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80 microcomputing™

the magazine for TRS-80® users

A WAYNE GREEN PUBLICATION

Crash Savers:
Your Program May Not Be Lost!

Time Saving Magic—
Utilities Computerize Your Programming

Utilities Buyer's Guide:
What You Need To Know Before You Buy

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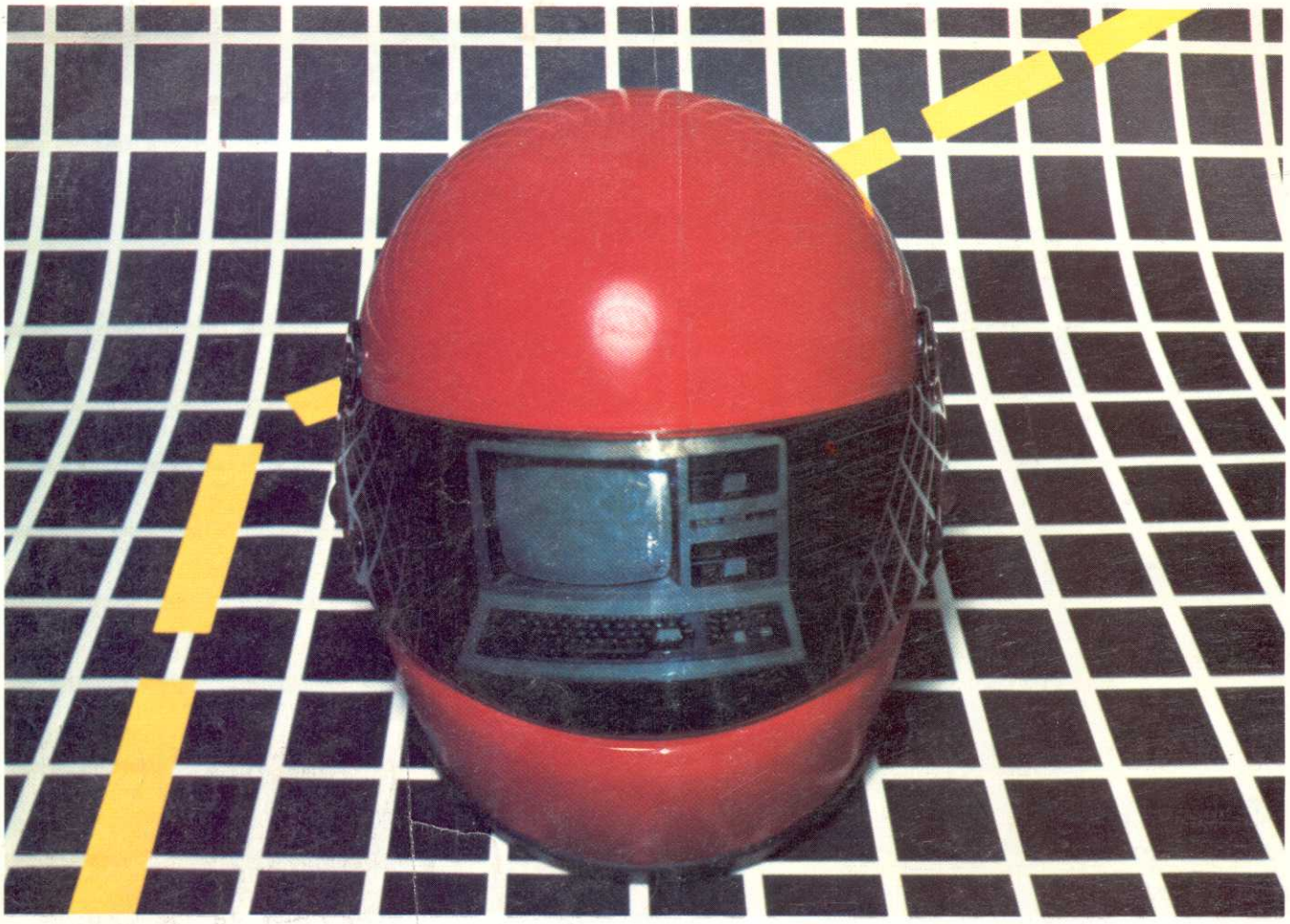

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Basic Misinterpreter 86*

by David Busch

Speak of the Devil! Dave says he's received such a demand for KTI products that he thought it would be a good idea to produce . . . er . . . acquire some. Here is his first offering, an item he says is "a significant technological regression."

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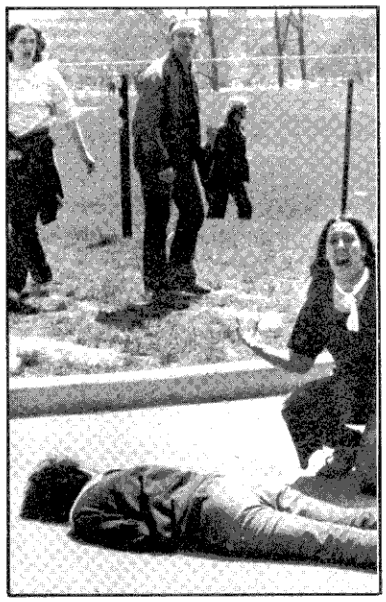
by Kerry Leichtman

In Stamford, CN, American business is owning up to the confidence President Reagan has placed in it to help the disadvantaged, and using computers to do it.



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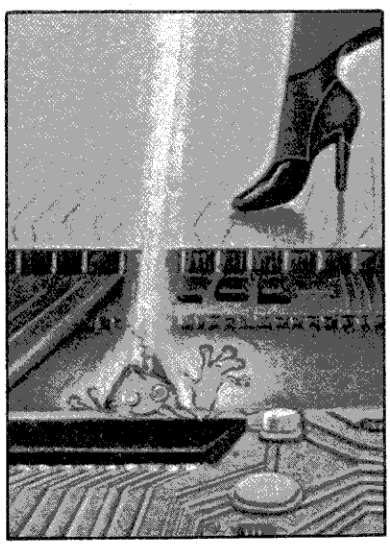

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80 REMARKS

by Wayne Green

"A letter from a chap in Maryland lists in detail how he saved $913.72. . ."

Month Change Coming

In order to thwart the people who handle the newsstand circulation of *80*, we will be running a double month in one issue of 1982. Every subscriber will get the twelve issues bargained for; just the date on the issues will change.

Newsstand distribution is handled through a network of about six hundred distributors. Each of these firms service as many as several hundred newsstands or magazine sections in supermarkets, discount stores, book stores, and so on. We run into problems with the date on the magazine cover. The chaps who stock the magazines and return the unsold copies do not keep track of how many days or weeks a magazine has been on sale. They look at the cover month and, if the month is about up, pull the unsold copies.

Since *80 Micro* comes out fairly late in the month listed on the cover, we found some newsstands had the issues on sale for less than a week before they were removed as unsold copies. By moving the date on the cover ahead one month, each issue will get a full month on the newsstands and thus be available when people come looking for it.

The newsstand sales of *80* have been surprisingly strong, considering the date problem, so we're anxious to increase these sales. So far we have tested newsstand sales in only a few areas of the country, but we would like to go national with it once we solve the cover date problem.

We'll get the computer to move all subscription renewal dates one month later and then sit back, waiting to answer the piles of letters from readers who have not read this or future announcements, beefing about losing an issue on their subscription.

Fortunately, these hot heads are in the minority. I am just as proud as I can be of you—the reader. You buy the magazine, you write great articles for it, you write interesting letters, and you buy the products advertised with abandon. The advertisers tell me that they do far better with their ads in *80* than any other magazine.

If you do have trouble with any firm, including mine, let me know.■

The No Monitor Debacle

An easy way, it was thought, to cut about $50 from the manufacturing cost of a desktop computer was to leave the monitor off and let the user plug in a television set. After all, $50 saved up front can bring down the retail price by $150 to $200, which is significant.

The development of micros with color capability made the additional cost of a built-in color monitor even more onerous. When we see those $79 black and white television sets and those $250 color sets in the discount stores, we tend to push out of our mind what we know about manufacturing and distribution.

Those low-priced tv sets are possible because somewhere, using almost 100 percent automation, a very large factory is churning those sets out by the hundreds of thousands or more. They are then shipped by the boatload and merchandised via discount stores, where there is a minimum of overhead.

It is impressive to visit one of these truly mass production factories. One that I toured not long ago was about 50 miles out in the country from Seoul, Korea. Even though the worker wage was miniscule by our standards, the factory was thoroughly automated. One man stood and watched as a mammoth machine inserted parts into the tv set boards. The parts had been automatically put on a strip for this inserter by another machine, which took strips of the parts and restripped them in the order they would be inserted.

The production line was continuous and so perfect that all but the final test station had been removed, and that really wasn't necessary. New employees train on a small pseudo-production line until they are ready to move to the big line, which seemed to move for miles through the huge plant.

Burning-in tests, glue drying, and other wait periods which normally call for the removal of the set from the moving belt were accomodated by the belt going above the work area and circulating during the necessary delay. The belt then returned the products to the work level for the next steps in the process.

Production engineers figure each doubling of the quantity of merchandise manufactured results in a lowering of the unit cost by about 15 to 25 percent. Thus, if we are making an Apple computer and figure the whole system sells for about $4,000 with disks and so on, if we increase production from 100,000 per year to 1,000,000 units, our selling price will be down around $1,750. At six million the selling price is down to about $1,000. You get the picture.

If you leave the monitor off a computer you create some serious problems for the customer and the dealer. First, the definition of characters on most television sets is crummy. This does not enhance the image of the computer. If you're going to have decent looking readouts your monitor is going to have to be a dedicated monitor. It is going to have to have a much wider bandwidth than television sets provide. And bandwidth determines the sharpness of the picture. The wider the bandwidth, the sharper the image.

But since monitors are needed in thousand lots, not in millions, their cost is high compared to a tv set. When you consider there is less technology involved in a monitor and that, if the quantities were of the same magnitude as tvs they would cost considerably less, there are some emotional problems (particularly for engineers, who understand the problem) involved in paying more for less.

There are other difficulties too. In a business environment we rarely have a television set which can be commandeered for use with a computer. In that case there is obviously no saving to the buyer of the system when the manufacturer sells only the computer and no monitor.

In the home we have another situation. Sure, we have a tv set in the home—a couple of them, at least. But these were bought for watching television, not to be preempted for use with a computer. The person who drafts the family tv set to play a game or build some business charts is going to have several very angry family members raising hell. The average home tv set is in use over seven hours a day. This doesn't leave much time for the computer.

I would be remiss if I didn't add one more straw to your load. Once you see a color computer you get all excited about it. This is one of the reasons Apple has

←Reader Service for facing page ✓30

done so well. Radio Shack's color system has done surprisingly well, considering that there is virtually no software for it. That's the power of color; but with the market for color monitors less than miniscule, the price for these gadgets is all out of proportion to color tv sets. It's worse than the black and white monitor versus tv difference. It's those small quantities again.

Most color computer owners make do with a tv set, managing to live with a really terrible display. This can only have a chilling effect on the sale of color systems, so our manufacturers are going to have to tackle this obstacle soon.

The bottom line is that there are no benefits to the consumer in buying a computer which does not have a dedicated monitor. The apparent savings are paid for by having to accept poor displays or by having to pay a bundle for a decent monitor—which is obviously no saving.■

Saving Money

In the December issue I asked readers to let me know how much they had been able to save without violating warranties when buying TRS-80 systems from *80 Micro* advertisers. A letter from a chap in Maryland lists in detail how he saved $913.72 through our advertisers rather than buying at his local Radio Shack store. He patronized Perry in Michigan, Texas Computer Systems and Data Resources in Denver. Most of the Model III, 48K, two disk system came from Perry. The Epson printer and cable came from Texas, and disks and a disk box from Data Resources.

His cost in Maryland would have been $4,000.03 according to his documentation, versus $3,086.31—and that includes the cashier's check and postage.

This fellow got fast deliveries and full warrantees, and is very, very happy.

How about you? Any more success stories with our advertisers which I can pass along?

If you have any problems with advertisers—heck, if you have trouble even with non-advertisers, please let me know the details. The normal procedure I prefer is: Write to the firm which has caused you aggravation, giving them as dispassionate an explanation of the details as you can, and suggest a solution to the problem. Then send the original to them and a copy to me. Note: It can be helpful if you mark on the bottom of the letter that I am getting a copy.

There have been cases where I have not been able to help customers. But for the most part these things end up favorably. I make it a point to do all I can to see our advertisers are doing all they can to give you good products and good service. Oh, I get shafted now and then, just as you do, but not often.

If you do write and wish not to be identified just let me know.■

TRS-80 Service Research

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8). MACRO'S FOR DRAWING BORDERS LIKE YOU SEE HERE. --->
9). EFFORTLESSLY VIEW A FILE WITH OUR SPEED READER MODE
10). INTERACTIVE ERROR CHECKING MODE FINDS ERRORS FAST.
11). START PRINTING AT ANY PLACE IN THE TEXT BUFFER WITH HEADERS, FOOTERS AND PAGE NUMBERS IN PLACE.
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Back in the dark ages of mainframe computers, utilities were an intricate part of the machine's software system. In fact, you had to call up a utility program in order to make your applications program run. Called systems utilities, they performed general functions such as sorting and disk I/O. With the advent of minis and micros, programs were designed to stand alone and the need for systems utilities diminished. This change is attributed mostly to the development of high-level languages. Now high-level languages are the norm, and utilities play just as important a role. In essence, they are diagnostic tools that the programmer uses to create good, memory-efficient, high speed programs. This is not to undermine the seriousness with which most computerists regard utilities, but utilities are to microcomputers what a magic hat is to a magician. They enable the programmer to perform tricks. For instance, operating systems have a variety of built-in utilities that enable the programmer to do just that—perform what many would consider magic. After all, if you are a serious tinkerer, what more could you ask?

