, the remote computer acts as a terminal to the Model 4.

Like Term, Board2 assumes you have already installed and run Setup. The Board2 module resets *CL, a device used by Setup to configure the RS-232C hardware. To prevent Board2 from aborting (if you haven't run Setup on your system), delete RESET *CL from Listing 7.

You can choose only one of the five JCL modules on each run through Init. I designed the program this way (instead of having it return you to the Init menu after

Program Listing 3. Term.

```
%1F.TERM/JCL - Model 4 Data Transmission Sequencer
.By Keith E. Risler.
SETCOM (BAUD=1200,WORD=8,STOP=1)
.Activate Model 4 Terminal Program
COMM *CL
//STOP
```

End

Program Listing 4. Mdisk.

```
%1F.Enable memory banks 1 and 2 as solid state 64K Memory Drive
.By Keith E. Risler
SYSTEM (DRIVE=3,DRIVER="MEMDISK")
D
D
Y
%1F.Memory based drive is Drive 3 in DIRectory
//ALERT 5,0
//STOP
```

End

Program Listing 5. Logfile.

```
%1F.LOGFILE/JCL - Initiate automatic command log on Drive 1
.By Keith E. Risler.
.CAUTION -- All entered commands are recorded in file LOG4
ROUTE *JL TO LOG4:1
//ALERT 1,0,7,0
.Command Log is on
//STOP
```

End

Program Listing 6. Nolog.

```
%1F.NOLOG/JCL - Terminating automatic logging procedure
.By Keith E. Risler.
RESET *JL
//ALERT 1,0,7,0
.CAUTION -- Automatic logging of commands is now OFF
//STOP
```

End

Program Listing 7. Board2.

```
%1F.BOARD2/JCL - Use Model 100 as Keyboard
.By Keith E. Risler.
RESET *CL
SET *CL TO COM/DVR
SETCOM (BAUD=9600,WORD=8,PARITY=NO)
LINK *DO *CL
LINK *KI *CL
.Keyboard linkage is now complete
.Model 100 is now your Model 4 keyboard
.Use STAT 88N2E in your Model 100 terminal program
.Use RESET to break linkage
```

End

Photo. Shell System's option menu.

each option's completion) in order to maintain the modular structure of the shell. If the selected JCL files returned control to Init, you couldn't use the modules individually from TRSDOS Ready.

Suppose, for example, that you want to install Mdisk without booting it through Init. You can do this by booting DOS while holding down the enter key and then typing DO MDISK. When the file ends, you'll return to TRSDOS Ready. If Mdisk returned control to Init after execution, you'd waste time circling through the master JCL file.

You can retain a measure of the Shell System's modularity and chain JCL files together. I use a version of Init with Superscripsit in which Mdisk has an extra line of code that reads:

SCRIPSIT/CMD:0

On that program disk, I always enter Superscripsit after running Mdisk, making it easier for me to tolerate the diminished flexibility. You'll have to decide for yourself how limiting your JCL modules can be. I've found it best to keep them as simple and general as possible.

Further Customizing

You can add an option of your own to the Init menu by inserting the following three lines of code:

```
//option number
%1Fprogram name
//STOP
```

The number following the two slashes (//) should reflect the numerical placement of the option in the menu. The program name can be an application program, another JCL file, or a DOS command.

You also must add a descriptive comment line to the Init menu. Be sure to place a period at the beginning of the line, which tells TRSDOS to display it, not to execute it. You can add as many special applications as you like, as long as you add the comment lines to Init's menu and supply the code within the master JCL. ■

Keith E. Risler is a computer hobbyist who holds a master's degree in journalism from the University of Western Ontario. You can write to him at 80 Adelaide St. S., London, Ontario N5Z 3K5.

Patching Things Up

If you searched through the November 1986 issue for the Model I patch program to go with our answer to Dick Kahoe's Feedback Loop question (p. 16), don't despair. We accidentally switched listings. See the Program Listing below for the real Patch/BAS, which lets you use the Model III driver for the Tandy DWP 200 printer on the Model I.

The listing that did appear (incorrectly labeled Patch/BAS) lets you bypass printer-control codes on a Model III running Newdos/80 2.0, and is further explained in this month's Feedback Loop (p. 16).

Program Listing. Patch/BAS for the Model I. (See p. 116 for information on using the checksums in this listing.)

```
10 CLS:PRINT"Model I Patch -- by David Goben": PRINT                '*  3911
20 CLEAR:DEFINT A-Y:HX$="0123456789ABCDEF"                          '*  2533
30 RESTORE:READ PL$ 'get filename                                   '*  1235
40 PRINT"Patching "PL$:PRINT:OPEN"R",1,PL$:FIELD 1,1 AS A$          '*  3814
50 Z=PEEK(VARPTR(A$)+1)+256*PEEK(VARPTR(A$)+2)                      '*  2781
60 IF Z>32767 THEN PT=Z-65536 ELSE PT=Z                             '*  2394
70 READ RS$ ' get file relative sector                              '*   652
80 IF RS$="END" THEN CLOSE 1:PRINT"Patches Complete.":END           '*  4089
90 V$=RS$:GOSUB 220:RS=V+1:GET 1,RS                                 '*  2177
100 PRINT"Altering Sector "RS$"H, ";                                '*  2628
110 GOSUB 210:RB=V 'get relative byte within sector                 '*  1094
120 PRINT"Relative Byte "V$"H ";                                    '*  2293
130 GOSUB 210 ' get byte count                                      '*   743
140 PRINT"for "V$"H bytes."                                         '*  1896
150 PRINT "   New data = ";:H$=""                                   '*  1994
160 FOR CT=0 TO V-1:GOSUB 210 'get value to put                     '*  1734
170 PRINT H$;V$;:H$=H$+":POKE PT+RB+CT,V:NEXT CT:PRINT              '*  3491
180 PUT 1,RS 'put sector back                                       '*   724
190 GOTO 70 'go for another patch                                   '*   634
200 'Byte value interpreter subroutine                              '*   146
210 READ V$                                                         '*   617
220 V=0:FOR X=1 TO 2:V=V*16+INSTR(HX$,MID$(V$,X,A))-1               '*  3163
230 NEXT X:RETURN                                                   '*  1158
240 'Patches in DATA statements in format:                          '*   150
250 'Filename                                                       '*   151
260 'Relative Sector, Relative Byte, Bytes Count, Patch Bytes       '*   152
270 DATA END                                                        '*   714
```

End

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TIDBIT #39

If you accidentally kill a TRSDOS 1.3 file on your Model III, don't give up and assume that all is lost. You can recover the file, but be warned that the level of difficulty depends on the number of files you have since stored on the disk, the amount of killed or deleted space that existed before you killed the file, and how much you know about the space the file occupied.

When you use the Kill command to get rid of a file, TRSDOS doesn't delete the file's contents right away. It flags the corresponding disk space as being available for the next file you save. The original file, therefore, isn't deleted until a new file is written over it.

The cases I'll describe all involve recovering 256-byte records, which are typified by Basic programs and Scripsit (ASCII) files. You can handle non-256-byte files by adding an LRL parameter to the Create command.

The most easily corrected situation—let's call it case 1—is when you know immediately that you want to recover a file, you have deleted no other files on the disk (meaning that data was stored contiguously from the starting track), and you know how many records the file contained.

Suppose the file contained six records. Execute the following statement:

```
CREATE OLDFILE (REC = 7)
```

which creates a directory entry called Oldfile having seven 256-byte records. Return to Basic, type LOAD"OLDFILE", and use the List command to look at the recovered file. Resave it by typing SAVE"OLDFILE".

(You might wonder why you use REC = 7 instead of REC = 6 to create the recovery file. The reason is that the Create utility fills the new file's last track with zeros; if you didn't create an extra track, Create would write over the end of the file with zeros.)

Unfortunately, most recovery situations aren't so cut-and-dried; few people study directories closely enough to remember how much space was occupied by the lost file. To recover a file under all the case-1 conditions but the last—you don't know how much space the file used—create a file large enough to cover the area you want to recapture. This situation represents case 2.

To find out how long the recovery file should be, execute the DIR command to find out the maximum number of granules on the disk. Since each granule contains three 256-byte records, you can set REC = 120 to cover an entire 40-granule disk. If you have a rough idea of the file's size, try setting the REC value slightly higher than your estimate to avoid losing part of the file.

After executing the Create command, use the TRSDOS List command (not Basic's List) to view the contents (type LIST followed by the file name). You must manipulate the enter and @ keys to make the screen start and stop scrolling. The display tells you each record's number, which you can use to find out where the old file ended.

If you determine, for example, that the old file occupied four records, kill the file you just created, recreate it with the correct number of records (REC = 5 in this example), enter Scripsit, load the file, edit it, and resave it.

Basic programs are harder to pick out of the TRSDOS List display because they aren't usually stored as recognizable ASCII characters. Look for beginning and concluding REM and Data statements, as well as the bit and hexadecimal symbols for Basic statements.

In the third type of recovery operation (hypothetical case 3), none of the case-1 conditions holds true. If you deleted files before the inadvertent kill, the recovery file shown after TRSDOS List will display other files ahead of the file you want.

Create a file called RECOV that is longer than the killed file by typing in CREATE RECOV (REC = nnn). Type LIST RECOV from TRSDOS Ready and observe the record count to determine how many records precede and include the target file. Kill the file you are scanning by typing in KILL RECOV. Assume, for example, that you find the target file begins at record 7 and ends at record 10 of RECOV.

Next, create a file that covers the distance to the target file. (If the target file is at the beginning of the RECOV area, skip this step, as you did in cases 1 and 2.) Here you don't have to add 1 to the REC value because you will make a filler space to facilitate getting the target file later. Assuming the hypothetical case of a target file occupying records 7–10, type:

```
CREATE FILL (REC = 6)
```

to create the filler.

Now, create the file you wish to recover, this time adding 1 to the REC value. Following the example, enter this statement:

```
CREATE OLDFILE (REC = 5)
```

Enter Basic, type LOAD"OLDFILE", resave the file (SAVE"OLDFILE"), and kill the filler.

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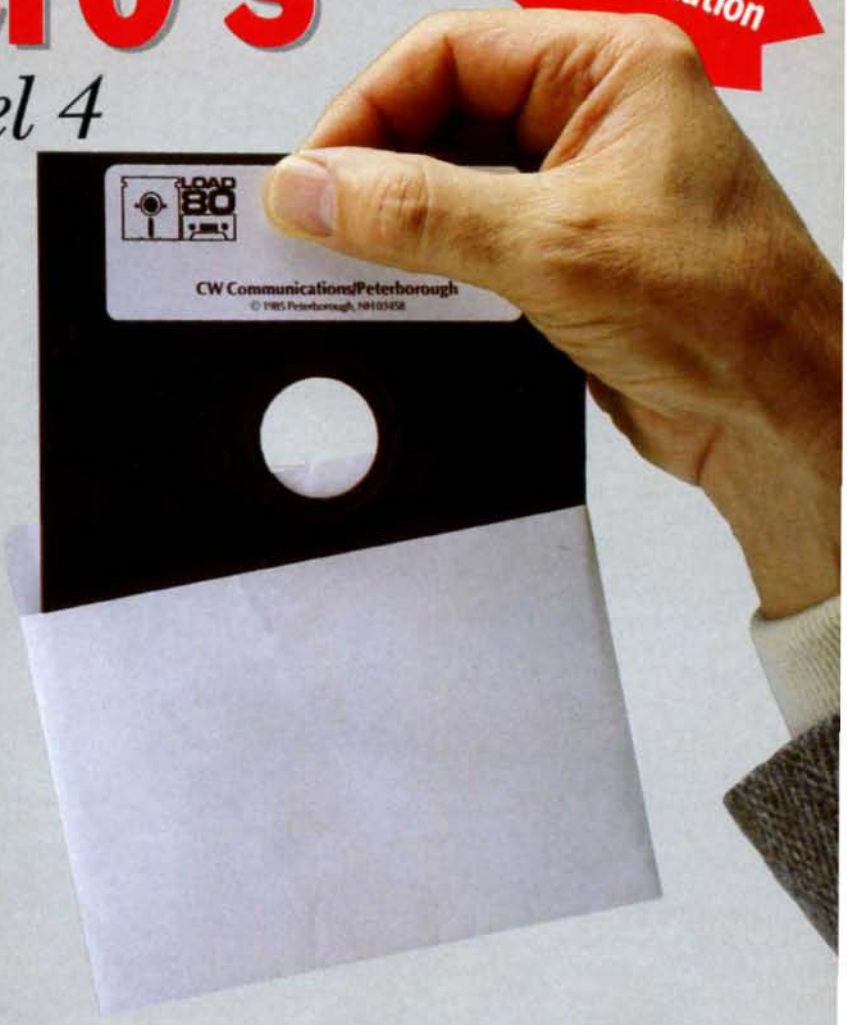

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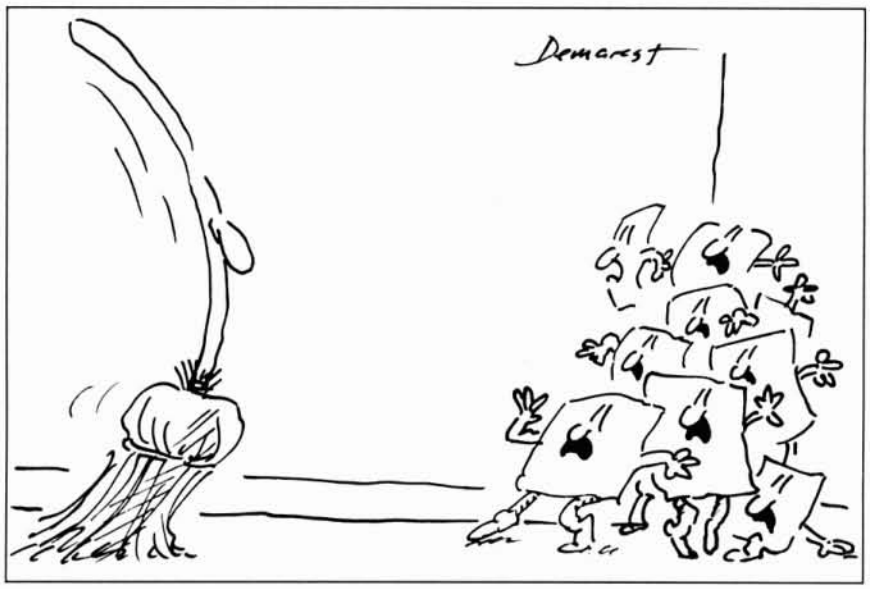
Clean Sweep



Many people are surprised to find that deleting a file doesn't remove its contents from a disk. All that actually changes is the disk directory. When you delete a file with the MS-DOS Delete or Erase command (or with GW-Basic's Kill), DOS changes the first character of the file's directory entry to E5 hexadecimal (hex) and alters the disk file-allocation table (FAT) to indicate that the deleted file's space is up for grabs.

Unless a new file has written over a deleted file, anyone can examine the disk and discover the contents of a deleted file using Debug or a disk editor, such as The Norton Utilities (Peter Norton, 2210 Wilshire Blvd., Santa Monica, CA 90403, $100) and PC Tools (Central Point Software Inc., 9700 SW Capitol Hwy., #100, Portland, OR 97219, $39.95).

If you work with proprietary material, you're open to disaster. On the positive side, the nondestructive methods MS-DOS uses to delete files also let you recover files. You can use the same utilities that let you examine a disk to "unerase" a file—again, provided you haven't written over it.

How can you be assured of destroying sensitive data in a file? One way is to overwrite the data with nonsense (or zeros), then delete the file. The Norton Utilities' Wipefile program does this (an accompanying program called Wipedisk "cleans" entire disks). Wipefile accepts wild-card file names and deletes hidden and read-only files, but it double-checks with you first. I have several other simple methods for wiping files. They're not as sophisticated or as easy to use as commercial utilities, but because you already have the necessary tools—Debug and Basic—they're cheap.

Debug Defilers

If a file is smaller than 64K, you only need four Debug commands to wipe it clean (see Fig. 1). Load the condemned file when you invoke Debug by putting the file name as a Debug parameter (as shown in Fig. 1). You can use a full path name with subdirectories if necessary. Debug won't modify a file that has the extension EXE or HEX; rename the file if you have to. The register command (R) displays the contents of the CPU registers. For files that are less than 64K, Debug puts the file length (hex) in the CX register when it loads the file (the 0B06 value in the example is 2,822 bytes decimal).

Once you know the file length, you can use the fill command (F) to load that many bytes of zeros or nonsense (in the example, repetition of the word "clean" followed by a space) into the memory-loaded file. Do this by putting the value held in the CX register after the length parameter (L) in the fill command. If you want a zero-filled file, replace the whole quoted phrase with a single zero. The first parameter after the F (DS:100) tells Debug where to start filling. (Debug always loads files starting 100 hex bytes into the CS segment.) Pressing W writes the altered file to disk; pressing Q quits Debug. It's then up to you to delete the cleaned file.

Wiping a file longer than 64K is more involved (see Fig. 2). The register pair BX:CX holds the length of a loaded file (it always does); filling must be done in several operations because Debug only fills 64K in any specified segment. Once you've filled one segment, adding 1000 to the segment address you used starts the fill at the next 64K segment. The 100 hex offset of the file in DS (the default segment) further complicates your address calculations. Using zero with the L parameter specifies 64K (10000 hex) as the length to fill. The three fill operations in Fig. 2 are more than enough to overwrite the example file.

You can use a similar technique to create dummy text files to test file-processing programs. You must put your own file length into CX with the register form of the R command (RCX for the CX register). Use the same length in the fill command. You must also specify a file name by adding the name as a parameter when you invoke Debug or by using the name command (N) from within Debug.

Basic Cleaning

You can also use a small Basic program to demolish a file's contents before deleting it. Clean (see the Program Listing) handles any size file (up to 2 gigabytes, anyway) using random-file techniques. (Sequential-file commands also do the job.)

On a Tandy 1000, Clean takes about a minute to wipe a 64K file from a 360K floppy disk. After entering the program in GW-Basic and saving it, type BASIC CLEAN from DOS to use it. Make sure that

System Requirements

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Basic

Illustration by Chris Demarest

```
C>DEBUG CIASPIES.TXT
-R
AX=0000  BX=0000  CX=0B06  DX=0000  SP=FFEE  BP=0000  SI=0000  DI=0000
DS=2756  ES=2756  SS=2756  CS=2756  IP=0100   NV UP DI PL NZ NA PO NC
2756:0100 0000          ADD     [BX+SI],AL
DS:0000=CD
-F DS:100 L0B06 'Clean '
-W
Writing 0B06 bytes
-Q

C>DEL CIASPIES.TXT
```

Fig. 1. Screen display created when wiping a text file (CIASPIES.TXT) clean of data with Debug.

```
C>DEBUG BASIC\LARGE.TXT
-R
AX=0000  BX=0002  CX=0001  DX=0000  SP=FFEE  BP=0000  SI=0000  DI=0000
DS=2756  ES=2756  SS=2756  CS=2756  IP=0100   NV UP DI PL NZ NA
PO NC
2756:0100 68            DB      68
-F 2756:0 L0 0
-F 3756:0 L0 0
-F 4756:0 L0 0
-W
Writing 20001 bytes
-Q
```

Fig. 2. Screen display from filling 128K (20001 hex) with zeros.

Program Listing. Clean.

```
10 INPUT "File to zero and delete";FILENAME$
20 ON ERROR GOTO 130:'    if file doesn't exist or isn't available
30 OPEN FILENAME$ FOR INPUT AS 1:CLOSE 1:'    check if file exists
40 ON ERROR GOTO 110:'    if write-protect tab or file-write error
50 OPEN FILENAME$ AS 1 LEN=128:'    128-byte random records
60 FLEN=LOF(1):RNUM%=INT(FLEN/128):RNUM%=RNUM%-(FLEN>RNUM%*128)
70 FIELD 1,128 AS FILL$:'    one field fills record
80 LSET FILL$ = STRING$(128,0):'    fill field with null characters
90 FOR I%=1 TO RNUM%:PUT#1:NEXT:'    record increment is automatic
100 CLOSE 1:KILL FILENAME$:END:'    close and delete zeroed file
110 PRINT "Write-protect tab or file-write error."
120 PRINT "File may be altered, but wasn't deleted.":RESUME 140
130 PRINT "Can't find or access filename. No action taken.":RESUME 140
140 CLOSE 1:END
```

End

you have both Basic and Clean on the default drive in this case. Clean prompts you for a file name and can accept a full path name if your file isn't on the default drive (or in the default subdirectory).