Since we know that you are always refining your know-how and polishing your technique, we have packed this issue with a plethora of original utility programs along with a comprehensive Buyer's Guide. Editor Lynn Rognsvoog, our in-house Buyer's Guide specialist, has compiled a section on what the consumer will find in the marketplace. Lynn's in-depth look will help you narrow your choices in the search for perfect utilities and start you on your way to expertise in the subject.

Lynn presents 20 manufacturers and ten major categories of utilities. Editors and assemblers; assemblers; disassemblers; Basic editors; monitors; disk zappers; tape utilities; file utilities; renumberers and compressors; and general utilities will all be featured.

Jake Commander, international programmer and successful author of several utility programs, gives us an extensive tutorial on utilities. Jake will examine not only the various types but how they can help you, both on the hardware and software level.

Also featured is "BAM (Beginners Advanced Monitor)" that, as the author says,"...taken in gradual doses, can help you learn machine code without having to look up one-letter commands. It can help make the change from Basic to machine code like learning a few new words rather than learning a whole new language..." Author Jeff Byrkitt decided to make each command in BAM a full word, so both the beginner and advanced programmer (who are equally beset by forgetfulness at times) can remember what each command is supposed to do. Jeff also wrote this innovative program "so that you professors can change it, expand it, and add to it, thus impressing your boss when he comes over for dinner and wants to know about machine code." A well-taken word of advice from Jeff—don't tell anyone a fourteen-year old wrote it by himself.

David Busch, wizard and creator of Kitchen Table, Inc. is featured in a special interview that, yes, folks, is for real.

And finally, beware of April whimseys produced by the creative minds of our own in-house editors.

Enjoy and April Fools'!

Pamela Petrakos
Senior Editor

The left bracket, [, replaces the up arrow, ↑, used by Radio Shack to indicate exponentiation, on *80 Micro's* printouts. When entering programs published in *80 Microcomputing* you should make this change.
80 formats its program listings to run 64 characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

Due to the death of his close friend and teacher Philip K. Hooper, Dennis Kitsz' columns will not appear this month.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include a SASE for a copy of our writers' guidelines. Payment for accepted articles is made prior to publication, at a rate of approximately $50 per printed page; all rights are purchased. Authors of reviews should contact the Review Editor, 80 Pine Street, Peterborough, NH 03458.

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BELOW ARE TESTIMONIALS from owners of AIDS systems. These are absolutely authentic statements and are typical of the comments we receive.

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David Wareham, Vice President (EDP), National Hospital and Health Care Services Inc.

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Jack Bilinski, President, 80 Microcomputer Services

"Your AIDS program is far and away the finest information management system that I've ever seen. I am currently using it to maintain a clear picture of the demographic data on all the kids in our residential treatment program and it is working for me superbly."
Frank Boehm, Director, Front Door Residential Treatment Program

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80 INPUT

"Under normal conditions our printhead will not need replacing for over 200 million characters of printing."

Microline 80 Printhead Warranty

I want to make a few comments about the Okidata Microline 80 printer.

We frequently use many of its character size and graphics features. During our first year of ownership we used the Microline 80 very little, we now use it for many things and are very pleased with it.

Approximately 13 months after purchase, one of the printhead solenoids became inoperable. The printhead was warranted for only one year. We ordered a new printhead from the company and the printer has been working since then.

Okidata's full-page advertisements appearing in many computer magazines state, "The head is warranted for 200,000,000 characters. That translates to over nine years...." We estimate the number of characters printed during the first 13 months of ownership to be only a small fraction of 200,000,000 characters!

How can Okidata's telephone sales personnel tell us the warranty lasts one year while those full-page advertisements say "...over nine years..."?

Wayne Field, President
Mountain States Computer Corp.
Colorado Springs, CO

Okidata Replies

Thank you for your letter concerning your Okidata Microline 80 printer. We are pleased you like the printer and are enjoying its many features.

I am sorry for any inconvenience the ad, mentioned in your letter, may have caused you. Since it has caused some confusion in the minds of some of Okidata's valued customers, like yourself, we have discontinued the ad for further publication. Its intent was to convey to potential buyers that under normal conditions our printhead will not need replacing for over 200 million characters of printing. (Test results are available on request.)

Because it would be extremely difficult for Okidata to accurately keep track of printhead usage based on number of characters printed, and some do fail for mechanical reasons, we offer a one year limited warranty.

The failure of your printhead appears to be an extraordinary case. So that we can evaluate it and determine its reason for failure, would you please send it to us if it is still available. This will help us catch any possible manufacturing mistakes.

I hope you will continue to use and enjoy the many quality features and reliability built into your Microline 80 printer.

William S. Gore II,
Manager/Marketing Services
Okidata Corp.
Mt. Laurel, NJ

Word Processor Update

Thanks for the very informative article on word processing ("A Fast Round Up," *80 Microcomputing*, November 1981) by Gordon McComb. We have added several more features to the current version of our Word Processor since Mr. McComb wrote his article. These include: global search/replace; headers; page centering; merging (merges date, name, address, and salutation for printing form letters); envelope/label printing (addresses envelopes or labels); variable column width option (from 1 to 6.4 inches): two-column print option (to print flyers, newsletters, and so on); and a line centering option (to center titles or any other line of text). In addition, our word processor now allows the user to develop and print four different sizes of characters, all within the same document, on various dot matrix printers like Radio Shack's Line Printer II, IV, V, VI, VIII, the Epson MX-80, MX-100, and many more.

Blanton Software Service's (4522 Briar Forrest, San Antonio, TX 78217) word processor is now priced at $24.95 for tape and $29.95 for disk (Model I, III, or Color Computer)—prices include shipping. In Mr. McComb's article he emphasized the importance of getting a word processing system which "suits your needs" and "fits the capabilities of your present inventory of hardware." We wholeheartedly agree! To help our customers put a "lasso" on that word processor which suits their needs and system, we offer a money back guarantee if they are not satisfied with ours. They may return our word processor and we will refund all but $2 to cover our handling and shipping costs.

Tommy Blanton
Blanton Software Service
San Antonio, TX

Digital Innovations

Our product, the DC-80, appeared in the New Products column (*80 Microcomputing*, May 1981), but, unfortunately, due to the postal strike in Canada all the people who wrote to us during this time had their mail returned "Service Discontinued" which apparently left the impression that we were out of business. We are in business and are offering our product in the U.S. for $49.95 plus $3 per unit for shipping. You can order it from us at the address below.

Donald F. Matheson
Digital Innovations
37 Stony Brook Drive
Kitchener, ONT N2M 4L6 Canada

Super Utility

Regarding Jerry Latham's letter "Program Bugs" (*80 Input*, November 1981) concerning bugs in Super Utility and inaccurate allegations as to the way Mr. Watt "fixes" his bugs, I, as Kim Watt's publisher, would like to respond.

First of all, Mr. Latham talks about a bug in Super Utility that "eats" sector five of track 17. Kim did indeed duplicate this bug, and fixed it. The cost for this "fix" and in fact for the latest version of Super Utility is only $1. That's right...$1! Mr. Latham inaccurately accused Mr. Watt of charging $25 for this fix. What Kim is charging $25 for, is the new Super Utility Plus, which is a complete rewrite of the program and works with all current DOSs, Models I or III. This is a $25 upgrade and you need to specify Model I or III. The Plus

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version retails for $74.95, so the owner that paid $49.95 for the original Super Utility ends up paying the same as if he bought it off the shelf new. He does not lose anything in the upgrade process.

Original owners of Super Utility may always get the latest version of the program for a $1 upgrade fee.

Original and upgraded owners of Super Utility Plus may always get the latest version of that program for a $3 upgrade fee.

To upgrade from regular Super Utility to Super Utility Plus is $25, plus we need the master disk returned to us with the order.

Dennis A. Brent, President
Breeze/QSD Inc.
Dallas, TX

Customized Commands For Mod III

Regarding my article "Customized Commands" (*80 Microcomputing*, November 1981), the six paragraphs beginning on the lower left of p. 298, "I normally load this program. . ." and ending with lines in the third column just above "Make It Work" should all be inserted onto p. 294 just below the second line in the fourth column. . ."MERGE to make a tape."

To make the programs in Customized Commands work with the Model III, change all occurrences of JP 0072H (C3 72 00) (in Listing 1—lines 260, 350, 380; in Listing 2—line 230; and in Listing 3—line 400) to JP 1A19H (C3 19 1A). In Listing 4, change two occurrences of 114,0 to 25,26 in line 25. In Listing 4a, change 114,0 to 25,26 in line 20.

Dale W. Rupert
Bethel, CT

ZBug for Model III

ZBug (*80 Microcomputing*, January 1981), works great on the Model III. However, you cannot use the copy function to its full potential. You could use this routine to upgrade any machine language program from 500 baud to 1500 baud even if the program normally resides in the same space as ZBug.

The following modification will let you change the cassette load/save rates befor every tape I/O. The routine replaces a ROM routine used in the Model I with the Cass? routine, new to the Model III.

Load ZBug and use the Set function to change the two bytes starting at 4548H, 45CAH, 4661H, 475FH, and 47DDH from 1202 to 4230. Then WRITE 4300 4F1B 4338 ZBug.

Now you can load/save at either speed by answering the Cass? prompt just before ZBug loads or saves.

Douglas DeTardo
Hollywood, FL

Prime Numbers

I would like to share the oneliner shown in Program Listing 1 with *80 Microcomputing* readers. It will output prime numbers up to 7660 on a 16K machine. It is based on the sieve of Eratosthenes and is quite fast for a Basic program. For example, it will generate all the prime numbers less than 1000 and print it to screen in 8.7 seconds.

Louis Pelletier
Maniwaki, Quebec

LPRINT to PRINT

A recent Tandy TRS-80 Newsletter listed a little program to change all the LPRINTs to PRINT and vice versa by changing the 178s to 175s. However, a problem arises if 178 or 175 is used as a line number indicator, or to point to the end of the line.

This short program (see Program Listing 2) avoids those memory locations that hold the pointers and line numbers and so cuts down the odds for error by a few million.

I use 26841 as the memory start point with Model III TRSDOS. Use 17129 as the start point for Level II and 17384 as the start point for Model III tape.

Norman E. Cook
Saint David Lakes Resort
Saint David, AZ

Locations 16548,9 always point to the start of Basic in any configuration.—Eds.

Using TRS-80s in Europe

I am having problems dealing with Radio Shack on my Model I system. I am in the US Army and on orders to Frankfurt, Germany. I wrote a letter to Tandy and asked about conversion instructions to operate the computer on 230 VAC/ 50Hz. It is a common practice for Americans to use step down transformers to convert the 230 VAC down to 115 VAC, but the power frequency stays at 50Hz.

I was shocked to get my response from Mr. Ted Rosenberg, Customer Relations Manager, which stated in part ". . . while we understand your desire to take your computer with you, we must suggest that you leave it at home. . ."

```
1 DEFINTA – Z:CLS:INPUT"PRIMES UP TO";L:DIMA(L):V =
INT(SQR(L)):PRINT2,:FORB = 3TOLSTEP2:IFA(B)NEXT
:ELSEIFB>VPRINTB,:NEXT:ELSEFORC = B*BTOLSTEP2*B:
A(C) = 1:NEXT:PRINTB,:NEXT
```

Program Listing 1

```
60009 CLS:CLEAR1000: 'Norman E Cook, St. David, Arizona
60002 PRINT "<1> Change all LPRINTS to PRINT
60003 PRINT "<2> Change all PRINTs to LPRINT
60004 KB$ = INKEY$:IFKB$ = ""THEN6004
60005 IF KB$ = "1" THEN PRINT:
      PRINT "Changing LPRINT to PRINT":
      C = 175:D = 178:
      GOTO 60008
60006 IF KB$ = "2" THEN PRINT:
      PRINT "Changing LPRINT to PRINT":
      C = 178 : D = 175:
      GOTO 60008
60007 GOTO 60004
60008 FOR I = 26841 TO 32767
60009 P = PEEK(I)
60010 IF P = C THEN POKE I,D
60011 IF P = 0 THEN 60013
60012 NEXT
60013 IF PEEK(I + 1) = 0 THEN 60014
      ELSE I = I + 4:
60014 IF PEEK(I + 2) = 0 THEN END
      ELSE I = I + 4:
      NEXT
```

Program Listing 2

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"It is not our style to tell powerful executives only what they want to hear."

Apple makes a power supply card which you can exchange with the standard card for operation on European power. I understand that the TRS-80 does not have such modular construction, but I cannot believe that the smart folks down in Fort Worth cannot figure out a conversion for the TRS-80.

I would think that a power inverter (the ones used with recreational vehicles to convert 12 VDC to 115 VAC/60Hz) could be configured to do the job externally. I would also suspect that a comparison of the schematics of the US and European version of the TRS-80 (Yes, Tandy makes a European version TRS-80!) would show the differences of components that I would have to switch or modify. What I *really* suspect is that Tandy already knows how to do the conversion much easier.

How about it, Radio Shack? I have spent $3000 on my TRS-80 and really enjoy it. Is your best advice really to "leave it at home for three years"?

Major Ed Marble
Fort Leavenworth, KS

Radio Shack Replies

I must apologize for the difficulty that you have had in obtaining correct information about using your TRS-80 Model I on 230 VAC/50Hz power systems.

The keyboard/CPU and expansion interface will each require a new external power supply. The cost is 100DM, ($46 U.S.) for both. The video monitor and disk drives will require substantial modifications. The video modifications are 250 DM ($114 U.S.) and the disk modifications are 175DM ($80 U.S.) each. The total cost for the 110 VAC/60Hz to 220 VAC/50Hz for your system (with two drives) would be 700DM ($320 U.S.) Please note that the prices given are valid at this time. Fluctuating international monetary rates may cause them to vary slightly.

The conversions would take approximately 2-4 weeks depending on parts availability. You will be given all components removed and the units can be remodified prior to your return for approximately ½ the cost of the original modifications.

You did not specify which of our printers you are using. If you let me know which printer you have, I will find out what steps need to be taken for conversion and the approximate cost. Of course, we have no way of knowing what effects these modifications will have on the operation of the Percom Doubler.

I hope this provides you with the information you asked for, and again, I apologize for the misunderstanding.

Bill Walters,
Consumer Information Manager
Radio Shack
Fort Worth, TX

Relocate TRS-80 Disassembler

When I saw Carl Wuebker's "TRS-80 Disassembler" in the August issue it was an answer to my prayers. The first thing I tried was taking T-Bug apart, but that did not work because this program overlaps T-Bug.

I made the changes shown in Program Listing 3 to solve my problems. Change the first few lines. Line 4000 needs a small addition and add line 3425.

Frank Pallanch
Edina, MN

Congratulations

Congratulations on your first two years! I have enjoyed every issue and have received many great programs from your pages and have purchased from several of your advertisers.

One thing about the magazine that bugs me is the never-ending petty griping about Radio Shack. I have had my TRS-80 for over three years. I have had a couple of problems with it, but the Radio Shack people have been cooperative and helpful, both locally and in Fort Worth.

Rather than complain about the things Radio Shack left out of the machine or does not supply for it, we should all be grateful for the opportunity this gives hundreds of suppliers to sell us a wide variety of hardware and software (and advertise in *80 Microcomputing).*

How about looking for a different axe to grind for a change?

Tom Kilbride
Waco, TX

Gripes

Tom, you know as well as I do that it is human nature to gripe far more than it is to compliment. If we didn't think the TRS-80 was just about the best system available we wouldn't bother publishing 80. It is a super system, but where it does have problems 80 provides a medium for communications between users. . . and perhaps even more important, back to the factory. Often it seems as if customer problems fall on deaf ears with companies as huge as Radio Shack, which probably has a lot to do with 80 getting a lot of the gripes. We all know that the top management for firms as large as that often have a serious problem in getting all the facts for making decisions, so perhaps 80 helps since we pull no punches. There is a tendency to tell powerful executives only what they want to hear which, despite some grinding of high official teeth at Fort Worth, is not our style. In the long run both the TRS-80 and Radio Shack will, I believe, be better served by our airing of gripes. I personally know all of the top people at Radio Shack and assure you they are a darned good group, no matter how apoplectic I may make them now and then. We are not inclined to be Pollyannish up here in the heart of Yankee territory. —Wayne

```
5 'TRS-80 DISASSEMBLER FROM 80 MICROCOMPUTING AUGUST 1981 PAGE 240—REVISED 12/29/81
  FOR HEX STARTING LOCATION AND TO WORK AT ALL MEMORY LOCATIONS—F. T. PALLANCH
10 CLEAR 3000
20 GOSUB 2200
29 'HEX TO DECIMAL AND TWOS COMP.
30 HX$ = "0123456789ABCDEF"
40 INPUT"STARTING LOCATION (HEX   )  ";A$
41 L = 0:FORI = 1TO16:FORJ = 1TO4
42 IF MID$(A$,J,1) = MID$(HX$,I,1)THEN L = L + (I – 1)*16[(4 – J)
43 NEXTJ:NEXTI:L1 = INT(L + .5):PRINT"DECIMAL      L =  ";L1;:L = L1: IFL>32767THEN
   L = L – 65536:PRINT"      TWO'S COMP. L =  ";L:PRINT
50 P = 0

3425 IF L<0 THEN C = C + 65536

4000 C = L:IF L<0 THEN C = L + 65536
```

Program Listing 3

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CC—A Good Investment

Your January *80 Remarks* column concerning the future of the Color Computer causes me to write. I agree with what you say, but feel you are incorrect in your assertion that Radio Shack is going to abandon the CC.

When I was searching for a personal computer the price I could afford was of prime concern. I felt that the Apple II and TRS-80 Model II/III's were beyond my budget. It was not until after I purchased and upgraded my CC that I became convinced I had made a good choice. The initial impression the CC makes on people is that of an expensive toy to play TV games on. If one delves into the capabilities of Extended Color Basic and the extensive machine language capabilities of the 6809E microprocessor, the CC stands out as an enormous bargain.

Software for the CC has been painfully slow in appearing on the market, but is now beginning to come. One excellent example of this is a word processor package called TELEWRITER which I recently purchased and am using to produce this letter.

Perhaps Radio Shack's most serious mistake is in not selling and promoting others' hard/software. I have an Epson MX-80FT printer. It required, in part, the help of an electronics engineer friend to interface the computer and the printer.

Here's hoping Radio Shack continues to support the Color Computer.

John Bentley
North Reading, MA

Color Computer Lives

As the publisher of several magazines it seems you have the power to print virtually any personal opinion of yours as well as any unsubstantiated rumor no matter how far wrong you are. In the past we have tended to ignore your monthly misinformation about Radio Shack as it did no one harm, except perhaps yourself.

I must, however, take strong exception to your *80 Remarks* column of January 1982, in which you state that we are likely to drop the TRS-80 Color Computer.

That statement is absolutely untrue and is causing unnecessary anxiety on the part of our Color Computer owners. We just finished a terrific Christmas season with the Color Computer in which we sold out our entire warehouse supply. Contrary to your comments about no advertising, the Color Computer had more advertising September-December than any other TRS-80, which included a great deal of national tv advertising.

"So, Wayne, sorry, but you are dead wrong."

Our March computer catalog will list 26 Program Paks and 8 cassette programs for the Color Computer, and we have over 40 Program Paks, cassette and disk packages in the works. In addition to the current peripherals there are three additional hardware products for the Color Computer in design.

So, Wayne, sorry, but you are dead wrong. The Color Computer will not be dropped in 1982, or in 1983 for that matter. It is a highly successful product and stands a good chance of being the number one unit selling computer in America this year.

If you believe in responsible journalism you will publish this letter as soon as possible, and, in the meantime, I will send it to those customers who are calling us who, unfortunately, believe that if something is in print, it is true.

You are also wrong on the Pocket Computer. We sold more of those the first 12 months of its life than we sold Model I's the first year of its life. And we just introduced its new brother.

John Shirley, Vice President
Merchandising Computer Products
Radio Shack
Fort Worth, TX

Who's At Fault?

Mr. Shirley, your letter is appreciated. I hope it will quell any further rumors about the Color Computer. Of course you understand that it is difficult for journalists to print other than rumors when the moves of Radio Shack are shrouded in such total secrecy and it seems that even true rumors are denied. Unless there is a more open relationship with the press I am afraid that this is going to be a continuing problem and journalists will continue to be accused of irresponsibility. Mr. Shirley, we really try, sometimes against overwhelming odds.

The crescendo of ads for the Color Computer at Christmas time was not surprising. I think most of us expected it to be promoted as a Christmas toy up against the Atari, Bally, Mattel and other game computers. The owners who have been frustrated are those with the technical understanding of the system who realize what the power and potential of it really is. They feel that with some Radio Shack support this system could give Apple one hell of a run for their money. They wonder if Radio Shack understands how good the system is?

We here at Wayne Green Inc. have been hoping for much more in the way of technical articles and programs to be submitted for publication in this magazine and by Instant Software. Perhaps your letter will create a feeling of confidence which will result in better customer and third party support of the Color Computer. I hope so. —Wayne

Peterborough, RAH! RAH! RAH!

In writing for and reading a large amount of magazines, I have come to the conclusion that *80 Microcomputing* is the best of the lot for the TRS-80 user, and I am constantly recommending it to my friends. However, I am at a loss to what appears to me as a running gag that I don't know about. My question is: "What's the story on Peterborough, New Hampshire???"

Let me clarify myself: A short time ago, I noticed a contest in "The Alternate Source" magazine. The contest rules were shown, but when it came to the prize, it said "No, it's not a trip to Peterborough"—what prompted this? Is Peterborough the loveliest place in the country? The ugliest? Is there some sort of shrine there? What?

Then I began noticing the large amount of activity going on in that town of less than 4,000 people. McGraw Hill, certainly a large firm, is located there, along with Wayne Green Inc. which seems to own *everything*! Also, there's a town nearby called Greenfield. Does Wayne Green own that, too?

I must admit, I have only been in the New Hampshire/Vermont area once and I fell in love with it. It is just perplexing that the "Big Cheeses" of the computer world all reside in that particular niche of New Hampshire which I had never heard of until now. Please tell this poor California boy "What's so great about Peterborough?"

Tim Knight
Moraga, CA

It's just a nice, simple, quiet, small, picturesque, clean, friendly New England town. Not far from Greenfield is a town called Greenville. Wayne doesn't own either. . . yet.—Eds.

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80 AID

Enhanced Word Processor

I recently programmed my TRS-80, Level II, 48K machine for the Basic Word Processor described in your May 1980 issue.

Can text entry be speeded up by replacing the INKEY$ function with some other statements?

The program's cassette function is of limited value; has anyone modified his program for disk storage?

I would like to be able to expand this program into generating enhanced bold, underlined and headlined (whose size is software programmable) text. Does anyone have such program mods?

I notice the program will not justify text that has been previously justified and then edited or compiled. It appears to have some other defects and limitations. I am interested in all improvements of it made by your readers.

John J. Williams
P.O. Drawer 537
2011 Cresent Drive
Alamogordo, NM 88310

CC Chips

Cheers for Dennis Kitsz and for his excellent article on upgrading the TRS-80 Color Computer (*80 Applications*, November 1981)! The memory expansion, 16K to 32K, is a straightforward project and a bargain at $17.50 plus a little time.

The Lowerkit character generator is a gem, especially the improved version now offered by MSB. Both lower and uppercase letters are sharp and well shaped. The hidden (POKE) game characters are a real bonus.

Mr. Kitsz' solution for double speed operation (POKE 65495,1) was very timely. Many TRS-80s have MC6821s which hang up at 1.8 MHz. When you use software that POKEs the double speed register, your computer must have chips such as the 68-A-21s that can operate at 1.8 MHz. I could locate only 68-B-21s (2 MHz) at $26 per pair. This is expensive since the 6821s are only $5 per pair. Are the As less expensive and if so, where are they available?

Now that more hardware and software specialists are working with the Color Computer they should develop a modification that permits SET graphics to produce 128 by 48 resolution. This would be a boon to lazy hobbyists who want to use Model I programs on the Color Computer with little modification.

K. Gilleo
Box 409 RR5
Sparta, WI 54656

Programming with Students

We own a TRS-80 Model III with TRSDOS 1.3 and are interested in corresponding with others who are interested in programming with junior high students.

We have experience teaching at the elementary level, and have taken programming courses at the local junior college. We have done some work teaching children how to program, and hope to do more of it.

We are also writing educational programs (for schools) and entertainment-educational programs (for home use). As of yet we have nothing perfected to the point of selling—we are trying them out with students—but we hope to market them soon.

Marjorie Crabbe
Crabbe Associates
212 W. Graham Avenue
Lombard, IL 60148

HPLC-pumps Aid

This is a response to the letter on HPLC-pumps submitted by Kasper Kirschner in the December 1981 issue.

For the past 14 months I have been involved in the automation of routine analysis in a laboratory. Since I had a TRS-80 I investigated ways of interfacing it to HPLC instruments. The Laboratory Data Control constametrics pump which has the provision for outside control through a 5 V signal input is easiest to interface with the TRS-80. All this needs is a digital to analog converter with a 5 V output (such as found from DSI). This allows for 255 steps of flow control of about 0.04ml each. A feedback from the pump output through an analog to digital converter can provide accurate flow control.

Other pumps such as the Beckman 101a and Micromuridcs have similar interfacing. The Waters Associates 6000A pump presents a bigger investment. Input through the gradient control plug requires a pulse to be generated for motor control. An alternative to inputting through the gradient control is to substitute the manual controls, which is a resistance network, with a resistance network on relays controlled by the computer. This is not approved by the manufacturer and should be considered only if absolutely necessary.

I would be interested to find out if anyone has actually done this since after the final evaluation the company went to a Hewlett Packard computer and I never got the chance to try any of this directly with a microcomputer.

James W. Murphy
Technician III
Norwich-Eaton Pharmaceuticals
Analytical Services Section
Norwich, NY 13815

Textbooks

I am serving time in Graterford Prison, PA. There is no real educational program here, and, at 12 cents per hour, my working 120 hours per month does not cover necessities like soap, toothpaste, and so on. If I had other sources of income, I could purchase material to educate myself. As it stands, I am trying to obtain textbooks and other necessary literature toward a computer science education without money. I know I have the ability and will apply myself. Do you have any textbooks or related material to help me? Could you please refer me to others

80 AID

who might be willing to help? I have plenty of time I would rather spend educating myself than brooding.

I will be happy to answer any questions and provide whatever information requested. I am also looking for pen pals. My interests are varied and wide ranging.

Thank you in advance.