Clean tries to open the specified file for sequential input (line 30) to make sure the file exists before opening it for random use. If the name you specified doesn't exist, a random open would create an unwanted file. The error trap set up in line 20 handles this situation. The error trap set up in line 40 handles situations such as an unexpected write-protect tab or bad sector. With any error, Clean closes the file but does not delete it.

I used the default 128-byte record size (line 50) because it's the largest integral division of a disk sector that can fit in a string (255 bytes maximum). Figuring how many records to fill is then simplified (line 60). Line 80 fills the single record field with null characters, and line 90 writes the nulled field to however many records it takes to fill the file. Incrementing of the record pointer in the file is automatic. After Clean closes the zeroed file, the Kill statement (line 100) deletes it.

Control-X

GW-Basic provides a moderate set of full-screen editing features. You probably know that pressing control-end erases to the end of a line, and that control-Z erases to the end of the screen. These commands are in the manual. But did you know that control-X inserts the previous line at the cursor? For example, pressing control-X while the cursor's on line 20 inserts line 10, moving line 20 down the screen. Bill Sisto (La Mirada, CA) discovered this one. It's not in the Tandy GW-Basic and IBM Basic manuals I have.

If you use GW-Basic, it pays to read the manual section on key functions. The function keys, especially F1–F4, are always useful. For example, pressing F2 (without pressing the enter key) runs the current program. Pressing a letter key with the alternate key held down usually produces a Basic keyword (for example, alternate-P produces Print).

Printer Problems

If your printer sporadically produces double characters ("stutters and stammers," as one reader put it), your Tandy 1000 might need a BIOS (basic input/output system) upgrade. The original 1000 BIOS (version 1.00) doesn't disable interrupts during output from printers that aren't edge-triggered. (The LP VII and DMP 420 are examples.) If a hardware interrupt (a tick from the system clock or input from the keyboard, for instance) occurs during a certain phase of printing, a character (including line feeds and carriage returns) prints twice.

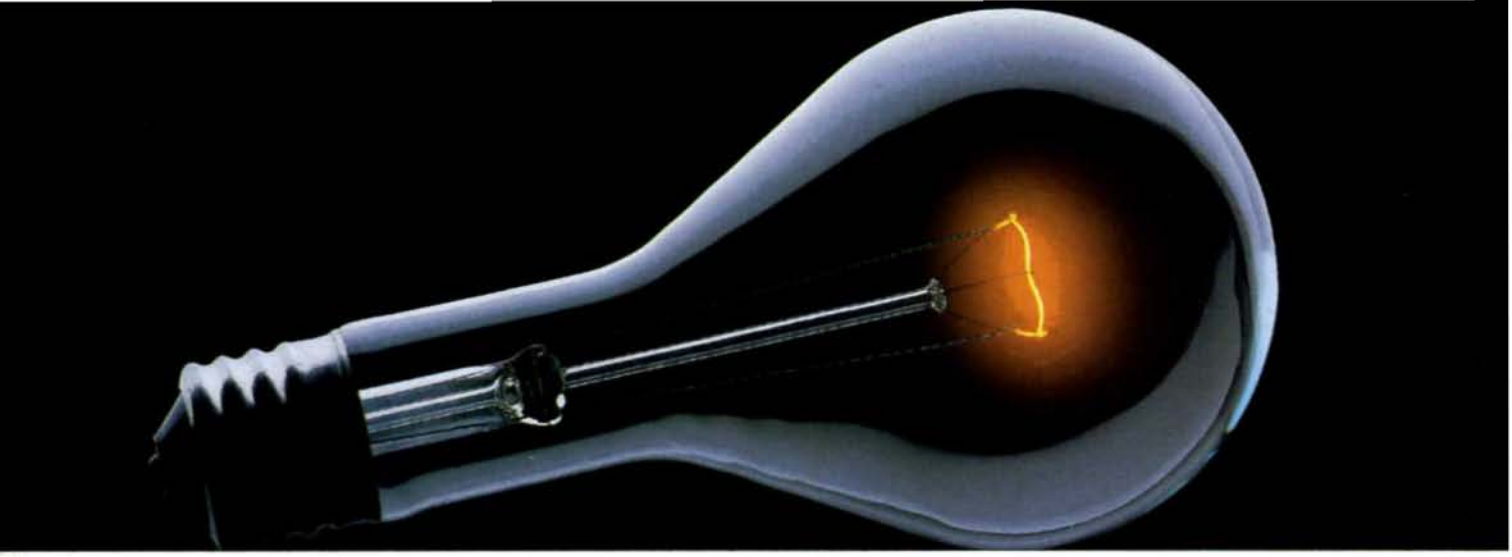
Bob Bass (Colabasas, CA) noticed slowed-down printing from his 640K 1000 when using either Volkswriter Deluxe or Wordstar. His Epson MX-80 paused between each line of text for about a second. Using the DOS Print utility, however, produced rapid printing of the same documents. (The Print utility doesn't format output, however.) The fix: When Bob installed a software print spooler, printing from his word processors improved markedly.

TRS80PRO

Have you heard of the SIG (special-interest group) on Compuserve called the TRS-80 Professional Forum? (Type GO TRS80PRO or GO PCS-21 when on line.) Section 5 covers Tandy's MS-DOS computers—the 1000, 1200, and 3000. You'll find discussions of new machines, discoveries of 1000 bugs (and maybe solutions), and other helpful items. You might also find help for some computer problem that's been nagging you. Check the section 5 data library (DL5) for answers before pestering the system operators (sysops). If a question comes up enough times, a definitive answer usually gets posted in DL5.

The MS-DOS data library (DL5) contains useful programs and commonly requested information. One DL5 program worth mentioning is T1KKEY.COM, a memory-resident keyboard handler that maps the 1000's F11 and F12 keys to read as the IBM PC's gray plus (+) and minus (–) keys. Adding these two keys makes using programs like Framework and Thinktank much easier on the 1000. There's also a RAM-disk program that shrinks itself on demand. Many of the discussions and stored files concern terminal packages and communications techniques. The file Tanlog.BAS, for instance, creates a dialog file for Vidtex and the Tandy 1000's 300-baud internal modem. ■

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



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Circle 78 on Reader Service card.

This Tidbit uses subroutines to pack and unpack numeric strings in Basic. You can use it to reduce the memory and disk space required for storing zip codes, telephone numbers, Social Security numbers, and account numbers.

You must use an even number of digits; if you're starting with an odd number, tack a zero onto its left side. (For example, you would change 326 to 0326.)

The first subroutine in the Program Listing packs strings (lines 30310–30340) while the second subroutine unpacks them (lines 30410–30450). The pack subroutine organizes the ASCII numeric string into byte pairs from left to right, packs each byte pair into a single binary byte, and combines the packed bytes into a string half as long as the ASCII numeric string.

Your main program must put the unpacked ASCII numeric string into the UP$ variable before Gosub 30300 and the packed string into PK$ before Gosub 30400. The first subroutine returns the packed string in PK$ and the second subroutine returns the unpacked string in UP$.

The Listing runs on the Models III and 4 (and under GW-Basic if you replace Print@ statements with Locate).

Curtis E. Stevens
Walnutport, PA

Program Listing. Program that compresses Basic numeric strings.

```
100 CLS:CLEAR 5000                                                    '*  1049
110 PRINT "Type in a numeric string,"                                 '*  2995
115 PRINT "using an even number of bytes."                            '*  3486
120 PRINT@192,CHR$(31);:LINE INPUT "          ";UP$                   '*  2771
130 L=LEN(UP$):M=FIX(L/2)                                             '*  1503
140 IF M*2<>L THEN GOSUB 15010:GOTO 120                               '*  2303
150 FOR I=1 TO L                                                      '*   931
160 IF MID$(UP$,I,1)<"0" THEN GOSUB 15100:GOTO 120                    '*  2860
170 IF MID$(UP$,I,1)>"9" THEN GOSUB 15100:GOTO 120                    '*  2872
180 NEXT I                                                            '*   609
190 PRINT "Input length is";L;" bytes."                               '*  3028
200 GOSUB 30300                                                       '*   840
210 PRINT@384, "The packed bytes are:"                                '*  2865
220 L=LEN(PK$):FOR I=1 TO L                                           '*  1619
230 P$=STR$(ASC(MID$(PK$,I,1)))                                       '*  1756
240 P=LEN(P$):P$=RIGHT$(P$,P-1)                                       '*  1811
250 IF P<3 THEN P$="0"+P$                                             '*  1368
260 PRINT P$+" ";:NEXT I                                              '*  1413
270 PRINT:PRINT "Packed length is ";L;" bytes"                        '*  3524
300 PRINT@676, "Press any key (except BREAK) to continue."            '*  4550
310 A$=INKEY$:IF A$="" THEN 310                                       '*  1740
400 GOSUB 30400                                                       '*   843
410 PRINT@704, "The unpacked string is:"                              '*  3110
420 PRINT "           "+UP$                                           '*  1275
430 PRINT "Unpacked length is";LEN(UP$);" bytes."                     '*  3737
500 PRINT@996, "press any key (except BREAK) to continue."            '*  4589
510 PRINT "Press BREAK to end this session.";                          '*  3576
520 A$=INKEY$:IF A$="" THEN 520                                       '*  1746
530 GOTO 100                                                          '*   674
15010 PRINT@896, "Odd number of bytes."                               '*  2885
15020 PRINT "Press any key (except BREAK) to try again.";             '*  4465
15030 A$=INKEY$:IF A$="" THEN 15030                                   '*  1942
15040 RETURN                                                          '*   762
15110 PRINT@896, "Nonnumeric input."                                  '*  2744
15120 GOTO 15020                                                      '*   874
30300 ' Pack ASCII Numeric string - Subroutine                        '*   246
30310 UP%=LEN(UP$):PK$=""                                             '*  1425
30320 FOR I=UP%/2 TO 1 STEP -1                                        '*  1726
30330 PK$=CHR$(VAL(MID$(UP$,I*2-1,2)))+PK$:NEXT I                     '*  2828
30340 RETURN                                                          '*   762
30400 ' Unpack into ASCII numeric string - Subroutine                 '*   247
30410 PK%=LEN(PK$):UP$="":FOR I=PK% TO 1 STEP -1                      '*  2813
30420 P$=STR$(ASC(MID$(PK$,I,1)))                                     '*  1856
30430 P=LEN(P$):P$=RIGHT$(P$,P-1)                                     '*  1911
30440 IF P<3 THEN P$="0"+P$                                           '*  1468
30450 UP$=P$+UP$: NEXT I:RETURN                                       '*  1958
```

End

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Choose Your Weapon: Basic, Pascal, or C

Illustration by Mark Steele

Comparing programming languages is a dangerous business. Many battles have been waged over claims that one language is better than another. Unless you're willing to risk Armageddon, it's generally safer to keep such opinions to yourself. Aware of the peril, I will keep last month's promise to compare the merits of Basic, Pascal, and C.

To begin, I'll list the features I think qualify a language for general-purpose microcomputer use. Afterward, I'll examine how each language handles these features and rank their performances on a scale of zero to 100. The language with the highest average score is the one I consider most worthy for microcomputer programming.

A Perfect Image

In my view, a general-purpose programming language is one that meets the following criteria:

- It is easy to learn.
- It handles all typical data types directly and with as few restrictions as possible. These types include integers (whole numbers); floating-point numbers accurate to at least six digits; high-precision numbers accurate to at least 12 digits; characters and groups of characters; and records, as in data files.
- It reads and writes sequential- and random-access disk files.
- It has a well-documented interface to other languages, including assembly language.
- It allows access to the underlying hardware or operating system directly when necessary.
- It allows easy means of inputting and outputting data (as appropriate) to standard devices, such as terminals or monitors, printers, communications ports, and keyboards.
- It includes or allows graphics commands (preferably the former).
- It supports transcendental functions, such as exponentiation, trigonometric functions, logarithms, and their inverses.
- It has a well-defined, standard syntax.
- It supports modular development, user-defined function libraries, recursion, and both global and local variables. These are necessary if a team of programmers uses a language for development.

This list is not all-inclusive. Certain applications might require more or different capabilities. Nevertheless, these 10 factors provide a reasonable yardstick for measuring language performance.

If I wanted, I could find versions of all three languages that fail to measure up to these standards. Rather than look for weak spots, however, I'll confine my discussion to the most promising versions: Turbo Pascal, Microsoft C 3.0 (though many of my comments apply to Lattice C as well), and Microsoft Quick Basic 2.0.

Easy to Learn

Most programmers agree that C is not an easy language to learn. I like C, but I would never recommend it to a beginner except as punishment. Programmers disagree, however, as to which language—Pascal or Basic—is easier for beginners to learn.

Pascal's syntax is picky compared to Basic's. The trailing semicolon causes anguish for novice and veteran programmers alike. Also, Pascal programs usually must be written with all functions and user-supplied procedures coded first. This is not how most people think; in fact, it's the reverse.

Pascal programs make the user declare all variables before use. Every time you use a variable, you have to make sure you declared it in the appropriate place. This, too, causes problems for beginners. The easiest way to learn a programming language is to sit down and use it. The fact that Basic comes free with most computers makes it highly accessible. Pascal isn't bundled with any popular computers. For this and the other reasons I've mentioned, I consider Pascal less easy to learn than Basic.

Handling Data Types

Basic has no problem handling typical data types. Most versions of Pascal don't include a high-precision type, but only integer and single-precision floating-point. However, the binary-coded decimal (BCD) version of Turbo Pascal includes a high-precision type that does qualify. I'll refer to that version, therefore, in this comparison.

Only Basic handles characters and groups of characters (strings) in a truly general way. Both C and Pascal handle strings in one of two ways: as an array of characters or as an array of pointers to a series of memory locations.

The first method wastes memory. If you have 1,000 character strings, you must allocate each the same amount of space. The second method doesn't waste memory, but it leaves string management up to the programmer—not an easy task.

On this point, Basic is clearly superior; C and Pascal are equally deficient. They tie for second place.

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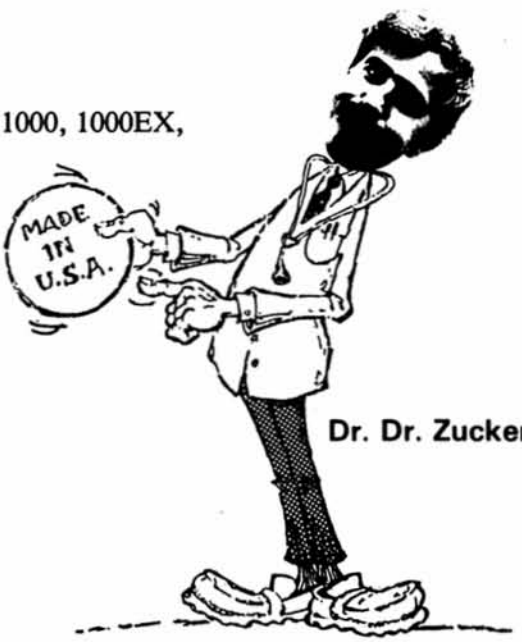

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	Basic	C	Pascal
1. Easy to learn	80	20	40
2. Handles typical data types	80	60	60
3. Disk-file read/write	90	90	90
4. Interface to other languages	90	80	90
5. Access to hardware or DOS	80	80	80
6. I/O to standard devices	95	60	75
7. Includes or allows graphics	95	60	75
8. Transcendental functions	80	95	50
9. Standard syntax	60	95	60
10. Supports modularity	80	90	90

Table. Basic wins hands down in a feature-by-feature comparison.

Disk-File Read/Write

All three languages can read and write sequential and random files. The syntax varies, but I see no reason to rank one language above the others.

Language Interfaces

Basic, C, and Pascal can use routines written in other languages. C, however, passes the arguments in inverse order, unlike Pascal and Basic. Nevertheless, you'll encounter few problems using any of these languages with assembly or with each other. The methods for doing so are clearly described in each language's manual.

Access to Hardware or DOS

Each language allows access to the computer's hardware or DOS. Each includes methods for calling the BIOS (basic input/output system) directly when necessary. The methods aren't particularly pretty, but they're not difficult.

I/O to Standard Devices

Basic has the cleanest interface to peripheral devices, though Pascal isn't far behind. Basic's commands for cursor location, color selection, serial port I/O, and hardcopy output give it an edge. C suffers from its minicomputer background. Commands specific to a particular computer are normally found in user libraries; they're not built into the language. Unfortunately, user libraries must be written or purchased.

Turbo Pascal supports the terminal well, but it's deficient in serial-port I/O commands. Setting a serial port to a baud rate and sending or receiving data isn't easy in Turbo Pascal. Again, you can write or purchase libraries for such tasks.

Graphics Commands

In this category, I rate Basic, Pascal, and C the same as I did in the previous category. Basic has a complete set of graphics capabilities; Turbo Pascal has some; C has none. Libraries can extend Pascal and C, and they are generally available at reasonable prices.

Transcendental Functions

Basic supports all the transcendental functions I mentioned earlier in either single- or double-precision mode. Turbo Pascal supports them in single-precision floating-point; the BCD math library that allows high-precision math doesn't support transcendental functions. C supports all the mentioned functions as well as hyperbolic functions in double-precision form. Advantage: C.

Standard Syntax

All three languages are popular and have had enough texts written about them to define their syntax. C has a widely accepted standard syntax, though users disagree about the implementation of certain features on different machines. Overall, C is easier to move to different computers. Both Basic and Pascal have problems with syntax. No useful standard exists for Pascal except for Turbo Pascal. Basic has no popular standard except for Microsoft Basic. The ANSI standard for Basic and the ISO standard for Pascal have been ignored by most programmers (for good reason). Advantage: C.

Supports Modularity

If I were writing this article in 1982, I'd subtract points from Basic on this score. It's always been possible to write modular programs in Basic, but not with global and local variables, user-defined function libraries with separately compiled submodules, and features programming teams require. Until Microsoft released Quick Basic, Basic was a language for one-person projects.

Current versions of Basic are more supportive of modular programming. In fact, I'd say Basic is on a par with Pascal and C. The implementations are different, and one language might still be better than another for certain jobs (Basic's subprograms are not recursive, for example), but overall the languages are equally supportive of modular programming. Except for the recursion factor, I'd put them in a three-way tie. As it stands, Pascal and C tie for first, with Basic a close second.

The Envelope, Please

Now to the nitty-gritty. I rated each language on a scale of zero to 100 for each of the 10 factors. (See the Table.) To simplify matters, I gave each factor equal weight. You might want to weight them differently, which is understandable.

From the results, it's clear that C is preferable to Basic for writing some kinds of programs. If you need the full set of transcendental functions, if you want to transport the program to a minicomputer or mainframe, or if recursive programming is necessary, then C is your best choice. Pascal rates higher than Basic only on modularity, and not by very much.

Using the same criteria, I rated a few other languages as well. The results are as follows: MBasic 5.2, 74; Model III Basic, 69.5; APL, 61.5; Cobol, 58; Fortran, 76.5; assembly, 59.

A Polemic

Some people claim that Basic ruins programmers for whom it is a first language, while Pascal teaches good habits. In my experience, the opposite is true. People who learn Pascal as a first language tend to be dogmatic, inflexible, and snobbish.

The time has come to tell it the way it is: Pascal isn't a useful alternative to Basic for anything. The language requires the user to be responsible for things computers are far better at than people: keeping track of variables, remembering where lines and statements begin and end, manipulating double-precision numbers and transcendental functions, managing string-data space, and keeping track of procedures and subroutines. To force such a language on beginners is silly, if not cruel.

Pascal might, as its proponents claim, force users to develop good programming habits. But continuing to use Pascal is like choosing to ride a bicycle with training wheels when you're an adult. Pascal users should graduate to a really good language when the time for training wheels is past. I recommend Basic, with a little exposure to C to prepare them for the additional capability.■

Bruce Tonkin is an independent software developer and industry critic. Write to him at 34069 Hainesville Road, Round Lake, IL 60073. You can also contact Bruce through Syslink and BIX.

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Important note: Every converted BASIC program will require some user editing (the 5% or less) before it will run on a PC. To facilitate such revisions, every keyword that may need manual attention is flagged and our user guides explain why and what needs to be done. For most programs, a casual knowledge of BASIC is sufficient to make the changes. However, if a BASIC program contains machine language, it will be extremely difficult for the average user to handle some of the necessary manual revisions!