Art McDowell F-5922
P.O. Box 244
Graterford, PA 19426

Break Address Found

Just after mailing my letter concerning returning to Basic on the Model II (*80 Aid*, January 1982), I decided to fish around in the interpreter myself. To my surprise, it took only a few minutes to locate the break address I needed (6069H).

Program Listing 1 replaces the one accompanying my previous letter. Under TRSDOS 2.0 (and 2.0a), execution returns the user to Basic with the Break function fully operable.

Gerald Lippey
The Lippey Company
210 South Bundy Drive
Los Angeles, CA 90049

MX-80 Printer Club?

I have heard that there is an Epson MX-80 printer club. I have been unable to locate it and would appreciate any information about it.

Ron Goodman
12702 Emelita Street
North Hollywood, CA 91607

Profile Zaps

I use NEWDOS 80 with my Model III disk system. With a little trouble, I have been able to convert most programs, including Scripsit and VisiCalc, to run under NEWDOS. Recently, I purchased Radio Shack's Profile. When I execute it under NEWDOS, I get an "Error 8," "Device Not Available," as it begins initialization. Do any NEWDOS users know of a zap to Profile to solve this problem?

John J. Roth
1125 Park Avenue
New York, NY 10028

Okidata 82A

Every time I see a software program for a printer in your advertisements or as an article in your magazine it seems as though the topic is the Epson MX-80. I own an Okidata 82A, which for the same price (if you shop right) is more for your money. I went back through quite a few issues and cannot find anything, on anything else but the MX-80. Has anyone written a program for the Okidata 82A or does anyone know of a company that offers one for the Model III?

Doug Kaherl
38344 Wooster
Mt. Clemens, MI 48043

Copying Tapes

Would any of your readers know of any service bureaus that will copy 1600 BPI tape to eight-inch disks for eventual processing on a Model II?

We have all our Cobol software written for other systems on tape and would like to avoid re-keypunching for our Model II.

Jim Williams
P.O. Box 87
East Brunswick, NJ 08816

Micros in Library Media Centers

We are interested in gathering information on the use of microcomputers in a secondary school library media center, specifically in the areas of media equipment inventory; card cataloging; acquisitions records; overdue and circulation records; bibliographic information retrieval; and budgetting.

Thank you in advance for any materials you might be able to send us.

Judith L. Dzedzy
Media Specialist
Council Rock School District
Council Rock High School
62 Swamp Road
Newtown, Bucks Co., PA 18940

Software Trade

I've written some Level II programs for the Model I that I would be willing to exchange with other readers. For my list please send a stamp and your list.

Anyone out in TRS-80 land who is into pen-pals please write too!

William Pickell
319 Greenland Drive
Lancaster, PA 17602

Write Me

I live in a remote area of Michigan and own a TRS-80 Model II. I would like to correspond with other TRS-80 Model II owners.

James R. Young
P.O. Box 336
Ludington, MI 49431

```
LD    HL,0
LD    A,3
RST   8          Removes previous break address
LD    HL,6069H
LD    A,3
RST   8          Sets new break address
JP    2800H      Branch to Basic
```

Program Listing 1

80 DEBUg

Chess Tutor Fixes

My thanks to Elio Zambrano of Tucson, AZ for finding a serious error in my Chess Tutor program (*80 Microcomputing*, December 1981). Whenever a player fails in three tries to get the correct move (if the correct move is a king or queen side castle) a SN error occurs in line 890, and the system becomes fouled up. The program does not check for a castle move and POKEs into system RAM. The following additional lines will correct this problem.

```
844 IFCI=44PRINT@CP+(P*6),"O-O-O";:
    GOSUB990:GOTO920
848 IFCI=55PRINT@CP+(P*6),"O-O";:
    GOSUB1050:GOTO920
```

Also, while researching this problem, I discovered a few other errors of varying seriousness. One was an incorrect display of white king on white square; another was an incorrect move in the French Defense; and still another was possible incorrect processing of castling (unrelated to the other castling error). The lines shown in Program Listing 1 should solve all these problems and a few more.

In any case, I apologize to all those who were inconvenienced by these errors, and I hope you get many hours of enjoyment from the program and learn a lot too.

Robert J. Dowd
326 Porter Drive
Lynn Haven, FL 32444

ROM Roll-Over Bugs

There are several bugs in Geary Kelch's modification to add 16K relocatable RAM to the TRS-80 microcomputer ("ROM Roll-Over," *80 Microcomputing*, November 1981). My findings are based on the schematic of the TRS-80 which is printed in Radio Shack's *TRS-80 Microcomputer Technical Reference Handbook*.

The first bug seems to be a reference to pin 4 of Z72 which Kelch claims is CAS*. His circuit requires a connection to CAS*, however you should make this connection to pin 9 of Z72 which is CAS* and not to pin 4 which is RAS*.

> *"Any standard TTL chip can withstand a voltage on its input up to 5.5V."*

The next bug occurs when you are instructed to insert a jumper from pin 5 of Z74 to pin 14 (+5V) also of Z74. But this jumper also brings pin 8 of Z79 to +5 volts, and pin 8 is an output of an OR gate. If the OR gate output a low (which would occur frequently), a short would occur and Z73 would probably be damaged. Also, this jumper would cause MEM* to go low even if the CPU was calling the keyboard or video RAM, causing several active outputs on the data bus at once. Again, more shorts and damaged chips would probably occur.

The last bug occurs when the RAM is switched to the lower addresses (0000H-3FFFH). The RAM outputs become active at these lower addresses; however, so do the ROMs since no provision was made to take the ROMs out of action. Once again there is the problem of multiple active outputs tied together on the data bus at the same time. I have a fix for this bug in the works which I hope to cover later.

Greg P. Segallis
1 Dixon St.
Port Chester, NY

No More Bugs

I thank Mr. Segallis for bringing to my attention the wiring errors that occurred in the printing of my article "ROM Roll-Over." I compared the magazine copy to my original and I found three errors in pin and chip designations as follows. The pin labeled pin 4, Z38 on chip 4 (A15) should be pin 9, Z38. The pin 11, Z35 label on chip 4 should be pin 11 of Z38 (A14). The designation pin 4, Z72 going to chip 2 (CAS) should have been labeled pin 9, Z72.

In reference to jumping pin 5 of Z24 to +5V I find no problems. Any standard TTL chip can withstand a voltage on its input up to 5.5V as stated in the manufacturers' design guide. If desired you can use a 2K pullup resistor. Likewise, you can tie output Z73, pin 8 to 5V without damage to the chip because of its internal configuration. Instead of jumping pin 5 of Z74 to 5V you may install an open collector inverter between pin 9 of chip 1 in the mod and pin 13 of Z74. You must remove the shunt between pin 12 and 13 of Z74 and use a pullup resistor on pins 12 and 13 of Z74.

Finally, Mr. Segallis is correct in that the ROMs are not removed electrically from the bus. However, this will not cause physical or electrical damage to the memory or surrounding circuitry. This again is due to the internal circuitry of the Read Only Memories. Unlike the 4116 static RAMs, the ROMs have a

```
340  DATA159,143,145,155,143,191,181,176,179,177,176,191
760  CA=0:IFCI<>44THEN790
790  IFYM$<>"O-O"ORCI<>55GOSUB1110:GOTO830
1130 FORII=256TO960STEP64:PRINT@II,STRING$(16,32);:NEXT
1190 IFCI=66THENCI$="DRAWN"
1420 DATA7,5,4,5,5,0,1,3,7,3,5,2,7,3,2,3,3,0,3,2,8,3,6,2
```

Program Listing 1

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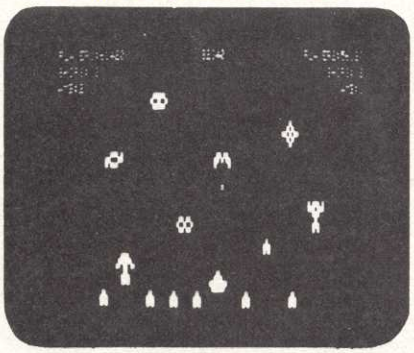

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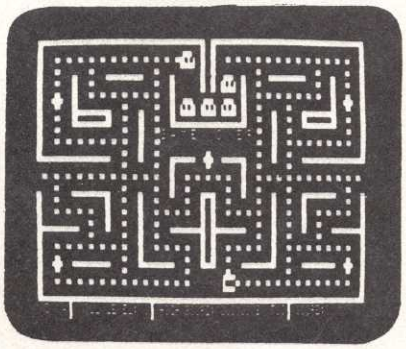

SCARFMAN

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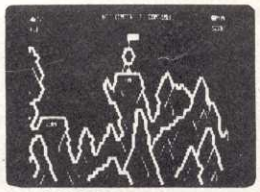

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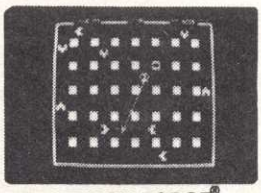

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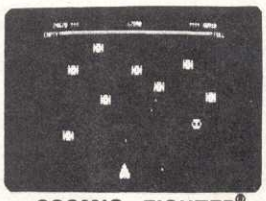

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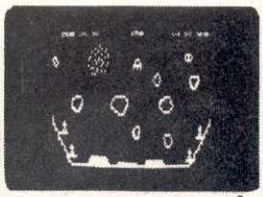

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80 DEBUg

series FET output configuration which presents a high output impedance and a low fan out capability. This is characteristic of FET type logic. The output data presented by the 4116's will dominate when the two memory types are hardwired together. Since the voltage drops across the ROMs, FET output never exceeds its rating, no damage occurs.

Geary Kelch
23 Mapledale Ave.
Glen Burnie, MD 21061

Help for the Home Buyer's Helper

Line 730 of Mr. Clarence Stinson's program "The Home Buyer's Helper" (*80 Microcomputing*, May 1981) contains an error. It reads:

```
730 RESTORE: J = I : K = J - 8 + Z
```

This defeats the program's ability to interpolate when faced with a fractional percentage input. Line 730 should read as follows:

```
730 RESTORE : J = INT(I) : K = J - 8 + Z
```

Max Barnett
303 Washington
Columbus, TX 78934

Bells and Whistles

I enjoyed Thomas Quindry's first article of Sargon modifications and was overjoyed to see a second article (*80 Microcomputing*, December 1981) with even more "bells and whistles."

I have found one minor and one major program bug. On line 5400 the RET instruction is missing. In the training mode the program sometimes incorrectly records a castle. I am not sure if this is a problem with my transcription or a true program bug.

Thomas G. Lareau
R.R. Aux 4 Box 127-A
Edgar, WI 54426

Castling

The problem Mr. Lareau experienced occurs when you use the Manual Play mode of my Sargon Saver program, MODIIB, (80 Microcomputing, December 1981). The way I see it, the incorrect saving of the castling move notation occurs for the player opposite the one in which the manual play mode is invoked. It shows up when you implement the training or the list moves modes. Sargon's own logic formats the move designation before my modification places it into buffer memory. I do not know why Sargon logic changes only this move designation but I can offer a correction. Add or change the following lines shown below:

> *"The problem occurs when you use the Manual Play mode."*

```
1560          ORG 462BH
1561 CORREC XOR 80H
1562          LD  (HL),A
1563          JP  6FECH
4160 MAN      LD  HL,CORREC
```

You should also make the changes shown below. (You do not have to make these changes if you have an uppercase only Model I. See my article for details.)

```
4460 BACK2A JR  BACK2
4645        RES 6,A
4770        JR  BACK2A
5400        RET
```

Also add a COPYRIGHT (C), 1981 by Thomas L. Quindry. This is not to deter readers from keying in the program but to preclude anyone from capitalizing financially on my time and effort. (I have plans for more changes.)

In my own version of MODIIB, I have made further modifications to provide a program which will run on both the Model III and Model I computers from Radio Shack. (Sargon II by itself would not run properly on the Model III. With my newer version of MODIIB, it will.)

I have received many inquiries about how to get a copy of the tape I offered in my article. I will provide a quality cassette tape with the System program of MODIIB (newer version unless the corrected magazine version is specifically requested) for $4.50. The operating instructions are the same for both versions and appear in the article.

Finally, many have asked about putting the entire program (including modifications) on disk. I have developed a procedure that allows you to save Sargon II and my modifications to disk. You can also add my modification to the disk version of Sargon II and save it to a new disk. I/O is still by cassette for saving the moves but I have developed a procedure for saving part to disk manually. These procedures are far too long for Debug, but I will send you a fact sheet for $1. If you also want a cassette with a short program to aid in this transfer, I will provide it for $4.50 (including the fact sheet). With my newer MODIIB, you can also make a Model III disk.

Thomas L. Quindry
6237 Windward Drive
Burke, VA 22015

Tenant Tracker Fix

My Tenant Tracker program (*80 Microcomputing*, December 1981) has a small error. If only one record exists for a rental address, the Sorting-Print option will print a report with zeroes the first time you run the sort.

You can solve this problem by having more than one record per rental address or by adding this line to the program: 572 IF J1 = 1 RETURN.

I have also received several inquiries about the availability of a disk version of this program. Anyone interested in such a version, please drop me a note.

George Kwascha
8007 Mahogany Drive
Charlotte, NC 28212

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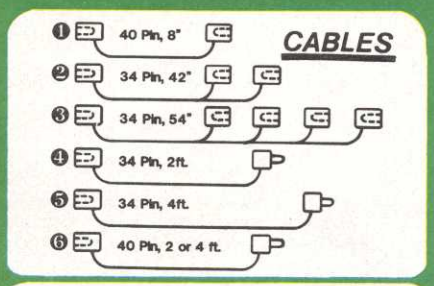

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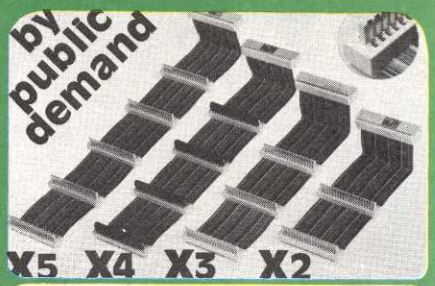

YOU ASKED FOR IT: "EXPANDABUS" X1, X2, X3 AND X4.

CONNECT ALL YOUR TRS-80 DEVICES SIMULTANEOUSLY on the 40 pin TRS-80 bus. Any device that normally plugs into the keyboard edge connector will also plug into the "EXPANDABUS". The TRS-80 keyboard contains the bus drivers (74LS367) for up to 20 devices, more than you will ever need. Using the E/I, it plugs either between KB and E/I or in the Screen Printer port. Professional quality, gold plated contacts. Computer grade 40 conductor ribbon cable. X2...$29. X3...$44. X4...$59. X5...$74. Custom configurations are also available, call us.

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8 DIGITAL MULTIMETERS PLUGGED INTO YOUR TRS-80!!! Measure Temperature, Voltage, Current, Light, Pressure, etc. Very easy to use: for example, let's read input channel #4: 10 OUT 0,4 'Selects input #4 and also starts the conversion 20 A=INP(0) 'Puts the result in variable "A" Voila! Specifications: Input range: 0-5V. to 0-500V. Each channel can be set to a different scale.
Resolution: 20mV (on 5V. range). Accuracy: 8 bits (.5%). Port Address: jumper selectable. Plugs into keyboard bus or E/I (screen printer port). Assembled and tested. 90 day warranty. Complete with power supply, connector, manual . . . . . $139.

TIMEDATE 80: REAL-TIME CLOCK/CALENDAR MODULE

Keeps quartz accurate time for 3 years on 2 replaceable AAA batteries (not included). Gives MO/DATE/YR. DAY of WEEK. HR:MIN:SEC and AM/PM. Features INTELLIGENT CALENDAR and even provides for Leap Year. This compact module simply plugs into rear of Keyboard or side of Expansion Interface (may be slipped inside E/I). Includes cassette software for setting clock and patching to any DOS (including NEWDOS 80, 2.0). Optional "Y" connector allows for further expansion. For Model I. Fully assembled and tested. Complete with instructions and cassette. ONLY $95.00. "Y" option, add $12.00

GREEN SCREEN WARNING

IBM and all the "biggies" are using green screen monitors. Its advantages are now widely advertised. We feel that every TRS-80 user should enjoy the benefits it provides. But **WARNING:** all Green Screens are not created equal. Here is what we found:

- Several are just a flat piece of standard colored Lucite. The green tint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.
- Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobbly film gives it a poor appearance.
- One "optical filter" is in fact plain acrylic sheeting.
- False claim: A few pretend to "reduce glare". In fact, their flat and shiny surfaces (both film and Lucite type) ADD their own reflections to the screen.
- A few laughs: One ad claims to "reduce screen contrast". Sorry gentleman but it's just the opposite. One of the Green Screen's major benefits is to increase the contrast between the text and the background.
- Drawbacks: Most are using adhesive strips to fasten their screen to the monitor. This method makes it awkward to remove for necessary periodical cleaning. All (except ours) are flat. Light pens will not work reliably because of the big gap between the screen and the tube.

Many companies have been manufacturing video filters for years. We are not the first (some think they are), but we have done our homework and we think we manufacture the best Green Screen. Here is why:

- It fits right onto the picture tube like a skin because it is the only **CURVED** screen **MOLDED** exactly to the picture tube curvature. It is Cut precisely to cover the exposed area of the picture tube. The fit is such that the static electricity is sufficient to keep it in place! We also include some invisible reusable tape for a more secure fastening.
- The filter material that we use is just right, not too dark nor too light. The result is a really eye pleasing display.

We are so sure that you will never take your Green screen off that we offer an unconditional money-back guaranly: try our Green Screen for 14 days. If for any reason you are not delighted with it, return it for a prompt refund.

A last word: We think that companies, like ours, who are selling mainly by mail should•list their street address•have a phone number (for questions and orders)•accept CODs, not every one likes to send checks to a PO box•offer the convenicnce of charging their purchase to major credit cards. How come we are the only green screen people doing it?

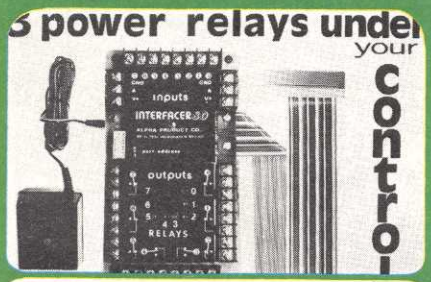
Order your **ALPHA GREEN SCREEN** today . . $12.50

DISK DRIVE EXTENDER CABLE, FREE YOUR MINI-DRIVES.

End the daisy-chain mess once and for all. Fits all mini-drives: Percom, Aerocomp, Shugart, Micropolis, MTI, Vista, Pertec, Siemens, BASF. East to install: just remove the drive cover, plug in the EXTENDER CABLE and replace the cover.

Now you can change and move your drives without disassembly. Keep the cover on and the dust out. High reliability gold plated contacts, computer grade 34 conductor cable. Tested and guaranteed.

Get one for each drive . . . . ONLY $8.95



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- 8 industrial grade relays, single pole double throw isolated contacts: 2 Amp. @ 125 Volts. TTL latched outputs are also accessible to drive external solid state relays.
- 8 convenient LEDs constantly display the relay states. Simple "OUT" commands (in basic) control the 8 relays.
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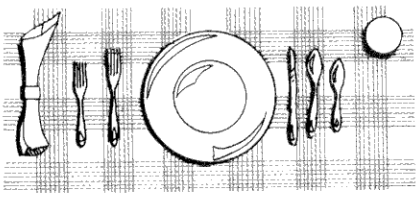
News From KITCHEN TABLE SOFTWARE, INC.

by David Busch



Things are slowing down at Kitchen Table Inc. right now, but as soon as the auditors, and FTC, FDA, FCC, and FPDE representatives leave, life should be back to normal.

As I am the only reviewer willing to discuss KTI products, I have been asked by KTI's founder, S. N. Hollerith, to answer a few reader questions. Hollerith would prefer to address these queries himself, but he is busy this month. However, bail has been set low, and he should be back on the job within days.

Dear Kitchen Table:

My TLS-8E Model I seems to be stuck in an endless loop. I can't find the Break key. What should I do? Please hurry!

Jon C., Tundra, SD

Dear Jon:

As you have noticed, the TLS-8E Model I does not have an on-off switch. However, you may accomplish the same effect simply by unplugging your ac cord from the wall receptacle. There is also a way to turn off the computer by POKEing a number into memory, but I've lost my issue of *80 Micro* revealing what the proper address is.

You have correctly noted the absence of the Break key. Kitchen Table was afraid the machine's Sri Lankan designers would take the label literally.

If you wish to get out of the loop without losing your program, you will need to hit the Reset key. This key has been much misused in the past, and KTI sought to discourage accidental resets by energizing the key with 110 volts ac. That particular plan caused a few unwanted deaths in the quality control section of Kitchen Table, so the design was abandoned in favor of hiding the Reset key, and not documenting its placement.

I have promised my Kitchen Table sources not to reveal Reset can be invoked by hitting uppercase X. I was told this particular key was chosen because everyone knows there are no useful words beginning with the capital letter X.

—DDB

Dear KTI:

I find it almost impossible to write personal letters with my Word Whacker software. Can you tell me why?

Rob P. Xavier, Xenia, OH

Dear Rob:

See the above letter.

—DDB

Dear Kitchen Table:

What kind of eraser should I use to clean the contacts on the expansion interface of my TLS-8E Model I?

Norm Jennings, Kent, OH

Dear Norm:

Under no circumstances clean those contacts. Every printed circuit card edge connector in the TLS-8E Model I is precision-coated at the factory with a microthin layer of oxidation designed to protect it from electricity. The procedure you are contemplating could result in the unimpeded flow of data from the CPU to the interface. Because the Z-79A microprocessor uses the DIE (Data Interrupt Enable) instruction to time certain functions, the results could be disastrous.

—DDB

Dear KTI:

Can I use silver solder on the PCB edge cards of my TLS-8E Model I?

Big Spender

Dear Big:

The high temperatures needed to melt most high silver-content solder alloys will probably cause the edge card to bend. Your cable connectors then will not seat correctly, and electrical contact will be poor. This technique is acceptable for restoring DIE function if you have inadvertently removed the oxidation from the contacts.

—DDB

Dear KTI:

I plan to operate a small-scale videotext service in my neighborhood without the approval and consent of my neighbors. Can you tell me the range of the unshielded RF modulator contained in the TLS-8E Model I?

Anonymous, New York, NY

Dear Anon:

In a major metropolitan area like New York, the output of your TLS-8E should be visible on any television screen within three city blocks. You will have the biggest audience when your neighbors are tuned to Channel 5. Good luck!

—DDB

Dear Kitchen Table:

Why don't I ever see advertisements for Kitchen Table products in *80 Micro* or other magazines?

Curious, Tustin, CA

Dear Curious:

Magazines typically stipulate advertisers must send in copy for ads three months prior to an issue's cover date. So far, no Kitchen Table product has remained on the market that long.

The company has developed a workable solution to this problem, however. Ads are now being written for products that don't exist. Once the copy has been sent for publication, KTI will commission a programmer or designer to actually develop the product. This allows considerable freedom to the advertising copywriter, who must also possess some rudimentary knowledge of what computers can and cannot do.

For example, KTI recently had to kill an ad which promised 7500 megabytes of disk storage on a hard disk drive measuring one-half inch in diameter. The writer of the ad was either overly optimistic, or ignorant of the fact anything more than 6800 megabytes is impossible in a hard-disk drive that size.

You probably noticed that I, too, was an unwitting victim of misinformation in my recent review of this product. From now on, I pledge to count each byte attributed to any hard-disk drive submitted to me for review.

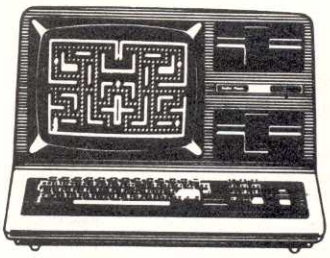
—DDB

Dear Kitchen Table Inc.:

My copy of KTI Super Adventure seems

IT'S HERE . . . . .

NEW!



ALPHA JOYSTICK for MODEL III

Only **$49.95**

Works with all games on next page!

Price includes Atari Joystick + Alpha Interface + instructions + demo program. The Alpha Joystick is backed by an unconditional money back guarantee. If you are not delighted with it, return it within 14 days for a prompt and courteous refund.

- *Features the famous Atari Joystick.*
- *Works with any (Level II) Model III.*
- *Fun to experiment in BASIC. Simply use A=INP(0) to read Joystick.*
- *Saves your Keyboard.*
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The Galaxy Invaders have returned in this exciting new twist on the ever popular Invasion theme.

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16K protected TAPE Mod I + III . $15.95
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LAST CHANCE . . . . .

If you don't have your copy of TALKING ROBOT ATTACK or GALAXY INVASION, it might be too late. By legal agreement with Atari Big Five stopped production on Dec. 1, 1981. Our well stocked shelves will soon be empty. Order yours now before these two are gone forever. Game info on next page.

-17

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COD ADD $3.00 EXTRA
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to have disappeared from my disk entirely. Can you tell me what happened?

Flabbergasted, Rochester, NY

Dear Flab:

You obviously neglected to use the "Save Game" feature when you were done playing. That option was meant literally. As the disk drive reads KTI Super Adventure into memory, it simultaneously removes all traces of the program from your disk by zeroing the disk sectors. When you opt for Save Game at the end of a session, the program is restored to the disk.

KTI programmers inserted that clever feature as part of the game puzzle. So far, not one of 3,000 purchasers have successfully solved the adventure, judging from the irate mail I have received to date.

—DDB

Dear Rat:

I recently tried copying KTI Super Adventure at a friend's house. Although TRAKCESS seemed to work okay, when I got home and booted the disk, my CRT displayed the words "Sucker!," and then "Disk Error."

What gives? I thought Kitchen Table encouraged program piracy!

Name Withheld by Request
(Has been forwarded to appropriate authorities)

Dear Name:

It is true KTI overlooked most program stealing in the past, but that was before the company came out with Super Adventure—the first program the company has marketed that was any good.

As you may know, the game simulates a session with a microcomputer gone wild. The object is for the operator to regain control before the computer destroys all available disks, double density boards, etc. Super Adventure is **very** realistic, and we have heard several reports of electrocutions, suicides, and other mishaps by players who got caught up in the spirit. The game has become an all-time best seller for KTI, outdoing even Dungeons and Dungeons.

As a result, the company has resorted to a fiendish protection scheme.

—DDB

Dear Rat:

So what is it?

Name Withheld by Request

Dear Name:

Glad you asked.

The disk supplied with the game recognizes TRAKCESS, Super Utility, and all other byte-by-byte copying programs but when it senses them it seizes control of the computer, overrides the operating system, and relays information to your CRT, fooling you into thinking the copy program is working. At the same time, false information is written to your disk.

I have pledged to KTI not to reveal the game information is stored on the disk, radially—outward from the center. The read/write head can detect the program only as the stepper motor moves it from track to track, because each consecutive byte is on a different track. Obviously, this read routine requires a special operating system located on the disk in Track 2, Sector 4½.