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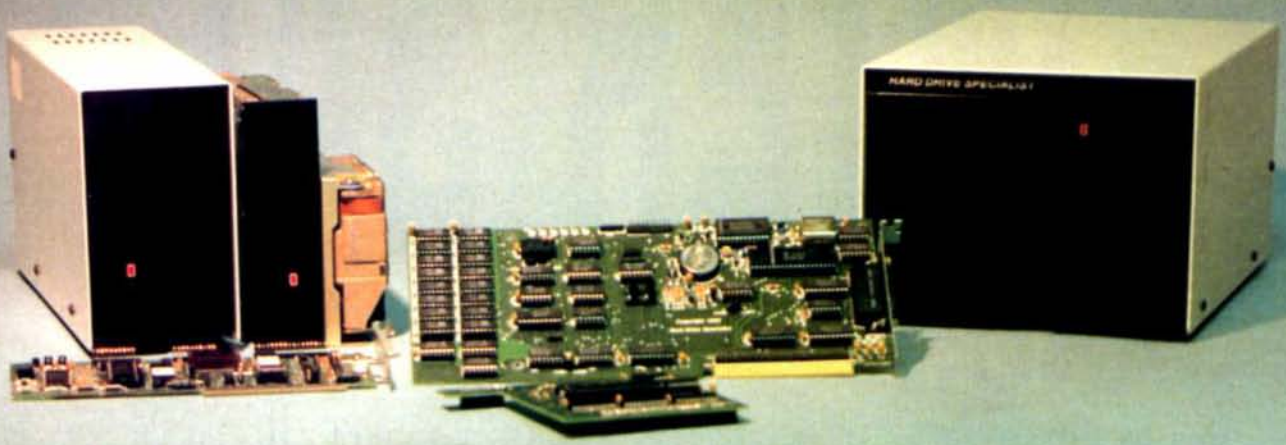

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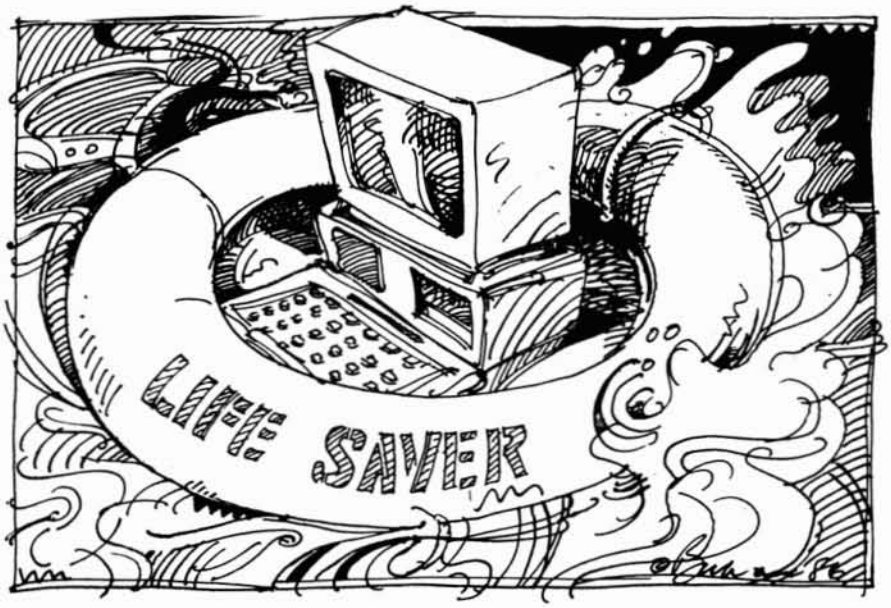


Pity the poor Tandy 2000 owner. He has a sophisticated machine with excellent graphics capability and impressive speed, but many of his favorite PC programs won't run on it. Instead, he's stuck with Tandy's and a handful of other suppliers' programs. When it came to software compatibility, Tandy left him in the cold.

Fortunately, help exists in the public domain. Bulletin-board systems (BBSes) are bountiful sources of programs for the Tandy 2000. Some are customized versions of popular software packages; others are short fixes that let you run off-the-shelf products on the Tandy machine. Utilities, word processors, languages, and telecommunications programs are among the programs you can find.

Of course, commercial on-line services also have programs for 2000 users. One of the best (and largest) sources is Compuserve's TRSPRO special-interest group (SIG), which offers a variety of programs and has a sizable membership. Not everybody wants to pay to belong to an on-line service, however. For cost-conscious 2000 owners, BBSes might be a better alternative.

I culled the programs described in this month's column from a number of BBSes with special sections for the Tandy 2000. Most of the programs also work on the 1000 EX and SX, 1200, and 3000 models. (See the Table for a list of BBSes that have software for the Tandy 2000.) Most of the programs are DOS utilities, but with a little effort, you can find almost any kind of program you need.

On My List

•Katalog helps you find files and programs by making lists of your disks and directories. When you run the program, it prompts you to insert the disks you want to catalog.

•Double Directory is the only program I know of that displays two directories side by side on screen. You can scroll through them and switch back and forth. The program is useful for comparing directories when you want to determine when you last backed up a disk or hard drive.

•Color lets you set the background and foreground colors of your monitor. The menu displays 16 color choices (normal and high intensity) and the proper syntax for using them. The colors, which are especially good-looking on the 2000's CM-1 color monitor, make reading the screen easier on the eyes.

•Page lets you display an 80-character by 50-line ASCII file on a nicely shaded background. You can page through the file, scroll horizontally, scroll line by line, and move to the beginning or end of the file more easily than you can using the DOS Type command or a word processor.

Improving Your Image

•Macpix is one of the few programs available that takes full advantage of the 2000's sharp (640- by 400-pixel resolution) display. The program lets you display digitized images from Macpix files, which also can be downloaded from a BBS.

When you type in Macpix, don't be surprised when nothing happens: Pressing the enter key makes the program display the instructions. Pressing the up- or down-arrow key moves the picture up or down one pixel row. The page-up and page-down keys move the picture 10 pixel rows. To print, load, set the printer, or exit to DOS, hold down the shift key and press P, L, S, or E, respectively. (The program instructions fail to mention that you need to press the shift key.) When you load a file, remember to tack the PIC extension onto the end of the file name. Loading a file takes about 18 seconds.

Of the Macpix files I've seen, the majority are images of scantily clad women. I'm told, however, that you can also find images of such people as Albert Einstein and James Cagney.

•Want to run PC-Talk on your 2000? Though the PC-shareware telecommunications program doesn't normally work on the 2000, I found a fixed version that does. The program displays a help screen on the right side of your screen, while your telecommunications session occupies the left side. You can clear the screen, scan the dialing directory, set your program parameters, set and clear the function keys, redial the last number, receive and transmit a file, view or delete a file, view the elapsed time in a session, and print your screen. The program is available in both interpreted and compiled Basic.

•Filer is a file-management utility that lets you sort and page through a directory, as well as mark, hide, and delete files. The program uses a split screen. The left side displays the current directory, with the name of the current drive and path appearing at the top. The right side displays help instructions. You can rename files, execute them, and display them in either hexadecimal (hex) or text format.

•Vfiler is another file-management program that lets you tag files in the current directory for mass operations, such as copy or delete. The program shows you a list of files in the directory and asks you to indicate those you want tagged. Move the cursor to the appropriate files and

Illustration by Yvonne Buchanan

press T. The program displays all tagged files in boldface. It also tells you the number of files you've tagged, the size of the current file, and the file's creation date. For help, press the question-mark (?) key.

•Move is an offshoot of the DOS Copy command. You can move files and directories and merge directories and subdirectories—a handy little utility.

•I also found fixes for making Sidekick (SKT2K.TXT) and Membrain (Membrain.HOW) work on the 2000.

•If you need help finding files, take a look at Search. It searches by drive, extension, or path, and it displays the total number of files and paths searched.

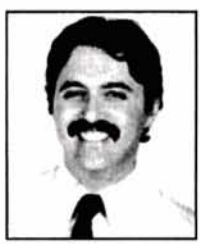
•PCUTIL is a collection of utilities for the 2000. It includes utilities for setting the number-lock and caps-lock keys, setting monochrome or color mode on your monitor, dialing phone numbers, programming your computer's speaker to emit a beep, setting the computer to wait a specified period of time before it can be used, determining memory size, printing sorted directories, and initializing an IBM graphics printer with different options. Instead of typing separate commands, you invoke all utilities on a single command line.

•If you can't find the software you need in Tandy's catalog, you might check SOFTWR.TXT. This list of software for the Tandy 2000 was originally posted on Compuserve but is now available through bulletin boards. The list is sectioned by application, some of which are highly specialized (one section, for example, is devoted to farm programs). Vendor/developer names and addresses appear at the end.

With Tandy cutting back its software program (see Pulse Train, p. 21), the software needs of 2000 owners are likely to become more critical. BBSes and the system operators (sysops) who run them do a great job of servicing this need. If you call a BBS, be sure to compliment those involved for their effort. They deserve the applause. ■

BBS	Location	Phone number	Baud
BBS-HQ	Boca Raton, FL	305-737-1590	300/1,200/2,400
80186 BBS	Nashua, NH	603-888-7562	300/1,200/2,400
MX 2000	Santa Rosa, CA	707-557-1096	300/1,200
2000 BBS-PC	Sugarland, TX	713-980-9671	300/1,200/2,400
Ridge BBS	Paradise, CA	916-872-3124	300/1,200/2,400
BBS 2000	Brunswick, GA	912-267-0758	300/1,200

Table. BBSes that have software for the Tandy 2000. All are open 24 hours a day, have x-modem capability, let you upload/download files, and let you leave messages.



As a technical writer for 80 Micro, Ryan Davis-Wright covers TRS-80 and MS-DOS computers. Write to him c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.

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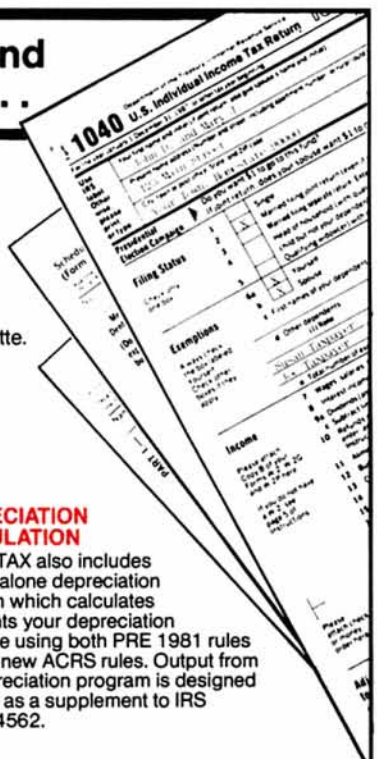

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Prefab Programs

Beginning programmers often feel that each problem they face is unique. Once they develop, code, and debug an algorithm, they use it in one program and forget about it. Experienced programmers, on the other hand, know they'll face the same problems over and over; those who work efficiently build libraries of solutions.

How you build and maintain libraries depends on the languages you use, the tools you have available, and your programming techniques. I find it hard to use libraries in Basic programs, for example, even though I've developed the tools to do so. Basic's insistence on global variable names and absolute line numbers always seems to get in the way.

However, I use libraries extensively when I write in assembly or C. To create the demonstration programs for this column, I often develop the program by first using my libraries and then work backwards (sometimes adding comments to disassemblies) until I have a program that looks like it was created from scratch. The main reason I use the Misosys assemblers, Pro-Create/EDAS and MRAS, on the Model 4 is because they simplify library development and use better than the other products I've tried.

If modified slightly, many of the techniques I'll discuss this month are portable to other advanced assemblers. They are the techniques that work well for me; you might find you can program more efficiently using other methods.

Hacker's Helpers

Essentially, macro commands are sets of instructions telling the assembler how to write a section of code, freeing you to think more about the program's overall logic. They're so powerful and easy to use that I sometimes overuse them.

You might need to compare the HL and DE registers several times in a program. Instead of writing the same instructions repeatedly, you can define a macro called CP_HL_DE (see Fig. 1) and

System Requirements

Model 4, 4P, and 4D
Editor/assembler

Illustration by Fred Schrier

Fig. 1. Macro for comparing HL and DE registers.

```
;--------------------------------------
;   Compare HL and DE, results in flags
;       If HL < DE:   C, NZ
;       If HL > DE:  NC, NZ
;       If HL = DE:  NC,  Z
;  Changes Flags only
;--------------------------------------
CP_HL_DE  MACRO
          PUSH    HL        ;;Save HL
          OR      A         ;;Reset carry flag
          SBC     HL,DE     ;;Compare
          POP     HL        ;;Recover original HL
          ENDM
```

End

Fig. 2. Macro for comparing HL with other registers.

```
;--------------------------------------
;   Compare HL and SS, result in flags
;        SS = {BC | DE | HL | SP}
;       If HL < SS:   C, NZ
;       If HL > SS:  NC, NZ
;       If HL = SS:  NC,  Z
;  Changes Flags only
;--------------------------------------
CP_HL     MACRO   #SS
          PUSH    HL        ;;Save HL
          OR      A         ;;Reset carry flag
          SBC     HL,#SS    ;;Compare
          POP     HL        ;;Recover original HL
          ENDM
;
;
;--------------------------------------
;   Compare HL and DE, result in flags
;--------------------------------------
CP_HL_DE  MACRO
          CP_HL   DE
          ENDM
```

End

Fig. 3. Macro for invoking supervisor calls (SVCs).

```
;-----------------------------------------
;     Invoke a TRSDOS 6 SVC
;     If "check" is specified, exit
;     through @ERROR if NZ flag is returned
```

Fig. 3 continued

Fig. 3 continued

```
;     from TRSDOS.
;-----------------------------------------
SVC     MACRO   #NUM,#CHECK
        LD      A,#NUM          ;;A = SVC number
        RST     28H             ;;Perform SVC
        IFGT    %%,1            ;;More than one argument?
          JR      Z,$1?         ;;Go if no error
          LD      C,A           ;;Put error code in C
          LD      A,1AH         ;;@ERROR SVC number
          RST     28H           ;;Exit through @ERROR
$1?       EQU     $             ;;Here if no error
        ENDIF
        ENDM
```

End

Fig. 4. Macro for pushing registers onto stack.

```
;-----------------------------------
;   RPUSH -- pushes 1 to 6 registers
;            on the stack.
;   Example: RPUSH    AF,BC,HL,IX
;-----------------------------------
RPUSH   MACRO   #R1='!',#R2='!',#R3='!',#R4='!',#R5='!',#R6='!'
        IRP     XX,<#R1,#R2,#R3,#R4,#R5,#R6>
          IFNE$   XX,'!'
            PUSH    XX
          ENDIF
        ENDM
        ENDM


Example of processed and assembled code:

0000            00014           RPUSH   BC,DE,IX
                00015           IRP     XX,<BC,DE,IX,'!','!','!'>
0000+           00016             IFNE$   XX,'!'
0000+           00017               PUSH    XX
0000+           00018             ENDIF
0000+           00019           ENDM
                00020             IFNE$   BC,'!'
0000+C5         00021               PUSH    BC
                00022             ENDIF
                00023             IFNE$   DE,'!'
0001+D5         00024               PUSH    DE
                00025             ENDIF
                00026             IFNE$   IX,'!'
0002+DDE5       00027               PUSH    IX
                00028             ENDIF
                00029             IFNE$   '!','!'
                00030               PUSH    '!'
                00031             ENDIF
                00032             IFNE$   '!','!'
                00033               PUSH    '!'
                00034             ENDIF
                00035             IFNE$   '!','!'
                00036               PUSH    '!'
                00037             ENDIF
```

End

Fig. 5. Macro containing expanded RPush command.

```
;-----------------------------------------
;   RPUSH -- Version 2
;     Pushes 0 to 6 registers onto the stack
;     Example:  RPUSH   BC,DE,HL,IX
;-----------------------------------------
RPUSH   MACRO   #R1,#R2,#R3,#R4,#R5,#R6
        IFGT    %%,0
          PUSH    #R1
        ENDIF
        IFGT    %%,1
          PUSH    #R2
        ENDIF
        IFGT    %%,2
          PUSH    #R3
        ENDIF
        IFGT    %%,3
          PUSH    #R4
        ENDIF
        IFGT    %%,4
          PUSH    #R5
        ENDIF
        IFGT    %%,5
          PUSH    #R6
        ENDIF
        ENDM
```

End

Fig. 6. Macro containing four TRSDOS SVCs.

```
00100 ;-----------------------------------------
00110 ;   DEFINE -- Define a label unless it
00120 ;         is already defined.
00130 ;-----------------------------------------
00140 DEFINE  MACRO   #LABEL,#VALUE
00150         IFNDEF  #LABEL
00160 #LABEL  EQU     #VALUE
00170         ENDIF
00180         ENDM
00190 ;
```

Fig. 6 continued

The power of macros rests in their ability to substitute user-defined strings for dummy variables.

place the code near the beginning of your program. When you want to compare the HL and DE registers, you need only type the command CP_HL_DE. The assembler inserts the four lines from the body of the macro definition into the program for you.

Figure 1, though simple, effectively demonstrates the syntax of macro definitions. After the explanatory remarks, the first line contains the name of the macro command and the Macro pseudo-op to tell the assembler you are starting a macro definition. The last line must have the ENDM pseudo-op. Everything in between is the macro body.

Also notice that all the remarks in the macro body begin with two semicolons, which are a command to the assembler to leave the remarks out of the listing when the macro is used or expanded. Whether you use single or double semicolons in a macro command is mostly a matter of taste and partly depends on how confident you are that the macro does exactly what you intended.

Figure 2 is of more general use than Fig. 1 (and more likely to be included in a macro library) because it allows you to pick a register to compare with HL. The same macro can be used to compare the HL and DE registers during one invocation and the HL and BC registers later. It takes a string that you specify for #SS and substitutes it for every occurrence of #SS in the macro. Since macros can call each other, you can now write the original CP_HL_DE in terms of CP_ HL (see the bottom of Fig. 2).

The power of macros rests in their ability to substitute user-defined strings for dummy variables. They can be made even more powerful by incorporating conditional expressions.

Figure 3 is a macro I use in virtually every Model 4 program I write. It invokes a supervisor call (SVC) and, optionally, checks the Z flag for a TRSDOS error. It also demonstrates three more features of macro commands.

First, it is often useful to know how many arguments were used to invoke a macro command. The Misosys assemblers use a double percent sign (%%) to

represent that value. Each time a macro is used, %% equals the number of arguments passed to the macro on that particular invocation.

Second, parts of a macro command can be conditional: The assembler decides whether to include them in the code it generates. The conditions must be based on information the assembler knows, not on conditions in a running program. You can test the values of labels or macro arguments, but you can't test the contents of a machine register or storage variable.

If Fig. 3 is invoked with a single argument, the argument becomes the SVC number and the SVC macro generates two lines of assembly-language code. If it is invoked with two arguments, the first is used as the SVC number and the second forces assembly of five more lines of code that make the program exit if TRSDOS returns an error from the SVC. It makes no difference what you use for the second argument, although I usually use the word "check" so that my original source code is clearer.

Finally, Fig. 3 demonstrates the use of a local label in a macro command. Each time the assembler expands a macro, it increments an internal counter, which is used to establish a substitution string for the question-mark symbol (?) wherever it appears in the body of the macro. The substitution strings generated are A–Z for the first 26 macro invocations, AA–ZZ for the next 676, and AAA–ZZZ for the next 17,576 macro expansions. I don't know how the assembler will react if you have more than 18,278 macro expansions in the same program.

The substitution string lets you use local labels in a macro command. If SVC is the first macro expanded in a program, the $1? label is changed to $1A when the assembler generates assembly-language code. If SVC is used again as the 28th macro in a program, the same label is expanded to $1AC.

You can perform still more tricks with macros. Figure 4 shows one I wrote to push one to six registers onto the stack (actually two macro commands combined). The first is called RPush and has six arguments, #R1 to #R6. Each has a default value; any argument not defined by the macro call defaults to a value shown as an exclamation point (!). RPush contains an invocation of one of the three "Intel standard" repeating macros. IRP substitutes each argument it receives for the dummy parameter XX during each invocation. In other words, on the first invocation of the IRP macro, XX is replaced by the value of #R1 defined in the outer RPush macro call.