There is another copy protection feature important to your friend below.

—DDB

Fink:

Where in the heck is my program?

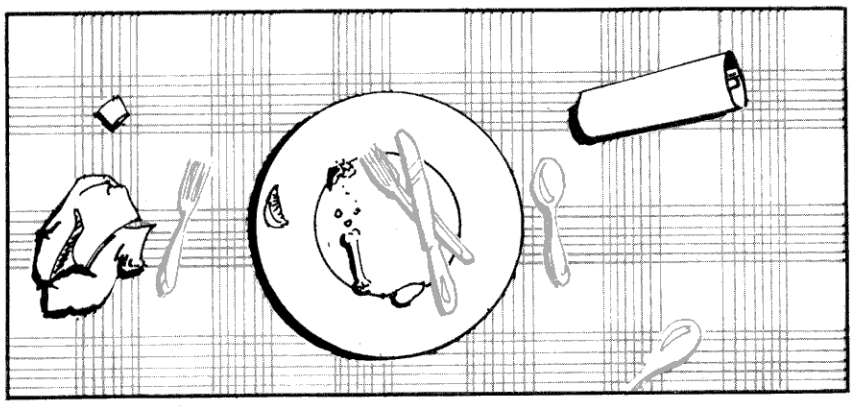
Friend of Name Withheld by Request

Dear Friend:

KTI Super Adventure self-destructs on any attempt to copy it. You may forward your original disk, and $19.95 for handling to KTI and receive a free backup. As the program only costs $14.95 at computer stores, I would recommend you simply buy a new copy.

Good luck!

—DDB■



Percom Disk Storage

Quality Percom products are available from the following authorized Percom retailers. If a retailer is not listed for your area, call Percom toll free at **1-800-527-1222** for the address of a nearby retailer, or to order directly from Percom.

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COMPUTER SERVICE CENTER	Hollywood	(213) 851-3434
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TRS-80* COMPUTING EDITION

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Percom's DOUBLER II® tolerates wide variations in media, drives

GARLAND, TEXAS — May 22, 1981 — Harold Mauch, president of Percom Data Company, announced here today that an improved version of the Company's innovative DOUBLER® adapter, a double-density plug-in module for TRS-80* Model I computers, is now available.

Reflecting design refinements based on both theoretical analyses and field testing, the DOUBLER II®, so named, permits even greater tolerance in variations among media and drives than the previous design.

Like the original DOUBLER, the DOUBLER II plugs into the drive controller IC socket of a TRS-80 Model I Expansion Interface and permits a user to run either single- or double-density diskettes on a Model I.

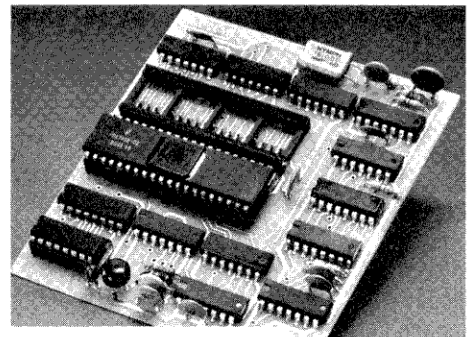
With a DOUBLER II installed, over four times more formatted data — as much as 364 Kbytes — can be stored on one side of a five-inch diskette than can be stored using a standard Tandy Model I drive system.

Moreover, a DOUBLER II equips a Model I with the hardware required to run Model III diskettes.

(*Ed. Note:* See "OS-80®: Bridging the TRS-80* software compatibility gap" elsewhere on this page.)

The critical clock-data separation circuitry of the DOUBLER II is a proprietary design *called a ROM-programmed digital phase-lock loop data separator*.

According to Mauch, this design is more tolerant of differences from diskette to diskette and drive to drive, and also provides *immunity to performance degradation caused by circuit component aging*.



Percom DOUBLER II®

Mauch said "A DOUBLER II will operate just as reliably two years after it is installed as it will two days after installation."

The digital phase-lock loop also *eliminates the need for trimmer adjustments typical of analog phase-lock loop circuits*.

"You plug in a Percom DOUBLER II and then forget it," he said.

The DOUBLER II also features a refined Write Precompensation circuit that more effectively minimizes the phenomena of bit- and peak-shifting, a reliability-impairing characteristic of magnetic data recording.

The DOUBLER II, which is fully software compatible with the previous DOUBLER, is supplied with DBLDOS®, a TRSDOS* compatible disk operating system.

The DOUBLER II sells for $~~219.95~~, including the DBLDOS diskette. Now $169.95!

The Percom DOUBLER II is available from authorized Percom retailers, or may be ordered direct from the factory. The factory toll-free order number is 1-800-527-1222.

Ed. note: Opening the TRS-80 Expansion Interface may void the Tandy limited 90-day warranty. ✓1

All that glitters is not gold

OS-80™ Bridging the TRS-80* software compatibility gap

Compatibility between TRS-80* Model I diskettes and the new Model III is about as genuine as a gold-plated lead Krugerrand.

True, Model I TRSDOS* diskettes can be *read* on a Model III. But first they must be converted and re-recorded for Model III operation.

And you *cannot write* to a Model I TRSDOS* diskette. Not with a Model III. You cannot add a file. Delete a file. Or in any way modify a Model I TRSDOS diskette with a Model III computer.

Furthermore, your converted TRSDOS diskettes cannot be converted *back* for Model I operation.

TRSDOS is a one-way street. And there's no retreating. A point to consider before switching the company's payroll to your new Model III.

Real software compatibility should allow the *direct, immediate* interchangeability of Model I and Model III diskettes. No read-only limitations, no conversion/re-recording steps and no chance to be left high and dry with Model III diskettes that can't be run on a Model I.

What's the answer? The answer is Percom's OS-80™ family of TRS-80 disk operating systems.

OS-80 programs allow *direct, immediate* interchangeability of Model I and Model III diskettes.

You can run Model I single-density diskettes on a Model III; install Percom's plug-in DOUBLER™ adapter in your Model I, and you can run double-density Model III diskettes on a Model I.

There's no conversion, no re-recording.

Slip an OS-80 diskette out of your Model I and insert it directly in a Model III.

And vice-versa.

Just have the correct OS-80 disk operating system — OS-80, OS-80D or OS-80/III — in each computer.

Moreover, with OS-80 systems, you can add, delete, and update files. You can read *and write* diskettes regardless of the system of origin.

OS-80 is the original Percom TRS-80 DOS for BASIC programmers.

Even OS-80 utilities are written in BASIC.

OS-80 is the Percom system about which a user wrote, in Creative Computing magazine, "... the best $30.00 you will ever spend."†

Requiring only seven Kbytes of memory, OS-80 disk operating systems reside completely in RAM. There's no need to dedicate a drive exclusively for a system diskette.

And, unlike TRSDOS, you *can* work at the track sector level, defining and controlling data formats — in BASIC — to create simple or complex data structures that execute more quickly than TRSDOS files.

The Percom OS-80 DOS supports single-density operation of the Model I computer — price is $29.95; the OS-80D supports double-density operation of Model I computers equipped with a DOUBLER or DOUBLER II; and, OS-80/III — for the Model III of course — supports both single- and double-density operation. OS-80D and OS-80/III each sell for $49.95. ✓3

Circuit misapplication causes diskette read, format problems.
High resolution key to reliable data separation

GARLAND, TEXAS — The Percom SEPARATOR® does very well for the Radio Shack TRS-80* Model I computer what the Tandy disk controller does poorly at best: *reliably* separates clock and data signals during disk-read operations.

Unreliable data-clock separation causes format verification failures and repeated read retries.

CRC ERROR–TRACK LOCKED OUT

The problem is most severe on high-number (high-density) inner file tracks.

As reported earlier, the clock-data separation problem was traced by Percom to misapplication of the internal separator of the 1771 drive controller IC used in the Model I.

The Percom Separator substitutes a *high-resolution* digital data separator circuit, one which operates at 16 megahertz, for the low-resolution one-megahertz circuit of the Tandy design.

Separator circuits that operate at lower frequencies — for example, two- or four-megahertz — were found by Percom to provide only marginally improved performance over the original Tandy circuit.

The Percom solution is a simple adapter that plugs into the drive controller of the Expansion Interface (EI).

Not a kit — some vendors supply an untested separator kit of resistors, ICs and other paraphernalia that may be installed by modifying the computer — the Percom SEPARATOR is a fully assembled, fully tested plug-in module.

Installation involves merely plugging the SEPARATOR into the Model I EI disk controller chip socket, and plugging the controller chip into a socket on the SEPARATOR.

The SEPARATOR, which sells for only $29.95, may be purchased from authorized Percom retailers or ordered directly from the factory. The factory toll-free order number is 1-800-527-1222.

Ed. note: Opening the TRS-80 Expansion Interface may void the Tandy limited 90-day warranty. ✓2

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✓See List of Advertisers on page 338

80 ACCOUNTANT

by Michael Tannenbaum C.P.A.

". . . Tandy has confirmed its commitment to the small business computer user."

With the introduction of the new Model 16 and upgrade boards for the Model II Tandy has confirmed its commitment to the small business computer market. The new equipment constitutes an enormous advance in processing potential. In effect Tandy is marketing a minicomputer disguised as a desk-top micro. For a business user the impact of the new equipment could be dramatic. Software packages such as the Tandy three-disk Cobol systems will run much faster. More importantly, users can add more work stations for data entry and retrieval purposes.

The use of multiple work stations is desirable in many accounting applications, especially accounts receivable. Because up-to-date receivable files are important for credit approval purposes a company should post collections as quickly as possible. Multiple work stations speed up the process by allowing several clerks to enter data at the same time. If several users can share the data base for data entry purposes, they can also share it for inquiry purposes. Until Tandy announced the Model 16 this feature was unavailable to TRS-80 microcomputer users.

Order Entry Systems

Tandy's new Order Entry System (#26-4607) will also benefit from a multi work station. Like accounts receivable data, companies usually receive their orders in bulk and they should enter them as quickly as possible. The open and closed order entry files are also subject to inquiry for customer service purposes.

This new system is the front end for the Accounts Receivable system (#26-4604) reviewed in my July 1981 column. Unlike the previous three-disk systems, Order Entry can not stand alone. If you wish to use it, you must purchase Accounts Receivable since the Order Entry system requires receivable files. Order Entry also includes an inventory control module that controls up to 1500 inventory items. If you wish, you can also add an optional Sales Analysis program (#26-4608) which provides extensive sales reports.

Of all applications released to date, order entry will most likely be the hardest to install. However, once it is installed successfully, it can have a major effect on your client's bottom line. An automated order entry procedure linked to inventory control could significantly reduce inventory requirements. The resulting benefit from the reduction in purchases could easily pay for a Model II or 16. In addition, improved analyses of sales and sales staff performance could provide direction to management, further improving profitability.

In the softgoods industry customers place orders before the merchandise is ready for shipment. Because of this time differential between the order and the shipment, managers require allocation procedures to select finished goods for shipment when they become available. Allocation procedures are quite complicated and difficult to automate. Even after a company has made its allocation decisions, invoicing is generally a complicated procedure. Some customers require an invoice with each shipment and others insist that invoices be sent to a central office for payment.

Softgoods order handling is complicated but hardgoods orders have their unique problems also. Often there are problems defining the correct item price. A company may sell items in many different markets. Each market may have different pricing conventions, discount rules and volume discounts. Decision makers need to know specific customer arrangements to prevent improper pricing resulting in bad will or unexpected loss. After pricing there is the question of availability. Since some items will be out of stock, managers must decide which to back order or cancel. Once an order is selected for shipment, an indication of warehouse location can save much picking labor and cost. This means that the system must be advised where the merchandise is to be stored.

With variable pricing and different sales commission arrangements, monitoring item profitability can be difficult. Hardgoods systems should be able to analyze profitability by item, customer, salesperson and location.

A common factor in both soft and hardgoods order processing is an on line requirement to track customer order status. Files of open and recently completed orders must be available at all times. This adds to the system's complexity and requires an enormous amount of disk space. Order processing systems are complex and because of this complexity prospective owners should carefully examine them for a fit before attempting installation.

The Tandy Order Entry and Sales Analysis system does not have the reports and categories required for a softgoods order entry system. A company could modify its present system to fit this package's features, but the fit will not be good. The fit for a hardgoods firm, however, will be quite good if the system's capacities are adequate. When used in a floppy disk environment the system can retain up to 300 open orders each with up to 5 line items and control 1500 inventory items. The Accounts Receivable system can handle up to 800 customers, retain up to 2,500 open items, be used with up to 100 salesmen and accommodate 6000 combined general ledger distributions and commissions due.

If the capacities are adequate, this system is an excellent candidate for installation. However, because it is a complex application, you need a good knowledge of the client's business and business environment. Document and review the findings with the client before proceeding. Once you have completed this formality, proceed with installation by defining the all important management reports which you expect the system to provide. Devote special attention to the sales analysis reports. These reports alone can justify the effort to install the system and you must consider their content in advance. If you do not enter the desired information because your client's present system does not classify customers by type or inventory items by category you must establish these classifications before installation procedures begin.