The IRP macro also has a conditional

Fig. 6 continued

```
00200 ;-----------------------------------------
00210 ;   @@FSPEC -- Move filespec or devspec
00220 ;       to an FCB or DCB
00230 ;   Test Z / NZ after using!
00240 ;   #Fname and #FCB are both required.
00250 ;   DE is set to #FCB
00260 ;   AF is altered.
00270 ;-----------------------------------------
00280 @@FSPEC MACRO   #FNAME,#FCB
00290         DEFINE  @FSPEC,4EH
00300         RPUSH   BC,HL
00310         LD      HL,#FNAME
00320         LD      DE,#FCB
00330         SVC     @FSPEC
00340         RPOP    HL,BC
00350         ENDM
00360 ;
00370 ;-----------------------------------------
00380 ;   @@OPEN -- Opens an existing file
00390 ;       or device
00400 ;   Aborts on all errors except changed LRL
00410 ;   #Buffer is required.
00420 ;   #LRL defaults to 0 (256)
00430 ;   #FCB defaults to current value in DE
00440 ;   AF is altered.
00450 ;-----------------------------------------
00460 @@OPEN  MACRO   #BUFFER,#LRL=0,#FCB
00470         DEFINE  @OPEN,3BH
00480         RPUSH   BC,HL
00490         LD      HL,#BUFFER
00500         LD      B,#LRL
00510         IFEQ    %%,3
00520           LD      DE,#FCB
00530         ENDIF
00540         SVC     @OPEN
00550         RPOP    HL,BC
00560         JR      Z,$1?
00570         CP      2AH             ;;Check for LRL change
00580         JR      Z,$1?
00590         LD      C,A             ;;Else error code to C
00600         LD      A,1AH           ;;@ERROR SVC number
00610         RST     28H
00620 $1?     EQU     $
00630         ENDM
00640 ;
00650 ;-----------------------------------------
00660 ;   @@GET -- Get one byte from file
00670 ;       or device
00680 ;   No error checking included
00690 ;   #FCB defaults to current value of DE
00700 ;   AF is altered
00710 ;-----------------------------------------
00720 @@GET   MACRO   #FCB
00730         DEFINE  @GET,03H
00740         IFEQ    %%,1
00750           PUSH    DE
00760           LD      DE,#FCB
00770         ENDIF
00780         SVC     @GET
00790         IFEQ    %%,1
00800           POP     DE
00810         ENDIF
00820         ENDM
00830 ;
00840 ;-----------------------------------------
00850 ;   @@CLOSE -- Close a file or device
00860 ;   #FCB defaults to value in DE
00870 ;   AF is altered
00880 ;-----------------------------------------
00890 @@CLOSE MACRO   #FCB
00900         DEFINE  @CLOSE,3CH
00910         IFEQ    %%,1
00920           PUSH    DE
00930           LD      DE,#FCB
00940         ENDIF
00950         SVC     @CLOSE,CHECK
00960         IFEQ    %%,1
00970           POP     DE
00980         ENDIF
00990         ENDM
01000 ;
01010 ;-----------------------------------------
01020 ;   @@CLS -- Clears the screen
01030 ;-----------------------------------------
01040 @@CLS   MACRO
01050         DEFINE  @CLS,69H
01060         SVC     @CLS,CHECK
01070         ENDM
01080 ;
01090 ;-----------------------------------------
01100 ;   @@DSPLY -- Displays line of text
01110 ;   LINE defaults to value in HL
01120 ;-----------------------------------------
01130 @@DSPLY MACRO   #LINE
01140         DEFINE  @DSPLY,0AH
01150         IFEQ    %%,1
01160           RPUSH   DE,HL
01170           LD      HL,#LINE
01180           SVC     @DSPLY,CHECK
01190           RPOP    HL,DE
01200         ELSE
01210           PUSH    DE
01220           SVC     @DSPLY,CHECK
01230           POP     DE
01240         ENDIF
```

Fig. 6 continued

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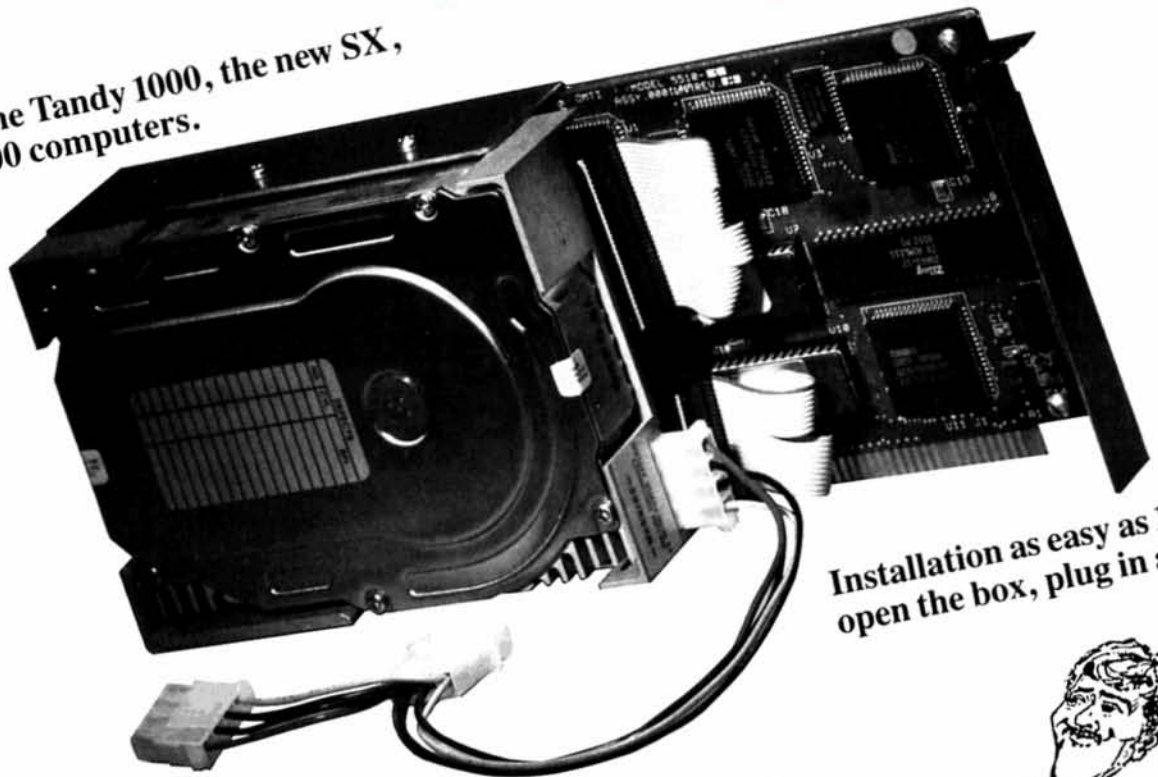

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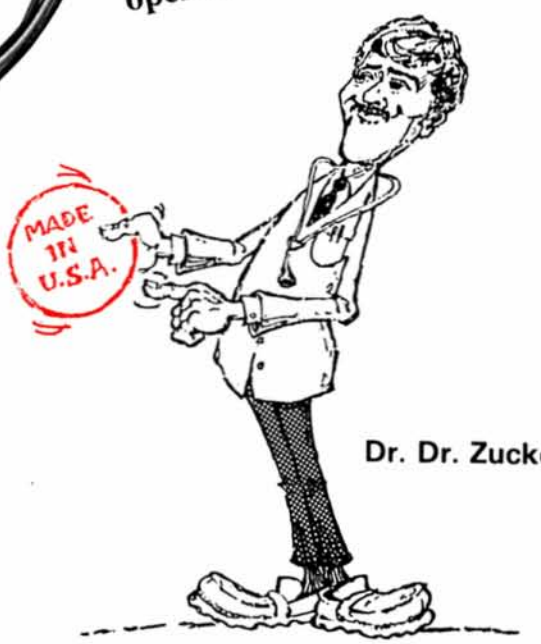

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statement that tests whether the XX dummy parameter has a value of !. If it does, no code is assembled. If it doesn't, the assembler generates the code to push the string represented by XX, which is one of the register pairs sent to RPush when it is invoked.

The bottom of Fig. 4 shows what the assembler creates for the macro instruction RPUSH BC,DE,IX. Although there are several lines of output from the macro, only three instructions are actually assembled: Push BC, Push DE, and Push IX. The assembler ignores everything else.

The version of RPush in Fig. 4 is a neat little macro that serves a useful purpose, but it isn't the version I included in my macro library. Regardless of how many arguments are passed to it, the Fig. 4 RPush updates the assembler's substitution counter seven times.

After using RPush a lot, I found that the substitution counter approached its limit even in small programs, so I rewrote RPush in the version shown in Fig. 5. It's less elegant, but it updates the counter only once. I also added a similar macro called RPop to my library—just substitute the pop string for each push that appears in the RPush macro.

Many other useful routines can be written as macros. Figure 6 shows four commonly used TRSDOS SVCs translated into macros. Figure 6 also contains two comparison macros that I use.

I try to write macros so they won't unexpectedly alter register values. Macros that use SVCs almost always alter the AF register, however, since that's the only way they can conveniently return a value from TRSDOS. My SVC macros also define the SVC name and number for documentation purposes, so the symbol list generated by the assembler contains a list of the SVCs used in the program.

There is a danger in using macro commands too often in a program. It is easy to forget that each command only requires a single line in your source code but can expand to dozens of lines in your finished program. Especially if you are concerned about the length of your final program, it might be better to write subroutines instead of macros.

Personal Libraries

Most programs contain two kinds of subroutines: general purpose and specialized. Adding the former to a personalized library can greatly increase productivity.

For example, the @Keyin SVC reads a complete line of text from the keyboard. There is no comparable SVC that reads a line from a disk file or device, but such a routine would be useful. Program Listing 1 shows a way to write one. It assumes

Fig. 6 continued

```
01250          ENDM
01260 ;
01270 ;-----------------------------------------
01280 ;  @@ERROR -- Reports an error.
01290 ;   Depends on CFLAG$ & SFLAG$ for options
01300 ;   Exits program via ABORT
01310 ;   Requires #ERRNO
01320 ;-----------------------------------------
01330 @@ERROR MACRO   #ERRNO
01340          DEFINE  @ERROR,1AH
01350          LD      C,#ERRNO
01360          SVC     @ERROR
01370          ENDM
01380 ;
01390 ;-----------------------------------------
01400 ;  @@EXIT -- Exits program
01410 ;  #RETCOD defaults to 0 (no error)
01420 ;-----------------------------------------
01430 @@EXIT  MACRO   #RETCOD
01440          DEFINE  @EXIT,16H
01450          IFEQ    %%,1
01460            LD      HL,#RETCOD
01470          ELSE
01480            LD      HL,0
01490          ENDIF
01500          SVC     @EXIT
01510          ENDM
01520 ;
01530 ;-----------------------------------------
01540 ;  IFEQ_JR -- Performs a JR if A = #Value
01550 ;-----------------------------------------
01560 IFEQ_JR MACRO   #VALUE,#JUMP
01570          CP      #VALUE
01580          JR      Z,#JUMP
01590          ENDM
01600 ;
01610 ;-----------------------------------------
01620 ;  IFLT_JR -- Performs a JR if A < #Value
01630 ;-----------------------------------------
01640 IFLT_JR MACRO   #VALUE,#JUMP
01650          CP      #VALUE
01660          JR      C,#JUMP
01670          ENDM
```

End

Program Listing 1. Linein.

```
00100 ;-------------------------------------------------------------
00110 ;  LINEIN
00120 ;       Reads a line of input from an open file or device.
00130 ;       Line is placed in a buffer and is not echoed to the
00140 ;       screen or printer.
00150 ;
00160 ;  ENTRY:        DE ==> Open FCB or DCB.
00170 ;               HL ==> Buffer to receive line (length B+1)
00180 ;               B  = Maximum line length.
00190 ;
00200 ;  RETURN: Success, Z flag set
00210 ;               HL ==> start of buffer (CR-terminated)
00220 ;               B = Actual number of characters input including CR
00230 ;          Failure, NZ flag set
00240 ;               A = error number
00250 ;
00260 ;  MACROS: DEFINE, @@GET, IFEQ_JR, IFLT_JR, SVC
00270 ;
00280 ;               Routine alters C register
00290 ;-------------------------------------------------------------
00300 ;
00310          IFREF   LINEIN
00320 *MOD
00330 ;
00340          DEFINE  LF,0AH
00350          DEFINE  CR,0DH
00360          DEFINE  TAB,09H
00370 ;
00380 LINEIN   PUSH    HL              ;Save beginning of buffer
00390          LD      C,0             ;To count characters
00400 ;---------
00410 ;  Loop to pick up characters
00420 ;---------
00430 LOOP?    @@GET
00440          JR      Z,NOERR?        ;Go if no error reported
00450          IFEQ_JR 0,ERROR?        ;Go if no character available
00460 NOERR?   IFEQ_JR TAB,SAVCHR?     ;Keep TAB in line
00470          IFEQ_JR CR,END?         ;Keep CR in line
00480          IFEQ_JR LF,END?         ;And linefeed also
00490          IFLT_JR ' ',EOF?        ;Go if not ASCII
00500 ;
00510 SAVCHR?  LD      (HL),A          ;Put character in buffer
00520          INC     HL              ;Point to next space
00530          INC     C               ;Add to count
00540          DJNZ    LOOP?           ;Get next character
00550 ;
00560 END?     LD      B,C             ;Get count of characters saved
00570          INC     B               ;Count terminating CR
00580          LD      (HL),CR         ;Terminate string
00590          POP     HL              ;Recover pointer
00600          XOR     A               ;Set Z flag
00610          JR      OUT?            ;And leave
```

Listing 1 continued

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that the macros in Figs. 2, 3, 5, and 6 are already included in the program.

A subroutine library is useless unless you can be sure its labels are local—they never conflict with those in a main program. You could keep a list of the labels in each subroutine and be sure never to use them for anything else, but it is easier to let the assembler assign unique labels when it compiles your program.

The first line of the Linein routine in Listing 1 contains the *Mod assembler directive. The Misosys assemblers keep track of two substitution strings: One is used for local labels in macros, the other for local labels in subroutines. The *Mod directive tells the assembler to increment the second counter.

The second step in creating local labels for subroutines is to add a question mark to every label in the routine. Although the labels in Listing 1 end with a question mark, you can adopt any convention in your own library.

Program Listing 2 is a short test program I used to debug the Linein routine. It assumes there is a file called Testfile/TXT on a disk (you can create the file with the Build command or with a text editor). It also assumes that Linein is in a file called Linein/ASM, and that the necessary macros are in a file called MACLIB/ASM.

You should be able to follow the logic of the test program easily. The program clears the screen, opens a file, reads lines from the file, and puts them on the screen. When it reaches the end, it closes the file and returns to TRSDOS without an error message. Because it relies heavily on macros and a general-purpose subroutine, the test program is easy to write and understand. It performs an important task in only 25 lines of code. Some high-level languages would require almost as much code to do the same task.

Listing 1 continued

```
00620 ;
00630 EOF?    LD      A,C             ;Get count
00640         OR      A               ;Did we have any characters?
00650         JR      NZ,END?         ;Yes -- end normally
00660         LD      A,1CH           ;Else show EOF error
00670         OR      A               ;Set NZ flag
00680 ;
00690 ERROR?  POP     HL              ;Clear the stack
00700         LD      B,0             ;No valid characters
00710 ;
00720 OUT?    RET
00730 ;
00740         ENDIF                                          End
```

Program Listing 2. Test program for Linein.

```
00100 ;-----------------------------------------------------------
00110 ;       Test Program for LINEIN Routine
00120 ;-----------------------------------------------------------
00130 ;
00140         OPTION  NC,NM,NE
00150 ;
00160 *LIST OFF
00170 *GET    MACLIB
00180 *LIST ON
00190 ;
00200         ORG     3000H
00210 BEGIN   @@CLS
00220         @@FSPEC FNAME,FCB
00230         @@OPEN  FBUFFER
00240 ;
00250 T1      LD      HL,LBUFFER      ;HL ==> line buffer
00260         LD      B,80            ;Maximum line length
00270         CALL    LINEIN          ;Read a line
00280         JR      Z,T2            ;Okay -- go
00290         IFEQ_JR 1CH,T3          ;Go if end of file
00300         @@ERROR A               ;Else report & leave
00310 ;
00320 T2      @@DSPLY                 ;Display line
00330         JR      T1              ;And loop back
00340 ;
00350 T3      @@CLOSE                 ;Close the file
00360         @@EXIT                  ;Return to TRSDOS
00370 ;
00380 *LIST OFF
00390 *GET    LINEIN
00400 *LIST ON
00410 ;
00420 FCB     DS      32
00430 FNAME   DB      'TESTFILE/TXT',0
00440 FBUFFER DS      256
00450 LBUFFER DS      81
00460 ;
00470         END     BEGIN
                                                               End
```

Memory Control

If you have a large number of subroutines, you need a way to control which ones are assembled into your programs. There's no reason to include a lot of unused code in an assembly-language program, especially since one of the reasons for writing in assembly is to reduce the size of the final program.

One way to use a library of routines and still keep your programs small is to put each routine in a separate disk file. For example, you might dedicate one disk to debugged subroutines and read short routine files into programs with the *Get or *Include commands when needed. (Each file, of course, requires one directory entry and at least 1 gran of disk space.) When your library is small, this approach works well. As the library grows, however, it could soon fill a disk with unused sectors at the end of each granule unless you use a program like LSI's Diskdisk to create a logical disk with very small granules.

A second approach that usually works well is to keep all subroutines in a single file and tell the assembler to generate code only for routines needed immediately. To do this, begin each subroutine with an IFREF pseudo-op and end it with ENDIF. You must also load the library (and therefore the subroutines) near the end of your program.

When the assembler reads IFREF plus a label, it includes the following code only if the label has already been referred to, but not defined, in the program. If a subroutine hasn't been referred to, for example, the assembler won't generate code for it. The technique requires that subroutines from your library be read into the source code near the end of a program to ensure that you have referred to all the necessary subroutines.

Another method of storing subroutines is used extensively on other computers but is only supported (as far as I know) by the ALDS, M80, and MRAS assemblers on the Model 4. Once you have debugged a subroutine, each of these assemblers can compile it into a relocatable object file that includes the object code for a routine or program module plus information on changing absolute addresses and accessing public labels. After assembling each routine, you can add it to a library of subroutines with a librarian program.

The finished program is also compiled into the relocatable object format. Then another special program called a "linker" searches through libraries in your main program, extracts the required subroutines, and uses them and your main program to construct a finished CMD program. Although the process sounds complex and is slower than direct assembly, it is probably the most efficient method to use if you write large programs or have extensive libraries.

Keeping Notes

The whole point of a library is to create "black boxes"—macros or subroutines you can use without worrying about the code. As your libraries grow, it becomes increasingly difficult to re-

member what they contain and the proper calling sequences. If you don't keep adequate documentation, they'll soon be useless.

I generally place the necessary information in a comment at the beginning of each macro or routine and surround the comment with lines of minus signs. Then I can use a short Basic program to print out the comments. Before I write a new program, I browse through a notebook of these comments to see what I've already written that might be helpful. When I'm lucky, I can depend almost exclusively on the libraries and add a little logical glue to hold macros and routines together. Developing a complex program can become nearly trivial.

Wheat from Chaff

It is rarely necessary to print unused conditional commands, lists of bytes in literal strings, expansion of macro commands, or code generated by a subroutine from a library. I almost always use the –NC, –NM, and –NE switches to suppress such listings. I also use the *List Off and *List On commands around *Get commands so that only the code specific to a program appears in listings. I can focus on a program's logic without worrying about macros and subroutines.

If you use such an abbreviated listing with Debug, you might feel lost at first. It seems as if you don't have enough information to know what is going on, but if you trust your libraries, you don't need to see most of the code. If you use the debugging macro from my July 1986 The Next Step (Debug Stops Here, p. 98) or the Debug C and G commands liberally, you'll find that a condensed listing is all you need to trace through a program intelligently.

The hardest problem most programmers face in developing libraries is knowing the difference between routines that are specific to one program and those that can be used in future programs. Only experience can help you make the distinction. But since there's no law that says every routine or macro must be used in a future program, it is usually best to add too much to your libraries rather than too little.■

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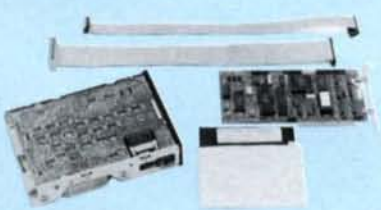

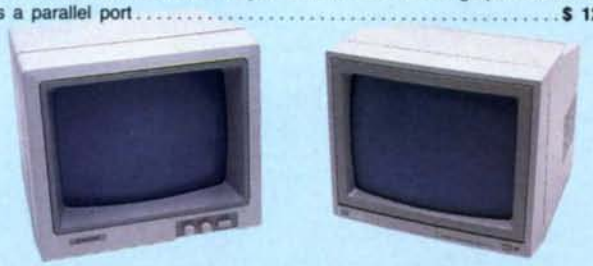

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Continued from p. 38

Golf
★★★

Golf runs on the Model 4 (64K) and requires two disk drives. Portable Software Inc., P.O. Box 394, Nottingham, PA 19362, 215-932-5395. $34.50.

Through the years, numerous golf games have been written for Tandy computers; this one from Portable Software is the latest in a long line. Unlike many other games that simulate play on only one course, Golf can handle up to three different courses: Beginner, Local Pro, and World Championship. As their names suggest, the three courses offer degrees of difficulty that range from easy to nightmarish.