To measure profitability with the sales analysis reports you must have an inventory item cost figure. The order entry system only provides for the average cost method to value inventory. The order entry

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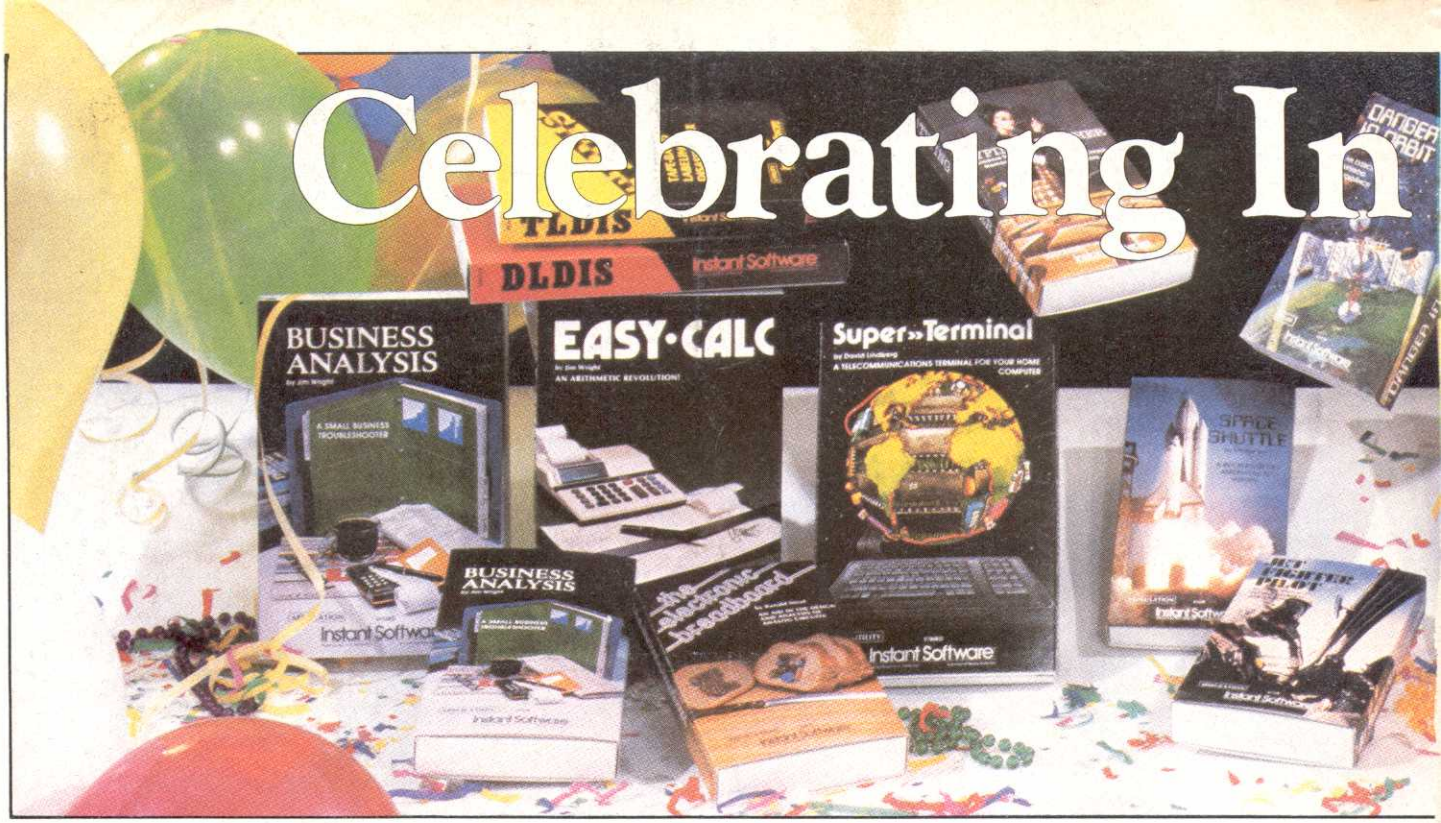

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system does not accommodate FIFO, LIFO, or specific identification methods of valuation. Decision makers use this inventory item cost to value the cost of merchandise they sell. If the accounting recordkeeping system uses a different method, there will be a variance between the sales analysis reports and the financial reports. If at all possible you should avoid this variance. You will obtain the best results if the financial reports ratify the gross profit percentage indicated on the sales analysis reports.

To facilitate this goal, the client should reconcile the financial and the sales analysis reports monthly. The client should prepare a schedule of gross profit reconciliation. This schedule should begin with the sales and profit on the sales analysis report and itemize the reconciling items to the values reported on the financial statements. Reconciling items could be variances from the inventory costs used by the order entry system detected in the purchase journal, custodial losses due to inventory shrinkage and merchandising losses caused by inventory markdowns. This gross profit reconciliation procedure will help keep the system honest.

Once you have defined the output reports you should create the files the system will use. As with the previous three-disk systems, you must select various options and fields during initialization of the files to enable the system to summarize the proper information for the output reports. Do not rush this procedure. The files contain much information and system set-up will take a substantial amount of time.

Hard Disk Systems

The large number of files and the integrated nature of order entry and accounts receivable has complicated my evaluation of this product. Since my review of the receivable system was published in July, I had to reinitialize my receivable files to work with the new system. If I had still been using the floppy disk system this would have been a hopelessly lengthy process. However, as I was starting evaluation for this article, I received my hard disk system. I immediately suspended testing operations and moved all of the files and programs to the hard disk.

The new disk system will work with the three-disk accounting packages with little modification. You can copy the programs from the disks supplied to the hard disk using the new utility FCOPY. Because floppy disk capacity is limited some program overlays such as SCREEN/COB are repeated on each disk. When this occurs, FCOPY prompts you to overwrite or skip the duplicate program.

After you copy the systems to the hard disk, you can use them without much effort. Some problems may occur when a program overlay does not return to the menu of the subsystem you selected. This will not cause any data loss and can be corrected by hitting the tab key and running the menu of the application desired.

With use of the hard disk, the Cobol accounting system is transformed. Because files and programs are extracted from the disk at comparatively high rates of speed everything executes much faster. The slow plodding systems which I observed became much more usable. In addition, system capacity expands enormously. The hard disk is equivalent to 17 floppy disks. Apparently you can expand the Cobol files without software modifications. Tandy doesn't yet know what the new capacity limitations might be. This is the native environment for these systems and any firm using this system should make acquisition of a hard disk top priority.

Thanks to the new disk's speed I set up test files in the accounts receivable and order entry system in less than a half hour. It was a pleasure to use each application without wondering whether the proper files were mounted on the correct drives. Thanks to a Floppy Off command, the hard disk operating system simply ignores the drive assignments and selects the file requested by the program. When the system prompted me to switch disks I just typed Done and the program found the proper files. Without the hard disk, you must swap disks at the end of every invoicing run. You must also swap disks to run the sales analysis system. The system checks to see that you have mounted the proper disk in the correct drive.

Files to Create

In addition to the accounts receivable files, the order entry system requires creation of inventory, price and commission code files. These files provide the line item identification data, pricing and commission structure used by the order entry program. The pricing and commission files allow great flexibility in pricing sales and commissions. An item can be priced with five separate formulas: by quantity ordered; by customer type; by quantity within customer; by pick quantity with up to three pre-defined prices; or by customer type with up to three pre-defined prices.

If you select one of the first three pricing options, you can also specify up to five levels of price breaks and related discounts. Similar options are offered when setting up the commission code file. The code file allows you to create many different commission payment schedules. Each schedule permits you to establish scaled commissions depending on the price breaks you established in the pricing file. In addition there is a provision for an override commission percentage if you will not be using the price breaks. You can calculate commissions on either the selling price or the gross profit (sales minus cost) of the item. This program can accommodate a highly complex commission structure. If a company installs this system to replace a simple percentage method of calculating commissions, many salespeople may have difficulty understanding how their commission has been calculated. Replacing a simple list of invoices with a voluminous commissions due report will probably compound the problem. Install this system with extreme care.

As indicated above, you can structure or obtain variable prices from the item master file. In addition, the item master file contains other data such as: commission and price schedule codes; item description to be placed on the invoice; quantity on hand; reorder level; quantity ordered but not yet shipped; sales analysis code; sales statistics period and year-to-date; taxability; general ledger account code; location code; back order status indicator; and vendor number.

The item master file contains most of the information necessary to control a hardgoods inventory. As expected, the system will generate inventory control reports such as purchasing notices and back order reports. However, the sales analysis subsystem is required to develop more detailed activity reports. Input to the sales analysis system is provided by the files created in the order entry system. Additional sales analysis files are not required.

Once you have created the required files, order processing is easy—that is, if all the data on the customer's order is correct. Because this system edits the customer number and the item numbers, exceptions could delay processing. During initial implementation you should manually pre-edit orders. The system provides a means by bypassing the edit and this option will result in loss of sales data and prevent proper adjustment of inventory balances.

When entering a new order two screens are used. One screen relates to the heading and the other to the line items ordered. Much of the data required for the heading

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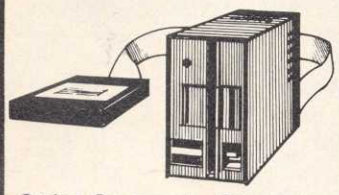

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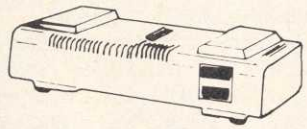

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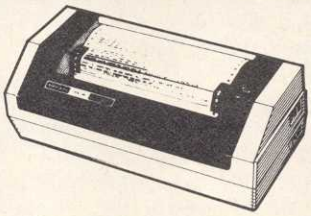

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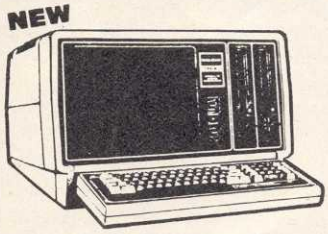

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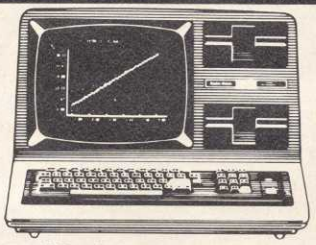

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is extracted from the accounts receivable files. If there are no changes to this data, entry is very rapid. If you do not know the customer number, you can invoke an alphabetic search routine by pressing the F1 key. This feature is also available on the second screen when you select line item codes.

If the quantity you keyed in exceeds the inventory on hand and the item master file allows back orders, then the system displays a back order option menu. This menu allows you to cancel the order, ship what is on hand and back order the balance or back order the entire amount requested. If the item can be processed, pricing is done in accordance with the schedule indicated by the item master. There is a provision to specify an additional discount percentage for each line item entered. Pressing the F1 key overrides any predetermined price or discount. This allows complete flexibility over all elements of the order entry process.

Once an order is accepted, you can change or examine it at any time. When the order is selected for shipping, picking tickets can be generated. These tickets serve as warehouse work orders and the system provides a space to enter actual amounts selected and shipping information. Although the system specifies a location, there are no summary reports by location that you could use to stage picking activities. Warehouse management could use staging reports to control order picking activities and this would be a desirable extension to the system. In lieu of a picking ticket, you could generate an invoice for systems which use a pre-billing processing method.

After picking is complete, you can process the order for billing. Selection of items to be billed is a straightforward procedure. Invoice preparation and printing are handled as separate functions. The system uses a preprinted invoice form. After the invoice has been printed, the system calls for the accounts receivable data disk and transfers the invoice data directly to the accounts receivable activity files. Unfortunately the data is not posted immediately to the customer's receivable record. Posting is deferred until you give a posting command when you run the receivable system. This procedure complicates customer service because it makes locating customer orders after shipment difficult.

After a customer order has been shipped, the order detail drops out of the order entry file. To trace shipped orders you must mount the accounts receivable system in the disk drives and scan the appropriate files. If you have not posted the invoice items, you will have to scan the unposted data file. You must know the invoice number to do this. Although this procedure complicates post invoicing customer service, you can establish records to keep search time to a minimum.

This system is impressive. However, because of its complexity and the enormous number of data files it requires, it is not at home in a floppy disk environment. It is slow, requires an inordinate amount of disk access time and much disk swapping. On the hard disk it runs beautifully. If this system meets your client's needs, recommend the hard disk expenditure. Your client will be satisfied.■

WAYNE GREEN INC.
PETERBOROUGH, NEW HAMPSHIRE 03458 USA

Winter/Spring 1982

Dear *80 Microcomputing* Subscriber:

We are making a cover date change on *80 Microcomputing*. What would have been your June 1982 issue will be the June/July 1982 issue. We are not combining an issue—simply changing the month listed on the cover. You will still get 12 issues of *80 Microcomputing* in 1982 and 12 issues in 1983, and so on; and we will change your expiration date by adding a month (more on that later) so you don't end up short-changed.

The reason for the cover date change? There has been an increasing demand for *80 Microcomputing* to be sold on major newsstands. Because *80 Microcomputing* is the last publication to be produced each month by the Wayne Green group it has not been getting to the newsstands on time. A complicated production change could have been made, but a simple cover date change will produce the same results—a full month's sale on the newsstand. Thus, the cover date change.

The change has other benefits. . . you, the subscriber, will be getting your magazines well before the local computer stores and newsstands. I've been hearing complaints that they get it first; after the June/July issue they won't (although they will still receive it in the month prior to cover date). Also, advertisers' ads will be assured of the full month on the newsstands, in computer stores and in your hands.

As I have said, you will still get 12 issues this year. *80 Microcomputing* will be in your mailbox every month, but the one you receive in June will say June/July, the one you receive in July will say August, and so on. We will, however, have to change your expiration dates to make up for the missing "cover month" and our computer will do that all at once. Note the upper right hand corner of your address label now and then note it after the date change and you will see a month's difference in the date listed there. If such a change does not occur please write to me at 80 Pine Street, Peterborough, NH 03458, and I will personally see that it is changed.