First, you select the course you want to attempt and enter the names of up to four players. With all the requisite information entered, you're ready to play. The program displays the current hole. Besides illustrating the green and your ball, the graphics display shows the hole's boundaries and hazards. The hazards can include trees, water, roughs, and the dreaded sand traps. The display indicates the wind's direction and strength.

To play a hole, you must select a club, determine an appropriate amount of swing strength, and set the direction for the ball's flight. The factors involved in picking the proper club are mainly altitude and distance, with iron clubs generating a much higher altitude than woods. Set the direction by moving an indicator to the desired position or leave it at the default (east). You can move it to any one of 72 compass positions by using the left- and right-arrow keys.

Swinging the club is done in an arcade-type manner, taking into account factors such as hook, slice, and the impacting portion of the club head. Fortunately, Golf permits one practice swing for each stroke to give you a chance to make adjustments and fine-tune your swing.

Once you have successfully made it to the green, putting is a matter of entering the swing strength and direction. While the wind is no longer a factor, you must take the slope of the green into account; arrows point out any elevations or downhill grades.

Golf's documentation consists of a four-page manual that covers the game in all respects and should have you out on the course in no time. I was impressed with the excellent use of the Model 4's limited graphics capabilities. Although it is written in compiled Basic, Golf's lack of speed in some areas is annoying. Overall, Golf is a good simulation and quite fun to play.

—Mark D. Goodwin

XPIP
★★★★

XPIP Disk Management Tool runs on the Tandy 1000 and 1200 and the Model 4. It requires 128K and one disk drive for MS-DOS, 44K TPA and one disk drive for CP/M. System Facilities Inc., P.O. Box 7079, Charlottesville, VA 22906, 804-977-5245. $29.95.

Whoever invented MS-DOS subdirectory commands must own stock in a company like Systems Facilities, which profits from the sale of disk managers, file organizers, and other products designed to make life easier in the land of paths, directories, and trees. System Facilities' XPIP, an integrated utility, DOS shell, and disk-management helper, sets itself apart from the DOS utility crowd in three areas: overall usefulness, CP/M compatibility, and price.

The program operates in two modes: as a one-line command with options for the seasoned user and as a menu-driven shell with commands listed in windows. As an example of the former, the command:

```
XPIP \temp\* = f*.com/%
```

moves to the subdirectory "temp" all files in the current subdirectory starting with the character "f" and having an extension of "com." XPIP does the move quickly by adjusting pointers in the disk directory; no physical move takes place. The menu mode shows the more than 25 commands that comprise the program's repertoire, listed in windowed groups for easy reference.

The commands cover standard DOS operations such as file renaming, copying, and deleting. But XPIP shows its strength in the areas of searching, editing, and maintaining directories. You can conduct string searches within a file or across an entire disk. XPIP displays each occurrence of the requested text along with the file name and line number within the file. The advantage of using XPIP for file deletion instead of MS-DOS's Erase or CP/M's ERA command lies with XPIP's options. Each command selection is coupled with about 10 options, depending on its function. For example, in deleting you can sort the file directory by name, type (or extension), size, or creation date and time; mark the files to be deleted individually; or specify groups of files to be deleted through wild-card selectors in the file specifications.

Other options pertain to the displayed output, which you can print with a selectable number of lines per page. Similar control exists over the screen. An initial screen-definition step configures the software for any terminal. During XPIP's execution, you can increase or decrease the speed of scrolled displays by pressing designated keys.

The editor alone is worth the price of the entire package. It operates on 128-byte sectors within a file. You can access any sector by sequential scanning or by entering the record number. The sector contents are displayed in both ASCII and hexadecimal form. You can then modify characters and subsequently update the sector on disk.

Under the miscellaneous command group, XPIP includes a half-dozen helpful functions. The program displays the ASCII table, supports keyboard macros, emulates a four-function calculator, and performs sorts. The sort function orders the records of a file in ascending or descending sequence according to "sort keys" that can be located virtually anywhere in the records.

If the function you need to execute falls outside of XPIP's domain, you can directly access any DOS command within XPIP's shell. The program remembers your last 10 commands, which you can summon again with a few keystrokes.

XPIP includes numerous other commands for managing directories, comparing files, and setting file attributes. If you had the time, you could probably piece together some of its functions from public-domain software. But you'd be hard pressed to find all of its commands in one package accompanied by a 75-page pocket-size user's manual. At $29.95, this is one software accessory that can't be beat.

—Ed Joyce

Surprise!
★★★

Surprise! runs on the Tandy 1200. Maynard Electronics, 460 E. Semoran Blvd., Casselberry, FL 32707, 305-331-6402. $249.

You say you can't afford to trade in your 1200 but wish you had some of the extra speed of a 3000? Several accelerator cards besides Maynard Electronics' Surprise! will make your Tandy run faster, but they'll also take a bigger bite out of your wallet. Surprise! costs a modest $249 and yields a respectable 50-percent performance increase. It's a simple, painless upgrade, despite the fact that its accompanying IBM PC-designed software hung up my 1200 HD.

Designed for maximum compatibility rather than blazing speed, Surprise! shuns the hot-rod tricks of other cards. It doesn't change system timing (my on-screen stopwatch program didn't lose or gain a second), play with DMA (direct-memory access) or interrupt cycles, or have any on-board memory for disk caching. Instead, it replaces the Intel

How to Use *80 Micro* Program Listings

Basic program listings in *80 Micro* include a checksum value at the end of each line. This value is the sum of the ASCII values of all characters and spaces in the line, excluding remarks. With our Checksum program, you can use these values to test the accuracy of your typing after you copy the listings from the magazine.

To check your typing, follow these steps:

- Type in the program *exactly* as listed, omitting the indentations where program lines continue to a second or third magazine line, the '* characters, and checksum values. Checksum ignores all comments marked with an apostrophe, so type them in or leave them out, as you wish.
- Save the program in ASCII format with the command SAVE"filespec",A.
- Load and run Checksum (see the Program Listing). It gives you the option of sending the line numbers and checksum values to the printer or screen. Enter P for printer, S for screen. When printing to the screen, Checksum lists 14 lines and then waits for you to press the enter key.
- Compare the displayed line numbers and checksum values with the checksums shown in the listing. The program asks you if you want to reload the original program. Enter Y for yes. Finally, 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  --  8/7/86                    '*    97
20 ' Enhancements by Henry Herrdegen, Arthur Walker, Al Arena    '*    98
30 CLEAR 1000:CLS:PRINT@140,"VERIFY CHECKSUMS ON PROGRAM"        '*  3715
40 ON ERROR GOTO 410                                             '*  1241
50 PRINT:PRINT:INPUT "Enter name of File to verify";F$           '*  4280
60 PRINT:PRINT:PRINT "List Checksums to:"                        '*  3236
70 PRINT TAB(20) "<P>rinter":PRINT TAB(20) "<S>creen"            '*  3631
80 PRINT:PRINT:PRINT TAB(30);"? ";                               '*  2151
90 K$=INKEY$                                                     '*   729
100 IF K$="P" OR K$="p" OR K$="S" OR K$="s" THEN 110 ELSE 90     '*  3356
110 PRINT K$:IF K$="P" OR K$="p" THEN LP=1                       '*  2481
120 OPEN "I",1,F$                                                '*   901
130 IF EOF(1) THEN CLOSE:GOTO 370                                '*  2001
140 LINE INPUT#1,L$:L=VAL(LEFT$(L$,6))                           '*  2278
150 IF Z=2 AND L=0 THEN 130 ELSE Z=2                             '*  2095
160 A=VARPTR(L$):GOSUB 300:Q=PEEK(A)                             '*  2241
170 LS=PEEK(A+1):MS=PEEK(A+2):A=MS*256+LS:GOSUB 300              '*  3112
180 IF INSTR(L$,"'") THEN GOSUB 310                              '*   990
190 IF RIGHT$(L$,1)=" " THEN IQ=Q:GOSUB 330                      '*  2513
200 FOR K=1 TO Q:P=PEEK(A):CS=CS+P:A=A+1:NEXT K                  '*  2939
210 IF CS=0 THEN 130                                             '*  1128
220 IF CS<100000! THEN D$="-"                                    '*  1532
230 IF CS<10000 THEN D$="- "                                     '*  1484
240 IF CS<1000 THEN D$="-  "                                     '*  1469
250 IF CS<100 THEN D$="-   "                                     '*  1454
260 IF LP=1 THEN LPRINT "Line";L;D$;CS,:CS=0:GOTO 130            '*  3376
270 PRINT "Line";L;D$;CS:CS=0:X=X+1                              '*  2285
280 IF X=14 THEN X=0:PRINT TAB(30) "Press <ENTER> to continue."
    ELSE 130                                                     '*  4933
290 K$=INKEY$:IF K$<>CHR$(13) THEN 290 ELSE 130                  '*  2714
300 IF A>32767 THEN A=(65536!-A)*-1:RETURN:ELSE RETURN           '*  3269
310 I=INSTR(L$,"'"):IQ=I-1                                       '*   944
320 IF LEN(L$)=INSTR(L$,"'") THEN RETURN                         '*  1463
330 FOR I=IQ TO 1 STEP -1                                        '*  1483
340 C=ASC(MID$(L$,I,1))                                          '*  1264
350 IF C<33 THEN NEXT I                                          '*  1379
360 RL$=LEFT$(L$,I):Q=LEN(RL$):RETURN                            '*  2321
370 PRINT:PRINT"CHECKSUM/BAS now in Memory"                      '*  3246
380 PRINT "Do you want to reload the PROGRAM that you are workin
    g on? (Y/N)                                                  '*  6161
390 Q$=INKEY$:IF Q$="Y" OR Q$="y" THEN CLS:LOAD F$               '*  3023
400 IF Q$="N" OR Q$="n" THEN END ELSE GOTO 390                   '*  2704
410 PRINT "File not found...Please try again.":PRINT:RESUME 50   '*  4827
```

End

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3. ☐ Not now, but intend to within 12 months.

G. Do you plan to purchase another TRS-80/Tandy Computer during the next 12 months?
1. ☐ Yes
2. ☐ No
3. ☐ Don't know

H. Where do you use your TRS-80/Tandy Computer? Check all that apply.
1. ☐ At home for pleasure
2. ☐ At home for business
3. ☐ At work
4. ☐ At school
5. ☐ For math/science applications in any location

I. The articles in 80 Micro are:
1. ☐ Too simple
2. ☐ Too complex
3. ☐ Just right

J. How many purchases have you made based on an ad you saw in 80 Micro?
1. ☐ 0
2. ☐ 1-3
3. ☐ 4 or more

K. Which of the following columns do you read? Please rate them on a scale of 1 (seldom read) to 5 (always read).
___ 1. Side Tracks
___ 2. Feedback Loop
___ 3. Pulse Train
___ 4. The Art of Programming
___ 5. The Next Step
___ 6. Dave's MS-DOS Column
___ 7. Fine Lines
___ 8. Reader Forum
___ 9. Reviews
___ 10. New Products
___ 11. Hot CoCo

L. If you are not a subscriber, please circle 500.

M. If you would like a one year subscription to 80 Micro, please circle 501 on the Reader Service Card. Each subscription costs $24.97. (Canada & Mexico $27.97, Foreign Surface $44.97, one year only). Please allow 10-12 weeks for delivery.

Reader Service: To receive more information from any of the advertisers in this issue, circle the number of the Reader Service Card that corresponds with the Reader Service number on the ad in which you are interested. You will find numbers. Complete the entire card, stamp and drop into a mailbox. In 4-6 weeks you will hear from the advertiser directly.

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2 7 12 17 22	152 157 162 167 172	302 307 312 317 322	452 457 462 467 472
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4 9 14 19 24	154 159 164 169 174	304 309 314 319 324	454 459 464 469 474
5 10 15 20 25	155 160 165 170 175	305 310 315 320 325	455 460 465 470 475
26 31 36 41 46	176 181 186 191 196	326 331 336 341 346	476 481 486 491 496
27 32 37 42 47	177 182 187 192 197	327 332 337 342 347	477 482 487 492 497
28 33 38 43 48	178 183 188 193 198	328 333 338 343 348	478 483 488 493 498
29 34 39 44 49	179 184 189 194 199	329 334 339 344 349	479 484 489 494 499
30 35 40 45 50	180 185 190 195 200	330 335 340 345 350	480 485 490 495 500
51 56 61 66 71	201 206 211 216 221	351 356 361 366 371	501 506 511 516 521
52 57 62 67 72	202 207 212 217 222	352 357 362 367 372	502 507 512 517 522
53 58 63 68 73	203 208 213 218 223	353 358 363 368 373	503 508 513 518 523
54 59 64 69 74	204 209 214 219 224	354 359 364 369 374	504 509 514 519 524
55 60 65 70 75	205 210 215 220 225	355 360 365 370 375	505 510 515 520 525
76 81 86 91 96	226 231 236 241 246	376 381 386 391 396	526 531 536 541 546
77 82 87 92 97	227 232 237 242 247	377 382 387 392 397	527 532 537 542 547
78 83 88 93 98	228 233 238 243 248	378 383 388 393 398	528 533 538 543 548
79 84 89 94 99	229 234 239 244 249	379 384 389 394 399	529 534 539 544 549
80 85 90 95 100	230 235 240 245 250	380 385 390 395 400	530 535 540 545 550
101 106 111 116 121	251 256 261 266 271	401 406 411 416 421	551 556 561 566 571
102 107 112 117 122	252 257 262 267 272	402 407 412 417 422	552 557 562 567 572
103 108 113 118 123	253 258 263 268 273	403 408 413 418 423	553 558 563 568 573
104 109 114 119 124	254 259 264 269 274	404 409 414 419 424	554 559 564 569 574
105 110 115 120 125	255 260 265 270 275	405 410 415 420 425	555 560 565 570 575
126 131 136 141 146	276 281 286 291 296	426 431 436 441 446	576 581 586 591 596
127 132 137 142 147	277 282 287 292 297	427 432 437 442 447	577 582 587 592 597
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129 134 139 144 149	279 284 289 294 299	429 434 439 444 449	579 584 589 594 599
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This card valid until March 31, 1987

A. How would you describe your interest in MS-DOS, IBM Compatible Systems?
1. ☐ I own an MS-DOS, IBM compatible system.
2. ☐ I intend to purchase.
3. ☐ I'm interested but have no immediate plans to purchase.
4. ☐ Not interested.

B. On a scale of 1 (no interest) to 5 (great interest), please rate your interest in seeing the following types of programs published in 80 Micro:
___ 1. Business applications
___ 2. Science/math applications
___ 3. Home management applications
___ 4. Money management applications
___ 5. Games
___ 6. Programming Utilities

C. *Excluding yourself*, how many people read your copy of 80 Micro?
1. ☐ One
2. ☐ Two
3. ☐ Three
4. ☐ Four
5. ☐ Five or more

D. What type of TRS-80/Tandy Computer do you own? Check all that apply.
1. ☐ Model I
2. ☐ Model II/12
3. ☐ Model III
4. ☐ Model 4/4P/4D
5. ☐ Model 4D
6. ☐ Model 16/16B/6000
7. ☐ Model 100/200
8. ☐ Model 600
9. ☐ Model 1000
10. ☐ Model 1200
11. ☐ Model 2000
12. ☐ Model 3000

E. How long have you owned your TRS-80/Tandy Computer?
1. ☐ Less than 1 year
2. ☐ 1-2 years
3. ☐ 2-3 years
4. ☐ 3-4 years
5. ☐ More than 4 years

F. Do you subscribe to an information utility, such as Compuserve, Dow Jones News Retrieval, etc.?
1. ☐ Yes
2. ☐ No
3. ☐ Not now, but intend to within 12 months.

G. Do you plan to purchase another TRS-80/Tandy Computer during the next 12 months?
1. ☐ Yes
2. ☐ No
3. ☐ Don't know

H. Where do you use your TRS-80/Tandy Computer? Check all that apply.
1. ☐ At home for pleasure
2. ☐ At home for business
3. ☐ At work
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54 59 64 69 74	204 209 214 219 224	354 359 364 369 374	504 509 514 519 524
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8088 CPU with an efficient NEC V20 mounted on a 3-inch card.

Surprise! plugs into a plastic carrier with 40 pins to fit in your motherboard's 8088 socket, although the CPU socket blocks slot 3 in my older 5-slot 1200 HD. The package includes a miniature crowbar to pry the 8088 free and a little padded box to store it in. Installation proved easy on my second try. Initially, following the somewhat skimpy IBM-oriented instructions, I tried installing the card and carrier together and mistakenly aligned its chips on the same side as those of my other add-on boards. This proved to be backward, as Surprise! indicated by smoke signals when I turned on my computer.

Set to slow mode by a jumper on the card (the only way Surprise! will work if you have an 8087 math coprocessor), the V20 gives an almost unnoticeable boost to your data base or spreadsheet. The Norton Utilities speed index, which uses some obscure CPU instructions, jumped from 1.0 to 1.8. In fast mode, Surprise! ticks at 9.54MHz—double the 8088's clock rate—hiking its Norton score to 2.6 and running 40- to 60-percent faster with all the software I tried. A Wordstar search and replace took two minutes, 32 seconds as opposed to three minutes, 44 seconds. Sorting a 300-line text file took 7.2 instead of 11.5 seconds.

IBM owners can go slightly faster by adding Maynard's Surprise.SYS driver to their CONFIG.SYS start-up files. The software promises to write directly to the screen (an installation menu lists most video cards), increase the keyboard type-ahead buffer, and allow toggling between fast and slow modes with the control-alternate-\ sequence used by the Compaq Deskpro. Unfortunately, the software stopped my 1200 HD halfway through booting either MS-DOS 3.1 from my hard disk or PC-DOS 2.10 from a floppy. The keyboard sequence toggled between one and two beeps as the manual said, but the DOS prompt never appeared.

Used strictly as a hardware device, Surprise! is a good choice for the economy-minded and slightly impatient. It's no 80286 screamer, but trimming a recalculation in Lotus's 1-2-3 from 26.5 to 16.5 seconds is nothing to be ashamed of.

—Eric Grevstad

Cashtrack 1.02

★★★★

Cashtrack 1.02 runs on the Tandy 1000/2000/3000 (128K) and one disk drive; a printer is recommended. Sublogic, 713 Edgebrook Drive, Champaign, IL 60820, 217-359-8482. $149.

If you have a complex financial profile with an IRA, lots of credit cards, loans, a mortgage, and so on, Cashtrack can help you watch over it quickly and efficiently. It is a home-accounting system that can give you up-to-the-minute information on nearly all aspects of your financial picture. It operates smoothly, posting transactions in under 30 seconds, and is one of the most sophisticated accounting packages for home use that I've seen.

Cashtrack is menu-oriented, and each page or menu area contains a windowed screen with financial data at the top, a warning or reminder in the middle, and options at the bottom. With this setup, you would almost have to try to make an error. This easy-to-learn program comes with a report generator that could come in handy at tax time.

Unlike many other accounting programs, Cashtrack is designed around business parameters, with a built-in audit trail that keeps the books updated and balanced. It keeps track of everything from loan amortization and lottery winnings to lunch at Burger King and UFOs (unaccounted-for outflow of cash). Cashtrack also contains a program that writes your checks and creates reports detailing everything from bank balances to cash flow.

Many similar home-accounting programs fail in their inflexibility or slowness, but Cashtrack allows for frequent data retrieval and changes. You can alter a budget or chart of accounts at any time, the only stipulation being that the books must balance, and whatever you move you must reassign to another account within the system. This feature is outstanding.

Cashtrack comes on a copyable disk and features an excellent, in-depth manual. You cannot operate Cashtrack with a joystick or mouse. It is entirely text-oriented with no icons or other visual aids and, while the program is complete and sophisticated, these state-of-the-art goodies might have made for a more visually interesting program.

Whether you have a need for this program is another question. If you have only a checking account, a savings account, and a few bills a month, Cashtrack might not be for you. It is designed as a household-oriented accounting package and cannot run a complex business. For a freelance writer who has a second income, it is ideal, and those with large or complex financial portfolios would do well to look into Cashtrack. But corporate users should forget it. The program is flexible and can be customized, but it would not be cost-effective in a small-business environment.

—Jeffrey Parker

8087 Boards

★★★

The Trionix 8087 Adapter works on the Tandy 1000 (128K) and requires one disk drive. Trionix, 3563 Roosevelt "B," Carlsbad, CA 92008, 619-434-4439. $240. Tandy Express Order Hardware number 90-2070.

★★★★

The 8087 Speed Ticket works with the Tandy 1000 (128K) and requires one disk drive. PG Design Electronics Inc., Dept. B, 37560 Thirty-one Mile Road, Richmond, MI 48062, 313-727-2744. $249.

When Tandy first released the Tandy 1000, it didn't include a socket for an 8087 math coprocessor chip; the company later corrected this with the release of the 1000A. But what of those 1000 users who want to install an 8087 chip to speed up math-intensive operations? Trionix and PG Design Electronics have hardware fixes that let you stick an 8087 in your computer as though it were born with its own socket.

Installation for both boards is a snap: Take your 8088 CPU out of your computer, plug it into the new board that has the 8087 coprocessor installed, and connect the 8087 board back into your computer. That's it.

You install the two boards differently. The Trionix board plugs directly into the 8088 socket, which can be a problem since the 8088 socket sits directly behind the edge connectors where you install expansion boards. When you reinstall your expansion boards, they might sit directly on top of the 8087 board. When I did this, the board seemed to sit just a bit too high. I don't know whether this will interfere with your expansion boards, but I'd prefer not to let the boards touch.

You attach the Speed Ticket board to the metal wall housing your disk drives; it uses a cable to go to the 8088 socket. This keeps the 8087 board out of the way. Both 8087 boards come with test software to make sure that your math coprocesser is performing the way it should. You should run the test occasionally to ensure proper operation.

Installing an 8087 chip in your Tandy 1000 isn't going to speed up your computer. The chip has to be used with the correct application. Either you have to write code for the 8087 or your program has to access it. Most programs, like word processors or simple data bases, don't need or use the 8087. Some software, like CAD (computer-aided design) programs or spreadsheets, can be made to run a good deal faster.

—Ryan Davis-Wright

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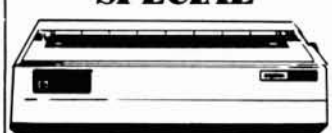

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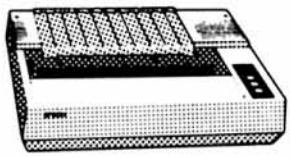

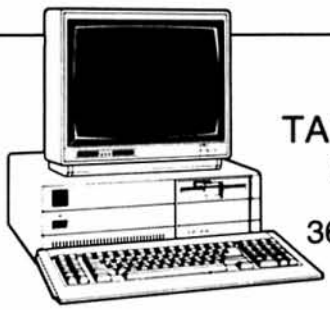

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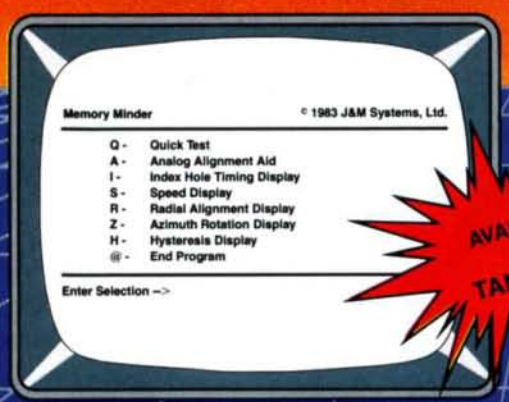

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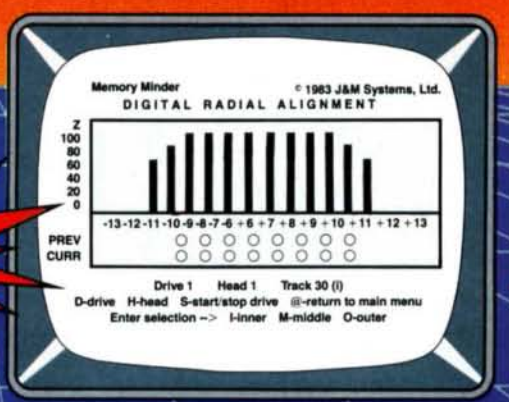

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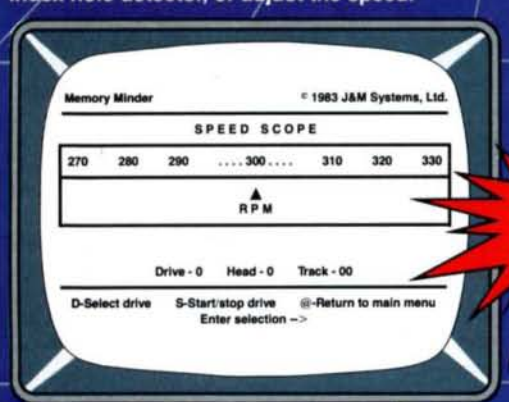

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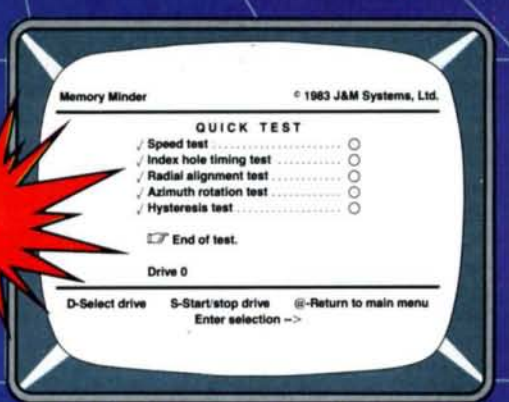

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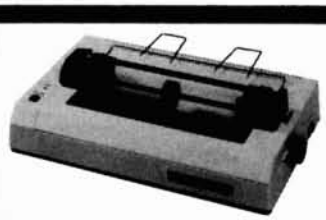

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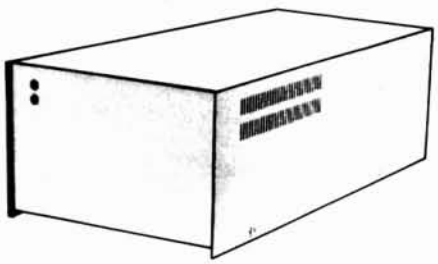

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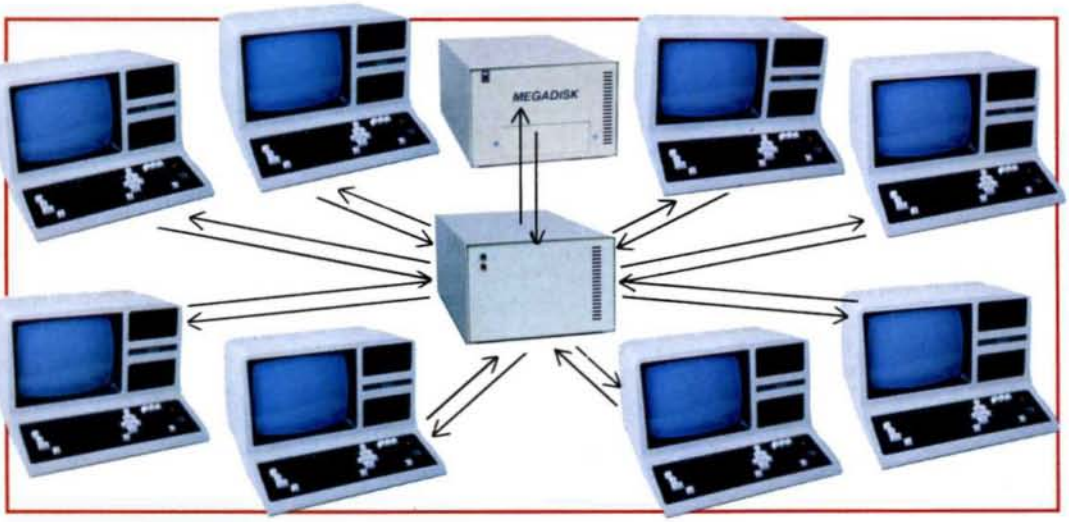

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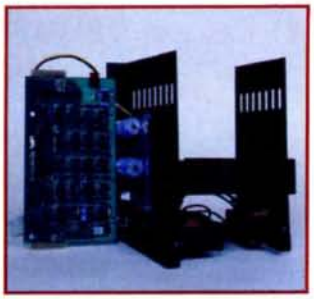

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MS-DOS

Expanded Memory

Bocaram from Boca Research Inc. is an expanded memory board for IBM PC/XT/ATs and compatibles with CPUs operating at speeds up to 12MHz. The two-thirds length add-on board is available in four memory configurations from zero K up to 1MB.

Bocaram conforms to the Lotus/Intel/Microsoft expanded-memory specification (EMS 3.2), permitting you to use memory above the 640K limit imposed by current DOS 2.0 or later. The memory board requires no switch settings for single-board installation, but if more than one EMS board is installed, a DIP-switch setting is required.

Bocaram can reside with compatible expanded memory products such as Intel's Above Board, and installation software is supplied along with a RAM disk and print spooler. The RAM-disk software permits a warm boot without loss of RAM-resident files.

Bocaram can be expanded an additional 1MB with an optional, low-profile RAM add-on. The board comes with a one-year warranty. The 1MB version costs $395, the 2MB version $740. Contact Boca Research Inc., 6401 Congress Ave., Boca Raton, FL 33431, 305-997-6227.

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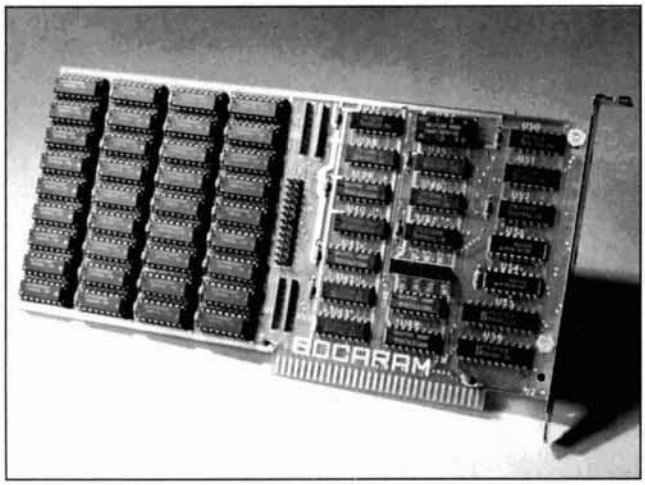

Bocaram is available in four memory configurations.

Flip a Switch

Vusoft's Switch-It lets you load any two programs into memory and switch back and forth between them with a single keystroke. It eliminates the time-consuming and error-prone process of repeatedly exiting and loading oft-used programs.

Switch-It creates two independent MS-DOS consoles, giving your computer the ability to do more than one thing at a time. You can run a data base in one console and communicate with another computer concurrently, just as if you had two computers running side by side. Switch-It jumps between programs without losing your position and allows instant access to any MS-DOS command in the middle of whatever you are doing—renaming, deleting or copying files, formatting disks, changing directories, or printing files in the background.

Switch-It requires an IBM PC/XT/AT or compatible with at least 256K and costs $49. Contact Vusoft Inc., 248 Tower Road, Lincoln, MA 01773, 617-259-0686.

Circle 568 on Reader Service card.

Just Your Type

Cybertype from Cyber Research Inc. is a typesetting system that lets you edit and format text, select and modify type faces, add graphics (including line graphics and logos), and lay out pages. The system is designed to aid in the creation of documentation, proposals, books, manuals, and other literature. The system uses fonts available for Postscript printers and typesetters and provides thousands of variations.

The software operates from within Microsoft's Word and takes advantage of that package's text-processing capabilities. Cybertype works with a normal computer keyboard or optionally with the Key Tronic 5153 Touch Pad keyboard, which provides 36 extra function keys.

Cybertype typesetting software is available from Cyber Research Inc. for $495. A complete package (typesetting software, Microsoft's Word 3.0, and the Touch Pad keyboard) costs $1,195. The software runs on the IBM PC/XT/AT and compatible computers, requiring 384K RAM, DOS 2.x or 3.x, a Hercules-compatible monochrome graphics display adapter, two floppy-disk drives or a floppy and hard disk, and a Postscript-compatible laser printer or typesetter.

Contact Cyber Research Inc., 5 Science Park Center, P.O. Box 9565, New Haven, CT 06536, 203-786-5151.

Circle 554 on Reader Service card.

Check the Menu

Sigma Software Inc. announces Menu Plus+, a complete menu system for use with hard disks. The package provides menus with room for 676 options and gives you one- or two-keystroke access to software systems.

Menu Plus+ supports a main menu and 26 submenus, each with 26 options. It uses DOS commands and comes with a DOS batch-file editor. Written in C language, the program has parameter passing and an optional hold feature to prevent listings from flashing by. Other features include optional password protection and menu color choices.

Menu Plus+ costs $39.95. Contact Sigma Software Inc., Menu Plus+ Division, 1009 Sullivan Ave., South Windsor, CT 06074, 203-644-4709 or 203-644-9689.

Circle 565 on Reader Service card.

Develop Your Expertise

Paperback Software International announces VP-Expert, a rule-based expert-system development tool. Applications in VP-Expert are built around a goal or hypothesis that the program assumes to be true. Rules within the expert system allow it to confirm or disprove the central goal.

VP-Expert works backward from the goal through the rules until it finds information it knows to be true. At times during this process, the expert system seeks answers from the user that give it additional information needed to reach the goal. The user can enter answers along with confidence factors that help VP-Expert determine the reliability of its final recommendation.

VP-Expert interfaces with standard spreadsheet and data-base files such as those created by VP-Planner, 1-2-3, Dbase II and III, and any ASCII text file. This interface lets you create rules that can manipulate the user's existing microcomputer data files.

VP-Expert sells for $99.95 and runs on the IBM PC and compatible computers with 256K RAM, an 80-column monitor, and at least one disk drive (two are recommended). Contact Paperback Software International, 2830 Ninth St., Berkeley, CA 94710, 415-644-2116.

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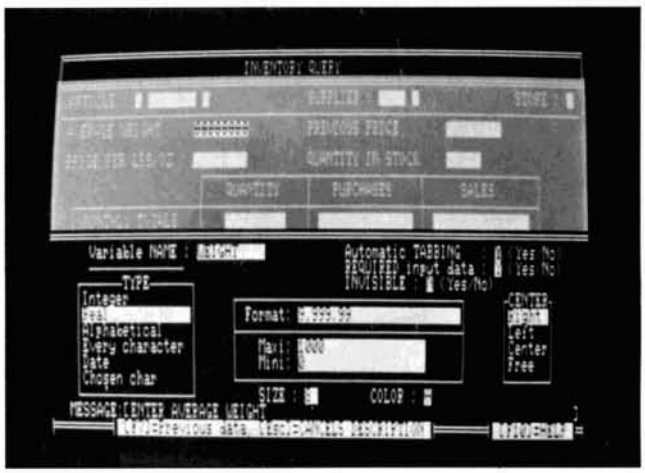

Softway Inc.'s High Screen gives you greater screen control.

Screen Your Programs

High Screen is a screen-making utility that operates with a variety of programming languages, including Basic, Pascal, Cobol, Fortran, C, and assembly language. It can handle variables in any language and tests their characteristics in only one program line, but it generates no source code, making maintenance easy.

Its full-screen generator implements your screen design and defines variables as well as the tests to be performed on them. The resident driver interfaces between the screen and your program. Programmers can open windows, display and manage pull-down menus, and control aspects of variable input. It can test the variable type, format, and range, and automatically take care of color and cursor positioning.

High Screen is not copy-protected and is royalty free, runs on the IBM PC and compatibles, and retails for $129. Contact Softway Inc., 500 Sutter St., Suite 222, San Francisco, CA 94102, 415-397-4666.

Circle 566 on Reader Service card.

Builder's Helper

Omware Inc. announces The Master Builder, a business-software package for contractors. It contains all the functions necessary to run a small or large operation: full accounting with general ledger, accounts payable and receivable, estimating, and job costing.

For special applications, enhancements such as contract control, time and material billing, parts list, certified payroll, and equipment costing are also available. The Master Builder is fully integrated with multilevel windowing and on-screen help, runs on the IBM PC/AT/XT and compatibles, and costs $2,995. Contact Omware Inc., 632 Petaluma Ave., Sebastopol, CA 95472, 707-823-7783.

Circle 563 on Reader Service card.

Hard-Disk Backup

EZ-Back is a hard-disk-to-floppy back-up utility for the IBM PC and compatibles. It uses a proprietary floppy-disk storage format to maximize disk capacity and allow fast operation, backing up a hard disk many times faster than MS-DOS's Backup.

Unlike image-back-up programs, EZ-Back is file-oriented; it backs up and restores any file, group of files, directory or subdirectory, files updated on or after a specified date, or only those files that have changed since the last backup. The program backs up any size file, providing data recovery, warnings for deteriorating back-up disks, and partial file recovery for damaged disks.

EZ-Back is not copy-protected and costs $49.95. Contact Lateral Technologies, Hornby Island, British Columbia V0R 1Z0, 604-335-0617.

Circle 559 on Reader Service card.

It's Magic

Magic Menu 2.0 can aid office workers, managers, and system developers in providing an interface between user and operating system. You construct a menu system with a separate menu-driven editor, defining a sequence of functions that can be activated by a single menu entry to perform complex DOS operations. By having a separate editor, editing functions can be limited to authorized personnel, and passwords can be attached to provide complete user lockout from DOS.

This program traps all abnormal terminations of programs, batch files, and DOS commands, and offers a log on/off function to record total access to the system. An audit trail provides system-use logs and information for time billing; to prevent screen burn-in, automatic blanking of the monitor screen is available.

Responses to menu-generated prompts can be passed as parameters throughout the menu system, with advanced users employing "speed entry" capability to access commonly used selections directly.

Magic Menu 2.0's screen can be memory resident, supports dot-matrix and laser printers, and comes with an extensive reference manual and tutorial. It runs on IBM PC/XT/ATs or compatibles with 128K. Retail price is $99 for the single version, $500 per file server for the network version. Contact Deeresoft Inc., P.O. Box 1360, Melbourne, FL 32902, 305-768-2477.

Circle 555 on Reader Service card.

Electronic Mailman

Mailmate is a mail-management system that creates directories, lists, Rolodex cards, word-processing merge files, and mail labels from an address data base. It uses sort sequences including second- and third-class bulk-mail sequence for newsletters, publications, and direct-mail advertising.

Profile information taken from your address records can be defined in up to 16 different fields, allowing for specialized sorts, printed output, screen lists of addresses, SIC standard classification, subscription control, and handling of foreign mail. File utilities convert ASCII files to Mailmate, as well as manipulate data fields within a file and delete and rename a file. The program's file-merge function recognizes several popular word processors including Wordstar, Wordperfect, Select, Multimate, and Superwriter.

Mailmate works on the IBM PC/XT/AT and compatibles with at least 256K and two disk drives; it costs $259.95. Contact Mailmate Corp., 300 S. Rodney Darham, Little Rock, AR 72205, 501-221-1666.

Circle 560 on Reader Service card.

Gift of Tongues

DuangJan is a bilingual word-processing program from Megachomp Co. that lets you edit text in English and a second language concurrently. You can choose from a number of second languages, including French, German, Italian, Portuguese, Spanish, Greek, Lao, Russian, Thai, Vietnamese, and Cambodian.

The program lets you display bilingual characters on the same screen and switch from one language to another with a function key. Word-processing features include a full-screen text editor, insert/overwrite modes, paragraph reformatting, block moves, and search/replace.

DuangJan also has a font editor and keyboard-layout editor for customizing character sets and keyboard layouts. An English typing tutorial and manual are also included.

The software runs on the IBM PC/XT and compatible computers with graphics adapters. It requires 256K RAM and one disk drive. Currently, the program supports Epson, IBM, and C. Itoh dot-matrix printers.

DuangJan retails for $59. Contact Megachomp Co., 3524 Cottman Ave., Philadelphia, PA 19149-1606, 215-331-2758 or 215-331-8138.

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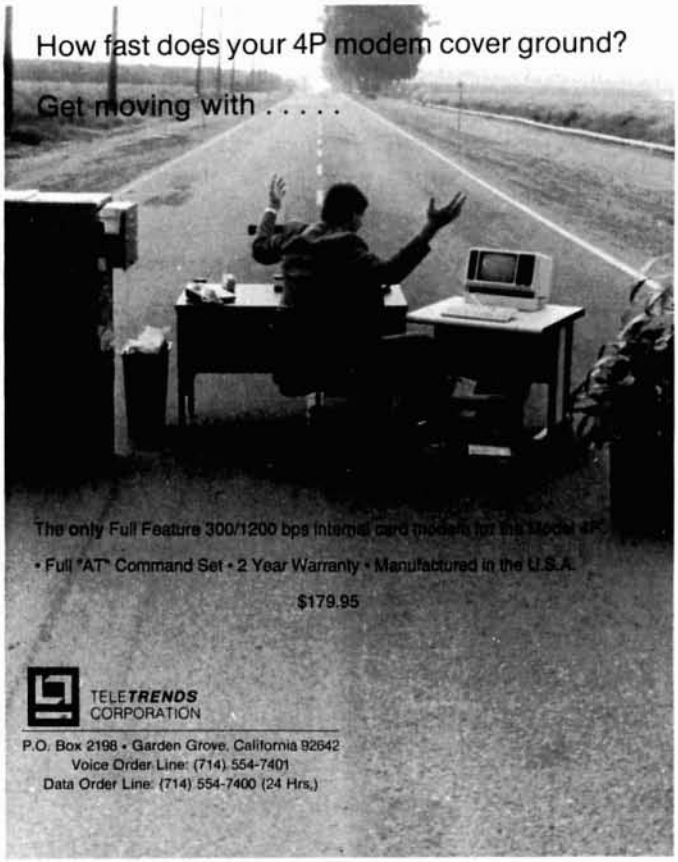

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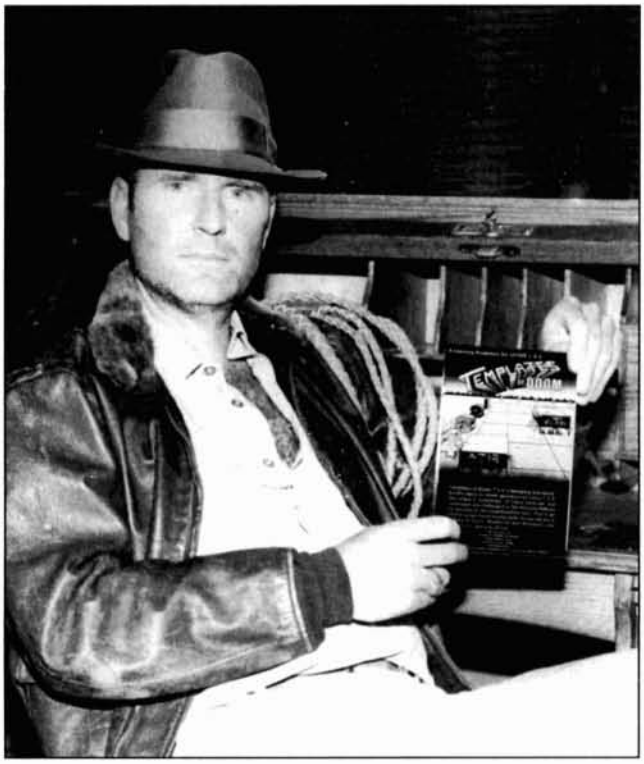
C Diagnostic

PC-Lint 2.00 analyzes C programs running under MS-DOS and reports on bugs, glitches, and inconsistencies to provide a perspective that a compiler doesn't have. It aids in developing reliable programs and in porting programs to new machines, operating systems, compilers, or memory models.

PC-Lint 2.00 also supports ANSI language extensions; structure assignment; prototypes; pragma and signed; and Microsoft keywords far, near, huge, fortran, pascal, and cdecl. Other features include indentation checking, checking of suspicious semicolons, and full Kernighan and Ritchie support with one-pass operation. PC-Lint 2.00 comes with modifiable standard C-library descriptions used by most compilers.

The program runs on any MS-DOS computer with 128K and uses all available memory. Cost is $139. Contact Gimpel Software, 3207 Hogarth Lane, Collegeville, PA 19426, 215-584-4261.

Circle 557 on Reader Service card.



Pete Antoniak, author of Templates of Doom, a tongue-in-cheek spreadsheet tutorial.

Move Over, Indiana Jones

Solar Systems Software has released a second version of Templates of Doom, a tongue-in-cheek adventure game played on Lotus's 1-2-3 and compatible spreadsheets. In the course of following the story line, the player is challenged to solve puzzles requiring the use of spreadsheet commands and formulas. Each puzzle teaches a different concept related to the use of 1-2-3 or another spreadsheet.

Though designed for one player, the program has special provisions for classroom applications. Site licenses and volume discounts are available for nonprofit learning institutions. Templates of Doom runs on releases 1a and 2 of

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IBM PROPRINTER (Standard Paper) (4201)	7/16 x 20	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$18/3	$66/12	$360/72
PC (Standard Paper) (5152)	1/2 x 20	$14/2	$36/6	$ 66/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
RADIO SHACK-TOSHIBA-COMMODORE-PANASONIC-RICOH		RS LP-I-II-IV, CENTRON			730-737-739-779 (Zip Pack)			$12/3	$45/12	$252/72
Carbon Film - DWP 210, DIABLO HYTYPE II Black (1445)	5/16 x 145	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
DW II, DWP 410-510, RICOH 1200-1300-1600 Black (1419)	1/4 x 145	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
Red, Green, Blue, Brown Colors (1419)	1/4 x 130	$21/3	$72/12	$414/72	$6 ea 3-11	$5 ea	12 or more	$30/6	$54/12	$234/72
Fabric (Long Life), DWP 210, DIABLO HYTYPE II Black (1458)	5/16 x 17 NOT EZ LOAD	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$21/3	$78/12	$432/72
DW II, DWP 410-510, RICOH 1200-1300-1600 Black (1449)	1/4 x 25	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$21/3	$78/12	$432/72
DMP-100, LP VII, COMMODORE 1525, GORILLA BANANA (1424)	Inker Loop	$18/2	$51/6	$ 96/12						
DMP-200, 120, (430 Inserts & Reloads Only) (1296) (1483)	1/2 x 20	$20/2	$57/6	$108/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
DMP-400-420, LP VI-VIII, PANASONIC KXP-130-1093 (1418)	5/16 x 14	$15/2	$42/6	$ 78/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
DMP-500 (130 Inserts & Reloads Only) (1236) (1482)	1/2 x 20	$22/2	$63/6	$120/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
DMP-2100, TOSHIBA P1340-1350-1351-351 (1442)	1/2 x 20	$15/2	$42/6	$ 78/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
DMP-2200, C ITOH 3500 (1233)	**1/2 x 52**	**$35 each**			**$18/1**	**$16 ea**	**2 or more**	**$30/3**	**$57/6**	**$108/12**
LP III-V, CANON A 1200 (New Only) (½ x 5) (1414)	1/2 x 15	$15/2	$42/6	$ 78/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
EPSON LQ 1000	1/2 x 18	$22/2	$63/6	$120/12	$8/1	$7 ea	2 or more	$18/3	$66/12	$360/72
MX-FX-RX 70-80-85, LX 80-90 (5/16 x 7)	1/2 x 20	$14/2	$36/6	$ 66/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
MX-FX-RX 100-185-286, LQ 800 (1/2 x 18) LQ 1500 (1/2 x 14)	1/2 x 30	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$18/3	$66/12	$360/72
DX 20-35 Carbon Film (Multistrike), OLIVETTI ET-121-221	5/16 x 290	$21/3	$72/12	$414/72	(Call for Correctable Prices)					
NEC Spinwriter-Carbon Film - 2000-3500 (Reloads BCCOMPCO Only)	5/16 x 145	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
- 5500-7700 (Can Reload Most Types)	NOT EZ LOAD 1/4 x 145	$18/3	$60/12	$342/72	$5 ea 3-11	$4 ea	12 or more	$24/6	$42/12	$234/72
-Fabric - 2000-3500 (Can Reload All)	1/2 x 14	$18/2	$51/6	$ 96/12	$8/1	$7 ea	2 or more	$15/3	$54/12	$288/72
- 5500-7700 (Can Reload All)	1/2 x 13	$15/2	$42/6	$ 78/12	$8/1	$7 ea	2 or more	$15/3	$54/12	$288/72
Pinwriter P1-P2-P6, P-5 (1/2 x 14)	1/2 x 20	$25/2	$69/6	$126/12	$7/1	$6 ea	2 or more	$15/3	$54/12	$288/72
P3-P7	1/2 x 27	$30/2	$84/6	$156/12	$8/1	$7 ea	2 or more	$18/3	$66/12	$360/72
OKIDATA Pacemark 2350-2410 Black	1/2 x 100	$25 each			$20/1	$18 ea	2 or more	$36/3	$132/12	$720/72
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PANASONIC KXP-1080-1090-1091-1092-1592-1595	Inker Loop	$20/2	$57/6	$108/12						
BROTHER HR-15-25-35 / COMREX DX-15, II — Carbon Film (Multistrike)	5/16 x 82	$18/3	$60/12	$342/72						
BROTHER HR-15-25-35 / COMREX DX-15, II — Fabric (Call for Comrex 420 Prices)	5/16 x 17	$15/2	$42/6	$ 78/12						

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Lotus's 1-2-3, on Paperback Software's VP-Planner, and Mosaic Software's The Twin. The software is designed for MS-DOS computers with a minimum of 256K RAM. The suggested retail price is $49.95. Contact Solar Systems Software, 8105 Shelter Creek, San Bruno, CA 94066, 415-952-2375.

Circle 567 on Reader Service card.

Spread the Word

E. David & Associates has released Wordspread, a spreadsheet for words and thoughts that provides a method for organizing ideas. It features standard editing, rearranging, printing, saving, and restoring functions that let you change numeric spreadsheets into descriptive documents.

Whereas regular spreadsheets handle only one-line labels, Wordspread accommodates any alphanumeric information with up to 255 characters per cell. There are two editing modes: overtype (insert or delete) and the alter command, which changes a row, cell, column, or an entire range of cells. The reformatting function changes column width and height to suit your needs, and a variety of data sorts are possible.

Wordspread runs on the IBM PC and compatibles with DOS 2.1 or higher, is not copy-protected, and costs $39.95 (plus $4 postage and handling). Contact E. David & Associates, 22 Russett Lane, Storrs, CT 06268, 203-429-1785.

Circle 556 on Reader Service card.

Above It All

Vutek Systems Inc. has released the Above-All Board EMS multifunction board, a single-slot card for the IBM PC/XT and compatibles. Above-All Board can add up to 384K to the DOS 640K limit, or up to an additional 1.5MB of extended memory above 640K. It conforms to Intel/Lotus specifications to provide compatibility with software written to accept EMS memory.

Above-All Board's I/O (input/output) functions include a standard parallel printer port, an RS-232 serial port, and a clock/calendar with on-board battery backup. Optional features include a second RS-232 port and room for one piggyback board to add 1.5MB of EMS memory, enhanced graphics adapter (EGA) outputs, and ENIX.SYS security.

Above-All Board comes with a RAM disk, print spooler, EMS software drivers, and a full two-year warranty for $420. Contact Vutek Systems Inc., 10855 Sorrento Valley Road, San Diego, CA 92121, 619-587-2800 or 800-621-0852.

Circle 569 on Reader Service card.

Get Converted

R-Doc/X is a menu-driven utility that takes document files produced by one word processor and converts them for use with different word processors. Most print-enhancement and format-control codes are also translated, requiring little or no touching up of the converted document.

Multiple files can be translated in a single operation by using wild-card characters, and the program supports 12 popular word processors, including Wordperfect, Displaywrite-3, Wordstar, Multimate, Microsoft Word, Spellbinder, Leading Edge, Volkswriter Deluxe, PC-Write, and standard ASCII.

R-Doc/X works on any computer using MS-DOS or CP/M, is not copy-protected, and can be run from a hard or RAM disk. The cost is $149, which does not include occasional upgraded versions that support new word-processing formats. Contact Advanced Computer Innovations, 1227 Goler House, Rochester, NY 14620, 716-454-3188.

Circle 551 on Reader Service card.

Circle 464 on Reader Service card.

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 BASICG 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.

BIZGRAPH - Create business graphs from hand-entered or VisiCalc data. $75.00.

xT.CAD - Professional drafting aid which outputs to a printer or plotter. $345.00.

SURFACE PLOT - Plot three-dimensional equations of the form Z=F(x,y). $39.95.

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CHESS - A very powerful program with 10 skill levels, 40 play options. $49.95.

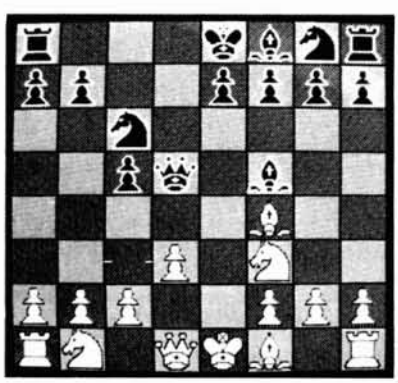
REVERSI - Play Othello with 10 skill levels, 20 execution options. $29.95.

3D Tic-Tac-Toe - Play the computer or a friend on a 4 × 4 × 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 5⅛% sales tax.

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15MB in the Bank

Kustom Electronics announces The Data Bank MS-15IR, a removable Winchester hard-disk subsystem designed for the IBM PC/XT and compatibles.

The Data Bank offers unlimited storage capacity in 15MB increments. Because of its cartridge approach, you can use it for backup as well as on-line mass storage. The system employs run-length limited (RLL) 2,7 encoding/decoding technology, making it suitable for storing classified or sensitive data.

The Data Bank MS-15IR costs $1,995. Additional cartridges are available for $130 each. Contact Kustom Electronics Inc., 8320 Nieman Road, Lenexa, KS 66214, 913-492-1400 or 800-255-6311.

Circle 558 on Reader Service card.

Show and Tell

Boss International's Show Me! is a pop-up file utility that lets users view the contents files in any location while running other programs. The utility displays text and binary files in ASCII, hexadecimal (hex), or EBCDIC modes. You can use it while running programs to display supplemental data and to view existing code while programming.

Show Me! allows vertical and horizontal scrolling within a variably sized window that you can place anywhere on screen. A search capability locates information stored in any file. You can also define options, including start-up keystrokes, file-buffer size from 1K to 128K, and video attributes.

Show Me! runs on the IBM PC and compatible computers running DOS 2.0 or later. The price is $29.95. Contact Boss International, Division of Mesa Software Inc., 3435 Greystone Drive, Suite 106, Austin, TX 78731, 800-531-5483 (800-252-8184 in Texas).

Circle 553 on Reader Service card.

TRS-80

Overcome Basic Problems

ABasic is neither a compiler nor an interpreter of the Basic language; it is a translator. You can write a program using any text editor that produces an ordinary ASCII file, and ABasic converts that code to a Basic program. When translating your program to another computer system, ABasic sets the target system and writes to that computer's version of Basic. In addition to this conversion function, ABasic modifies some Basic commands, streamlines logical constructs within programs, and doesn't require line numbers.

ABasic includes two optional modules. The Productivity Plus toolkit offers five utilities designed to speed up programming time; with the Database Construction Set, you can create relational file-management software using balanced-tree index routines and ISAM file handling.

This package is available for the TRS-80 Model 4/4P/4D (TRSDOS 6.2.x) with 64K, Models I and III (except TRSDOS version 1.3) with 48K, CP/M 2.2 systems, and IBM PCs and compatibles with 128K. ABasic costs $49.95, and the two optional modules are $29.95 each. Contact B&G Microsystems, 1733 Eastern S.E., Grand Rapids, MI 49507, 800-854-8544 (800-422-4227 in Michigan).

Circle 570 on Reader Service card.

Putting On a Display

Knewco Inc. has developed a demonstration version of FULSCR, a full-screen processor for the Models III and 4 (see New Products, August 1986, p. 155). The demonstration version comes with a 95-page manual and provides examples of program operation. It operates like the regular ver-

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sion except that screens cannot be saved to disk.

The demonstration version sells for $10, which you can credit toward the purchase of the regular package ($59.95). Contact Knewco Inc., P.O. Box 25329, Wilmington, DE 19899.

Circle 574 on Reader Service card.

In Writing

CTL Software announces Handwriting Analyzer for the Models I, III, and 4. Based on a handwriting description that you provide, the program prints a one-page analysis of the writer's personality. The program's analysis is based on theories of handwriting experts. Users of the program do not need to have knowledge of handwriting analysis.

The program costs $19.95 and is available on disk or cassette. Contact CTL Software, 115 Bixby Drive, Milpitas, CA 95035, 408-263-1623.

Circle 573 on Reader Service card.

Etc.

SPC for the 100

The Crosby Co. has released /SPC Chip, a Statistical Process Control (SPC) chip that plugs into the TRS-80 Model 100 and 102 to permit loading SPC programs from the menu while freeing computer memory for data files.

Features include direct input from a gauge using an RS-232 port; on-screen, printed average, and range-control charts; and a printed process-capability study.

The /SPC ROM chip is available as a stand-alone system or as part of the X&R Master Plus software package that works with the IBM PC and compatibles. Software is provided to transfer files to the PC for in-depth SPC work. The chip costs $365. Contact The Crosby Co., P.O. Box 2433, Glen Ellyn, IL 60138, 312-790-1716.

Circle 572 on Reader Service card.

Epson's LX-86 dot-matrix printer.

Nine-Pin Dot Matrix

Designed for use by small businesses or in the home, Epson's LX-86 dot-matrix printer produces 120 characters per second (cps) in draft-pica mode and 16 cps in near-letter-quality mode, operating bidirectionally in text mode and unidirectionally in bit-image graphics mode. It replaces the Spectrum LX-80 model.

The new printer features a Selectype panel that lets users change from draft to near-letter-quality mode by pushing a button and activates many type styles, including compressed, italic, elite, and double-strike. Epson's standard printer codes with built-in IBM-style characters provide increased graphics capability.

Circle 534 on Reader Service card.

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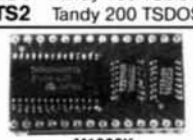
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The LX-86 comes with standard friction feed and has optional tractor and cut-sheet feeders ($34.95 and $69.95, respectively). It also has a 1K buffer, expandable up to 32K with an optional interface board ($175). The LX-86 costs $349, including a one-year warranty. Contact Epson America's Computer Products Division, 2780 Lomita Blvd., Torrance, CA 90505, 213-539-9140.

Circle 579 on Reader Service card.

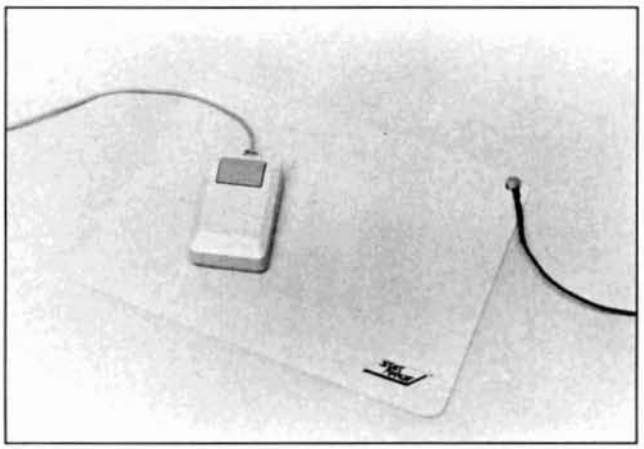
Clean Your Head

The Clean Image printhead cleaning kit is a cartridge that snaps into a printer in place of the ribbon cartridge. Until now, cleaning a printer head meant either removing the head and risking damage or inserting specially treated printing paper to do the job.

The Clean Image cartridge releases a cleaning solution. After the printer is run through a test pattern to engage all pins with the ribbon, the printer head is ready to produce sharp images. The cleaning kit is used each time you replace a ribbon and whenever you change a color ribbon to eliminate color overlap on subsequent documents.

The kit comes in three sizes to fit several-hundred printer models and costs $19.95. Contact Transphere International, 2325 Third St., Suite 325, San Francisco, CA 94107, 415-861-7510.

Circle 581 on Reader Service card.



Cover Craft's antistatic pad keeps mice grounded.

Antistatic Mouse House

Cover Craft offers an antistatic pad to keep sparks from flying when you use a mouse by continuously conducting charges through a ground wire attached to the pad.

The mouse mat measures 12⅛ by 9¼ inches—large enough to manipulate a mouse without letting it drop off the edge—and it's ready to use after you connect the 6-foot wire to any nearby electrical ground. The static-dissipating vinyl material is both flame retardant and chemical resistant while being soft to the touch.

The mat comes in two colors, brown or beige, and retails for $14.95. Contact Cover Craft, 540 N. Commercial St., Manchester, NH 03101, 603-644-3555 or 800-547-5600.

Circle 578 on Reader Service card.

It's Amazing

Amazing Things Inc. has released the Model A 1,200-baud half-card internal modem, featuring 300/1,200 bits per second (bps) operation, full or half duplex, auto-/manual originate and answer, Hayes Smartmodem compatibility,

Circle 97 on Reader Service card.

E1®

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System Requirements

Model 4/4P/4D Model I/III/1000

- **100% parsing of most questions.**
- **Handles hundreds of concepts & relationships.**
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- **Rejection of duplicate information.**
- **Determines logical consequences of stored information.**
- **Manipulates symbols, rather than numbers.**
- **Communicates in English!**
- **Modes: Learn . . . . . Accepts Inputs**
  Request . . . . . Asks Questions
  Forget . . . . . Deletes Information
  Dump . . . . . Displays File Contents
  Assimilate . . . . Optimizes Files
- **Automatic error handling & reporting.**

SAMPLE RUN:

EXPERT-1 PROGRAM

PLEASE SELECT REQUEST: LEARN, FORGET, DUMP, ASSIMILATE, END
? LEARN

IS NEW INFO CONCEPTUAL OR FOR THE DICTIONARY?
(ENTER C OR D) C

STATEMENT ? MR. SMITH IS A DOCTOR
STATEMENT ? A DOCTOR HAS MEDICAL KNOWLEDGE
STATEMENT ? MEDICAL KNOWLEDGE CAN SAVE LIVES
STATEMENT ? MRS. JONES IS A MEDICAL CONSULTANT
STATEMENT? A MEDICAL CONSULTANT IS LIKE A DOCTOR

PLEASE SELECT: REQUEST, LEARN, FORGET, DUMP, ASSIMILATE, END
? REQUEST
**REQUEST ? CAN MR. SMITH SAVE LIVES?
Searching . . .
YES.
**REQUEST ? WHAT CAN MEDICAL KNOWLEDGE DO?
SAVE LIVES.
**REQUEST ? GIVE EXAMPLES OF A DOCTOR.
MR. SMITH
**REQUEST ? CAN MRS. JONES SAVE LIVES?
Searching . . . NO DIRECT ANSWER. I'M CHECKING FOR SIMILAR CONCEPTS NOW. (INDIRECTLY)
YES

PLEASE SELECT: REQUEST, LEARN, FORGET, DUMP, ASSIMILATE, END
? END

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another high quality product from Southwestern Digital

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Features:

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- DMA
- Expansion Port
- Gold Edge Cards
- Easy Installation
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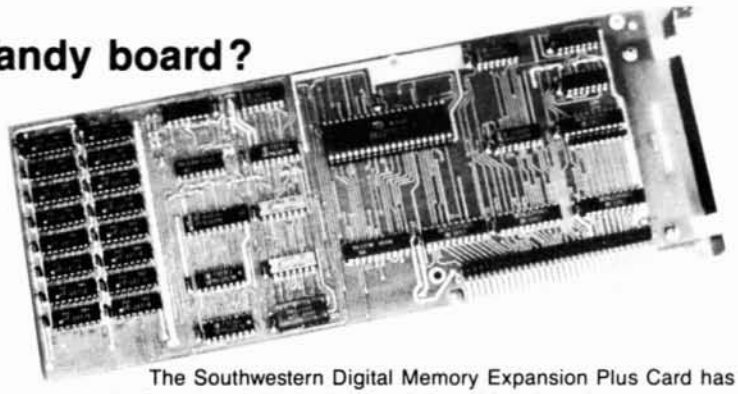


The Southwestern Digital Memory Expansion Plus Card has all the features of the Radio Shack Board but the price; you save almost $400. Features include 512K installed, burned in, and tested to give you a total of 640K, a DMA circut that is fully tested for hard drive operation, and an expansion port that will work with any of the Radio Shack Memory Plus Expansion Card options. High quality manufacturing, and features such as gold plated card edges make this the logical choice in upgrading your memory.

Tandy 1000 Add on Boards Serial, Clock, or Both

The Southwestern Digital new Add-On boards were developed for use with the Plus Card Port, (a piggy-back type, add on port established by Tandy to eliminate the need for an additional card slot). These cards are fully compatible with the Memory Expansion Plus Card from Southwestern Digital and the Memory Expansion Plus Board from Tandy.

RS232C PLUS Option Board

Mounts on a PLUS expansion board, and features selectivity between COM Port 1 and COM Port 2. The RS232C output connector is the standard Tandy female DB25, and is fully compatible with the Tandy output. $85.

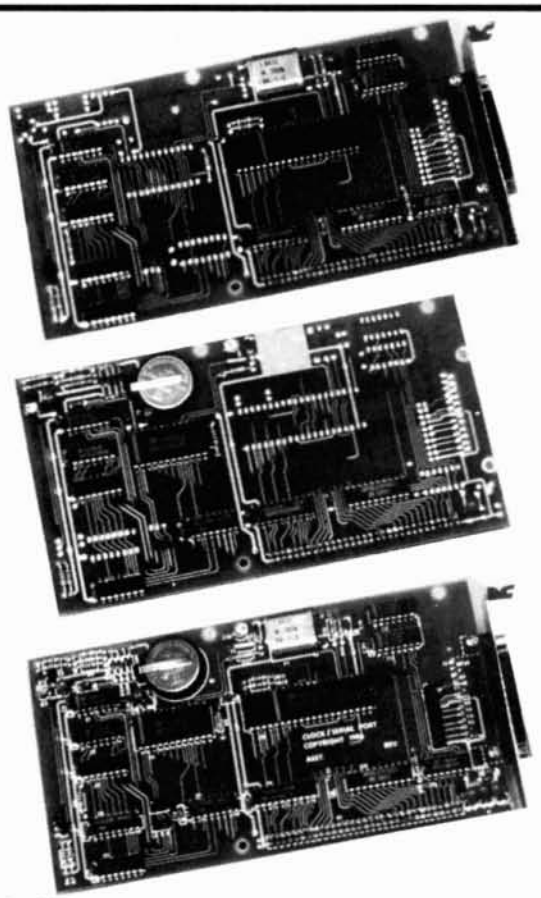
Clock/Calendar PLUS Option Board

Mounts on a Plus expansion board, and features selectivity between two ports so that you can run two clocks at one time. The Clock Calendar Board gives you perpetual time/date so that you don't have to re-input time and date into your application programs as part of your power up routine. $85.

RS232C-Clock/Calendar PLUS Option Board

Features options of both of the above boards on just one board. $170.

Save on the Combination
512K, RS232C-Serial Port, and Clock ..... **$245.**
(Includes RAM DISK and PRINTER SPOOLER)



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and the ability to fit into a half-size or full-size slot.

The Model A runs with various communications software, including Smartcom 2.1 and Crosstalk XVI, and comes with programmable software-control options, an integral speaker for audio call-progress indication, and analog loopback for testing.

The Model A 2,400-baud modem contains the same specifications, plus the faster processing speed. The modems run on the IBM PC/XT/AT and compatibles, come with a one-year warranty, and sell for $149.95 (1,200 baud) and $289 (2,400 baud). Contact Amazing Things Inc., 57 Providence Highway, Norwood, MA 02062, 617-551-0880 or 800-835-0139.
Circle 575 on Reader Service card.

Where's The Weirdware?

A new publication from Compute Books, *I Didn't Know You Could Do That with a Computer!*, is a buyer's guide to more than 120 useful and unusual programs for the IBM PC, its compatibles, and other computer brands.

Author Dan Gutman has coined the term "weirdware" to describe this index, which includes programs to trace your family roots, choose the right college, write your own will, manage a hog farm, learn how to mix a drink, reduce your stress level, design a patchwork quilt, and dissect a frog, among others.

The buyer's guide sells for $14.95. Contact Compute Books, P.O. Box 5406, Greensboro, NC 27403, 919-275-9809 or 800-255-2665.
Circle 577 on Reader Service card.

High-Speed Color Printer

The ProWriter C-715 Reliant from C. Itoh is a fast, seven-color, 24-pin dot-matrix printer that uses a credit-card-size identity card, letting users customize the printer to meet specific needs. It prints up to 300 cps in draft mode and 100 cps in letter-quality mode, and is capable of printing high-resolution graphics. The identity card lets the C-715 emulate the IBM Proprinter XL, Epson LQ-1000, Toshiba 351, and Diablo 630.

Other features include a quiet mode, proportional printing, automatic paper loading, push-pull tractor feed, and bottom feed. Centronics parallel and RS-232C serial interfaces are supported.

The price is $1,295, which includes a one-year parts and labor warranty. Contact C. Itoh Digital Products Inc., 19750 S. Vermont Ave., Suite 220, Torrance, CA 90502, 213-327-2110.
Circle 576 on Reader Service card.

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DIFFERENT TRACK

I.Q the Test lets you practice reasoning skills and spatial perception.

Brainpower

I.Q. the Test is a program that tests your own and others' intelligence, displaying graphics and text to test reasoning and spatial perception. Designed for children and adults, this program works on the premise that interacting with the computer alone reduces the environmental effects of test administration. Children can learn the style of intelligence tests and practice using their reasoning skills in a controlled testing situation.

The test includes verbal, math, logic, and visual-spatial questions, with the resulting scores showing a breakdown of strengths and weaknesses.

I.Q. the Test runs on the IBM PC/XT/AT and compatibles with 256K and a graphics card. The basic model costs $29.95; the deluxe model (not copy-protected), $39.95. Contact Rational Designs, 22704 Ventura Blvd., Suite 500, Woodland Hills, CA 91364, 213-396-2809.
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Joe Lynn's Payroll System for all TRS-80 III/4 and all IBM compatibles. $49.95 (815) 436-4477

BIBLE SEARCH. Study entire KJV Bible on disks. Lots of extras. Model III/IV sample disk $6. Write Scripture Software, Dept. 8M, Box 531131, Orlando, FL 32853.

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Name _____

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Telephone _____

CATEGORY _____

_____ _____ _____ (3 words)
_____ _____ _____ (6)
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Ides and Calends

Your "perpetual" calendars arrived just in time for the New Year. We weeded out the ones that, by not accounting for century years that aren't leap years, put Independence Day, 1776, on Tuesday instead of Thursday. Since century years leap once every 400 years, 2000 will have a Feb. 29, but 1900 didn't and 2100 won't. As Barry Mitchel (Reading, MA) pointed out, there's a nifty 400-year cycle to our calendar: What began on Monday, New Year's Day, 1601, will begin again on Monday, New Year's Day, 2001 (and again in 2401 if we last that long).

Time Machines

A few of your solutions counted days one by one starting from an arbitrary base date. One that began somewhere in the pre-Cambrian epoch is still running. But most of you resorted to contortive feats of arithmetic to get the job done. And what a job! T-shirts and bumper stickers are on the way to the winners.

Programs came in two varieties. Some gave the details for one date; others showed a calendar page for a month. Of the former, R. D. Boehmke (Rockaway, NJ) named the day in one line, from which I distilled Program Listing 1. Boehmke's arithmetic, however, doesn't reject dates like Aug. 64, 1066. It took Noble Sherwood (Huntsville, TX) two lines to do that.

While David Kelton (Richmond, VA) used three lines, the output he gives us is within allowable bounds, very informative, and nice-looking, too. David's routine (Program Listing 2) runs under any Basic that supports defined functions. Notice his use of Mid$ to put the proper endings on ordinal numbers.

Many of the calendar-page programs were remarkable in one or more details. Included in this group were entries from Darrell Lee (Sandy, UT) for the Tandy 200 and from Brian Murphy (Old Bridge, NJ) for the Color Computer. Howard Hobbs (Newburyport, MA) distinguished himself above and beyond the call of duty by taking the time to show October 1582 for what it really was: People in parts of Europe went to bed on Thursday, the 4th, and woke up on Friday, the 15th. Should we complain about losing a mere hour to Daylight Savings Time?

Paul Martin (Stevens Point, WI) was one of a few who combined a full calendar page with a spotlight on a specific day.

Program Listing 1. R. D. Boehmke's Day Deducer for the Model 4 and Tandy 1000.

```
10 INPUT"M,D,Y";M,D,Y:E=M+10:F=Y+(M-14)\12:P=((13*(E-(E\13)*12)-1)\5+D+77+5*(F-(
F\100)*100)\4+F\400-(F\100)*2)MOD 7:PRINT MID$("SunMonTueWedThuFriSat",P*3+1,3)
```

End

Program Listing 2. David Kelton's Dateliner for the Models III, 4, and Tandy 1000.

```
10 DEFINT D,I-N,Y:INPUT"Enter MO/DA/YEAR (@ TO QUIT)";D$:IF D$="@" THEN END ELSE M
=VAL(LEFT$(D$,2)):D=VAL(MID$(D$,4,2)):Y=VAL(RIGHT$(D$,4)):IF (M<1)+(M>12)+(D<1)+((
Y*100000+M*1000+D)<15821015)<>0 THEN 10 ELSE DEF FNMD(N,L)=N-(L*INT(N/L))
20 T$="0000310590912015111812122432733043343655":LY=(FNMD(Y,400)=0)-(FNMD(Y,4)=0)*(
FNMD(Y,100)<>0):J=VAL(MID$(T$,3*M-2,3)):IF D>(VAL(MID$(T$,3*M+1,3))-J+(M=1)*LY) TH
EN 10 ELSE J=J+D+(M>2)*LY:L=Y-1:L=INT(INT(L/100)*5.25)+INT(FNMD(L,100)*1.25)+1:L=F
NMD(L,7)
30 L=FNMD(L+J,7):DW$=MID$("SatSunMonTueWedThuFri",3*L+1,3):M$=MID$("JanFebMarAprMa
yJunJulAugSepOctNovDec",3*M-2,3):PRINT DW$+", "+M$+STR$(D)+",";Y;"(the";STR$(J); :
L=FNMD(J,10)+1:PRINT MID$("thstndrdthththththth",2*L-1,2);" day of the year)":GOTO
 10
```

End

Program Listing 3. Paul Martin's Tandy 1000 Perpetual Calendar.

```
1 N$="     Jan31Feb29Mar31Apr30May31Jun30Jul31Aug31Sep30Oct31Nov30Dec31":INPUT"E
nter date MM,DD,YYYY";M,D,Y:E=VAL(MID$(N$,M*5+4,2)):N=M:V=Y:IF N<3 THEN N=N+12:V
=V-1:IF(M=2)AND(((Y\100)*100=Y)AND(Y MOD 400<>0)OR(Y MOD 4<>0))THEN E=E-1
2 IF(M<1)+(M>12)+(Y*10000+M*100+D<15821015#)THEN 1 ELSE N=N+1:J=INT(365.25*V)-(V
\100)+(V\400)+INT(3#.6001*N)+1+1720997#:W=((J-7*INT(J/7))+1)MOD 7:PRINT TAB(37)M
ID$(N$,M*5+1,3);Y:PRINT TAB(27)"Sun Mon Tue Wed Thu Fri Sat":PRINT TAB(26+W*4);
3 IF X<E THEN IF POS(0)=54 THEN PRINT:PRINT TAB(26):GOTO 3 ELSE X=X+1:PRINT"  ";
:IF X=D THEN PRINT CHR$(16);:PRINT USING"##";X;:PRINT CHR$(17);:GOTO 3 ELSE PRIN
T USING"##";X;:GOTO 3 ELSE PRINT:PRINT:CLEAR:GOTO 1
```

End

Paul's program (Program Listing 3) produces an attractive display in which he right-justifies all the numbers with Print Using "##" statements. Then, rather than just naming the day, Paul *literally* spotlights it with reverse video, a technique that helps keep the program brief. The Tandy 1000 program will run on a Model 4 if, instead of the Color statements in line 3, you use the Print statement with the reverse-video switches, CHR$(16) and CHR$(17).

Getting There

My neighbors here in Maine are notorious for telling travelers, "Ya cahn't get they-ah from he-ah." It's often true.

Not so with computer programs. No matter how we're wowed by a program, there is always a logical path from its input and given constants to its output and conclusion—logical but not always obvious. That's this month's challenge. I'll give you the first line (zero), the last line (3), and the output of a program. You (re)construct the missing lines 1 and 2.

Here's the first line:

```
0 A$="SEASON'S GREETINGS":Z$=
  CHR$(13)
```

and the last line:

```
3 PRINT A$;Z$;B;Z$;C$;Z$;D$;Z$;E$;Z$;F$
  ;Z$;G$;Z$;H$;Z$;I$;Z$;J$
```

On execution, line 3 produces this display:

```
S E A S O N ' S   G R E E T I N G S
  1 2 2 0
S E A S O N S G R E E T I N G S
1 3 2 1 2 1 1 4 1
A E G I N O R S T
S A N G
S E A   S O N   T I N
S G N I T E E R G S N O S A E S
S R E E A E S T O I N N S G G S
S e a s o n ' s   G r e e t i n g s
```

The output, B through J$, derives from the A$ constant without anything sneaky like G$ = "SEA SON TIN". Everything fits comfortably into two lines. After you've deduced the significance of each output item, what might the missing code look like?

The rules:

1. Write your solution(s) in any TRS or Tandy Basic, except Pocket Computer Basic.
2. This month's entries must reach us by Jan. 15, 1987. This doesn't give everyone the same amount of time, we know, and we apologize to our overseas readers especially.
3. This month's winners will appear in the April 1987 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 be able to return entries.
6. Specify your T-shirt size. Bumper size not required. ■

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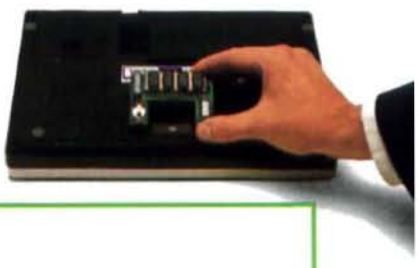

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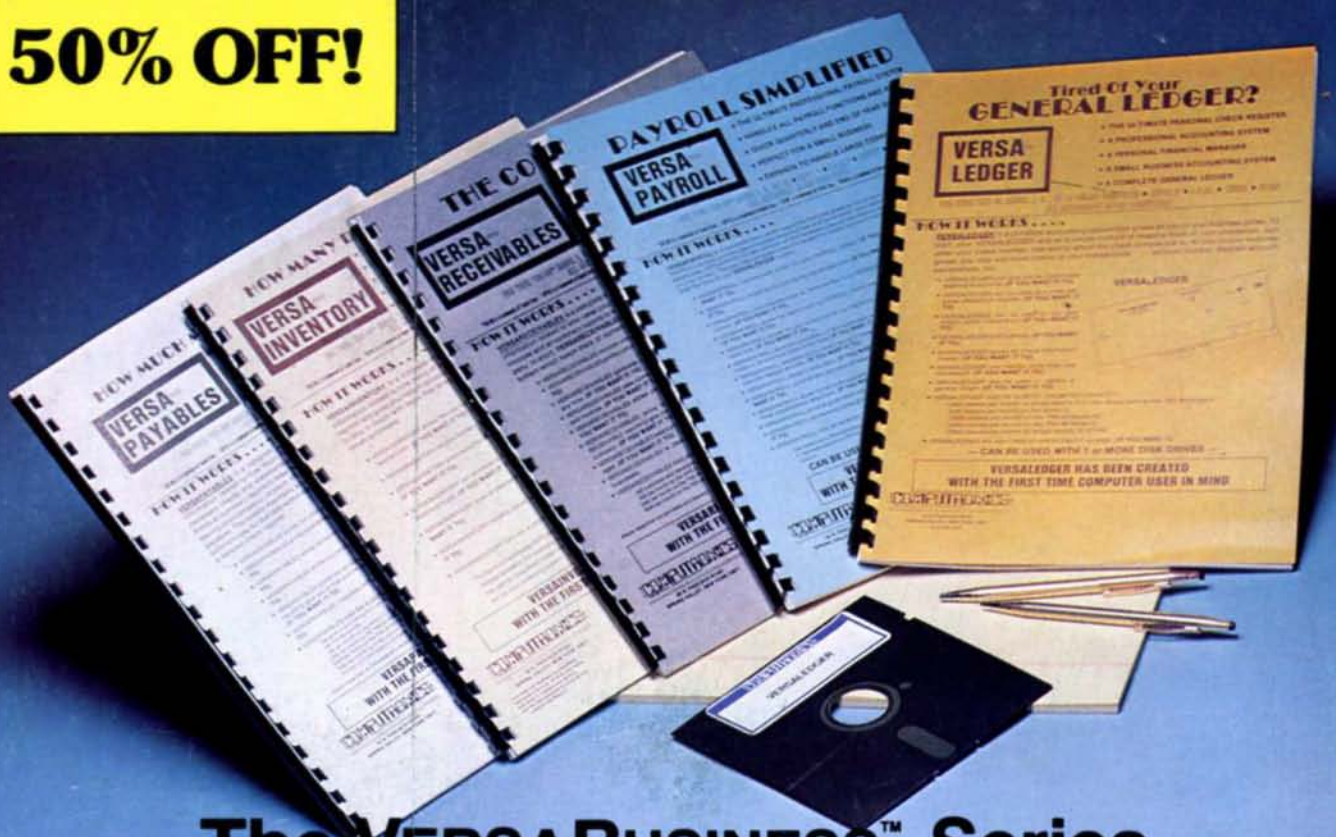

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