Thank you for your support of *80 Microcomputing*. I hope you continue to enjoy your subscription.

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80 REVIEWS

edited by Michael E. Nadeau

"Faster keeps track of all variables and the number of times they are accessed."

Faster 1.2
XTEND40
RPM
Prosoft
Box 389
North Hollywood, CA 91603
$29.95, $19.95 and $24.95 respectively

by Bruce Powel Douglass

Faster is advertised as a software speed up for Basic programs. Its approach is, however, unique. Faster is not a compiler; it is a program analyzer. It monitors the execution of your Basic programs and keeps track of how your program accesses its variables. It points out which lines you should pay particular attention to, and the variables you should define first.

Faster comes on disk or tape. I reviewed the disk version. It comes without an operating system per se, but it is on one of Kim Watt's special disks. This special disk copies its programs onto one of your disks by itself, saving one-disk-drive owners the hassle of trying to load a non-system disk onto systems disks. It saves Prosoft and the user from buying another copy of TRSDOS.

The manual for Faster is short (11 pages), but is attractively printed, and very well done. The major liability of most software is that the manuals appear to be written by someone making notes to himself —rarely are they directed to the user. Prosoft's Faster manual is an exception. The manual's instructions on how to install the programs on your own disks were incorrect, presumably since the self-copying disk is a new idea, but the self-copying disk came with its own instructions.

The manual discusses how to activate Faster to monitor Basic program execution. It also discusses how to use the output from Faster to modify the Basic programs so they will run faster, as well as some common problems that may occur (none of them happened to me), and some other suggestions for speeding up Basic programs. It even comes with a sample Shell sort to show how it works.

Faster monitors the Basic program. When you load it from disk, it has a default address (top of memory), or you may specify a memory address if you wish to have other machine-language programs in memory. Thus, Faster also works with hybrid Basic/machine-language programs. Faster keeps track of all variables and the number of times they are accessed. Basic creates a variable list that it must search each time a variable is referenced. If it does not find the variable in the look-up table, then it creates an entry for it at the end of the list. If your most often used variables come at the end of the table, Basic must search longer for the variable. Depending on your program construction and how long the program runs, a variable may be accessed many thousand times.

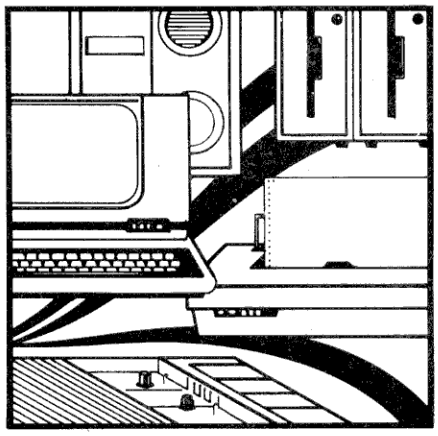
When you think your program has run long enough for Faster to get an accurate picture of how your program operates (you do not have to run it to completion), press Break and then 567 (together) and Faster requests what you wish to know. The options it gives are:

1. C = CLEAR TABLE
2. E = EXIT
3. 3 = SUMMARY
4. D = DETAIL
5. V E P = VIDEO/PRINTER

Some of these set switches. V displays the used variables by page (so it will not scroll off the screen). If the D switch is set, then it displays the number of times the variable was accessed during the trial run. If the S option is set, then it displays just the variables. The variables are displayed in descending order of the number of times they were separately referenced during the program's run. C clears the variables, so if there is a lengthy initialization sequence, you do not have to include it in the analysis. P sends the output to the printer as well as the video. The variable name, type and number of times referenced are displayed in this manner:

```
I% 1183 M$ 960 ZZ! 412 R%( 200
CHECK THESE LINES: 20 30 500
```

The manual shows you how to set up your variable table to maximize speed.



Most often, you have to add only one or two lines to your program to speed it up significantly. A DIM statement allocates variable space in the variable table for simple variables as well as array variables. Faster tells you to add a DIM statement. Make sure there is no Clear statement coming after your allocation to destroy it. Adding a line such as: DIM I%, M$, ZZ makes your program run faster. The manual advises that normal speed up is between 20 and 50 percent. In the short example given in the manual, the speed-up time I got for generating and sorting 200 random numbers was a little over 20 percent.

Unless you always write very short programs, Faster offers an inexpensive way to speed up your Basic programs. If you get a 30 percent increase in speed, a one-hour sort will take only 40 minutes, and 30 seconds-per-move Othello will take 20 seconds.

If you write modular code with global and local variables, then this program will not be as beneficial. For example, I use the letters I, J and K for local variables, especially in loops, throughout my programs and I make sure that these variables are first in the tables. Except for very simple programs, it is difficult to make all these allocation decisions correctly, and a few errors of this kind may slow execution considerably.

Faster may be slightly overpriced, but if you cannot afford a compiler, and would

like a significant increase in the run-time speed, then buy Faster.

XTEND40

If you have upgraded your system to 40-track drives and you have many 35-track disks, how do you avoid wasting those five extra tracks and 10 extra granules of space? You can get a 40-track formatted disk and copy all your files over, one at a time—a lengthy process—or you can use XTEND40.

In 15 seconds, XTEND40 formats those unused five tracks, verifies them, and updates the GAT sector. If they are already formatted, you receive an error message and are asked if you wish to do it anyway. This enables you to repeat the procedure if a sector gets locked out during the format process.

The manual consists of a single printed page, but the program is so simple to use, nothing more is required. If a track is locked out XTEND40 will not query you for another attempt to format the disk but since the process takes only 15 seconds, this is only a minor inconvenience. You can easily run through a whole batch of disks in no time at all with XTEND40. The instruction sheet does warn you not to use important disks, but only backup copies.

The program is simple to use and if you have more than 20 disks to format for 40 tracks, it is worth the investment.

RPM

RPM is a useful, well-written disk-drive timing program. It measures (and gives easy instructions on how to adjust) the drive speed of any drive in your system.

RPM is a hybrid Basic/machine-language program. It gives not only the current speed and deviation from normal (300 rpm), but also shows a continuously updated average and a graphics display of this variation.

The manual is a terse four pages, but is complete and describes fairly well how to adjust the speed. The potentiometer is also known as a trimpot, but it is not where they say it is for the Pertec drive. The manual says that the potentiometer is located on the upper corner of the main circuit board, but on both of my Pertecs, it is in the lower left corner. A screw head on this trimpot enables you to change the rotational speed of your drives with a slight turn of your screwdriver. Since there is a continuous display, you can easily adjust it to within very narrow limits. I have had a lot of trouble with one of my drives, and I found by using RPM that it was running significantly too slowly. I adjusted the speed, and the performance of the drive improved.

You may change to another drive simply by pressing the number of that drive. The speed variation graph and the averages are reset automatically, as is the number-of-observations counter.

This program is easy to use and provides a good diagnostic tool to locate a problem with your drives. If your drives have problems I recommend RPM before paying to get it repaired (Pertec charges $100 just to remove the cover). ■

QSD Utility Disk #1-LDOS 5.0.2.
Quality Software Distributors
11500 Stemmons Expressway, Suite 104
Dallas, TX 75229
Model I
$69.95

by George Bond

The utilities in this collection range from the trivial to how-did-I-get-along-without-it. Many were written by some of the heavies in the home computing field: Kim Watt, Earle Robinson and Tim Mann.

DIRLOWER/FIX is a cosmetic patch. It gives an upper/lowercase readout instead of all caps. Two additional patches, STATUS/FIX and KSMSTAT/FIX, modify the device command to show what special functions, such as double density and the key stroke multiply filter, are active.

There is a mistake in the documentation for KSMSTAT/FIX. The proper password for the /FIX programs is GSLTD not .RRW3.

A fourth utility, the stand-alone STAT/CMD, does about the same thing as STATUS and KSMSTAT, but includes a report on what disk drives are ready.

RESCUE/CMD permits resurrecting killed files that have not been overwritten. It gives a nifty little directory of the killed files for Y/N selection for saving and includes a note if a file is partially overwritten. Rescue, unlike most of the programs on this disk, works only in single density. For would-be speed typists there is DVORAK/CMD to remap the TRS-80 as a Dvorak keyboard. (If you're not familiar with this keyboard, see *80 Microcomputing*, December 1980.)

> *"LZAP can read some otherwise unreadable disks. . ."*

Things go uphill rapidly from here. BINHEX/CMD is a straightforward conversion program to put binary data into hexadecimal format and back again. This is often needed in data communications work.

Of less clear-cut usefulness is CHANGE/CMD, a drive-routing program. Change allows sending data meant for one drive to a different drive. The command CHANGE 1 0, blanks out drive 1 and puts drive 0 in its place. Calling for DIR:1 then gives you the directory of drive 0. Writing data to drive 1 puts it on Drive 0. As the documentation says, this does move the "LDOS operating system one step closer to total device independence. . ." The question, in this case, is why?

CLONE/CMD allows, as its name implies, copying files. You can make single-drive copies on drives other than drive 0. Some disk swapping is required, but not as much as with the XFER command. Also, you can copy a file over itself.

DCAL/CMD is for calibrating disk-drive operating speed. It shows exact and smoothed speeds. It is easy to use and does about the same thing as $25 stand-alone drive timers (and free, public-domain drive timers that can be downloaded from some bulletin boards). If you need to justify the cost of utility disks, this program goes a long way in arguing for the QSD diskette.

Two filter programs could be useful with some printers. UPCASE/FLT converts all lowercase output to uppercase (some printers cannot handle LC) and ADDLF/FLT adds a line feed after a carriage return, again something that a few printers look for.

VDISK/CMD verifies the readability of a disk's sectors on a given drive. It provides a quick check of disk quality when things keep going wrong, and provides information useful for fixing things up with LZAP/CMD.

If your disk arrives with everything glitched except LZAP, LPURGE, and LCOPY, you got more than your money's worth.

LCOPY and LPURGE only work in single density. Since they were both written by Kim Watt, who seems to fix his mistakes before most of us realize they are mistakes, they may be usable on double density by the time you read this. Frank Luff's LZAP works equally well on single or double density.

LCOPY's main virtue is that it solves LDOS' slowness problem when doing multiple file copies. It is versatile, allowing prompted selection for copying system files, visible files or all files; setting step speed on the destination disk; prompting for disk mounts; and starting the whole works over if you think you messed something up. If you really get puzzled, you can call up a help file.

For cleaning up a disk, use LPURGE. For us fumble-fingered folks, it has a super advantage—everything is done in memory until a specific command is issued to rewrite the directory to reflect the purge. Until that command is given, you can change your mind and all is forgiven (and saved). LPURGE allows browsing through the directory, killing any files or, with a single command, killing all visible files, all invisible files, all invisible non-system files, all /CMD files, all /BAS files, all system files or all files except BOOT and DIR. It also allows zeroing out all unused directory entries or disk sectors.

All those options may sound like enough for a single utility, but there is still option M, for more. This option allows, again with a single keystroke, making all files visible or invisible; changing the auto command; removing all passwords, changing passwords and changing a disk's master password. That is real utility.

LZAP does for LDOS much of what Superzap does for NEWDOS80 plus a few things that Superzap should do but does not. It allows direct entry to debug and return to LZAP. It finds and goes straight to the directory, no matter what cylinder (track) it is on. It finds the location of a file from its directory line, generates hash codes for files, removes passwords, searches an entire sector for a hex byte, and, just like Superzap, allows corrections to be made, byte by byte. If its error-trapping mechanism is shut off (which also cancels some of the more useful automatic functions such as searches), LZAP can read some otherwise unreadable disks, including ones with zapped boot tracks.■

The Utility Pack
Mike Friedman
B.T. Enterprises
171 Hawkins Rd.
Centereach, NY 11720
Models I & III, 48K
$49.95

by Sal Navarro

I use almost all of the major operating systems. It would be nice to have a fast spooler that would work with more than one system. Utility Pack has such a spooler. Tom, at B.T. Enterprises, gave me a demonstration. He put the disk in drive 1. He booted up NEWDOS and typed in SPOOLR48. He then loaded a Basic program and typed LLIST. As the printing started the Ready prompt came back on the screen. Then Tom took out NEWDOS, inserted another disk and pressed reset. The printing stopped and LDOS signed on. He then typed SPOOLR48! and the printer continued from where it left off without missing a letter. At the same time Tom called up Space Invaders and started playing while the printer was finishing what it started. "Sold," I told Tom.

At home I used the spooler with DOSPLUS, NEWDOS+, LDOS, NEWDOS80 Ver. 1 and 2, DOUBLEDOS and TRSDOS. It worked with all of them in single and double density. It worked with all the different combinations of line lengths, page lengths and buffer sizes. You can also feed the paper one line at a time from the keyboard by pressing the J and K keys together. Pressing the JL keys executes one top-of-form. To abort an operation press JMN and the printer buffer clears. Older operating systems previously unable to link printer output with video display can now do so by executing in Basic a PRINT CHR$(255). The spooler performs well with fast and slow printers. The Spooler requires a 48K memory.

You also get three other programs: Map, Cat and Erase on the same disk. They only work in single density. Map displays the disk's name, the date and the number of free grans remaining on the disk. Map also shows a detailed graph of the disk usage. It places an X where the granule is used, a period for a free granule and a hyphen for a locked-out granule. It will not show more than 40 tracks. On an 80-track system it only shows the first 40 tracks. The directory must be at the standard location (track 17). Map is invoked by typing in MAP n (n being the drive number).

Cat, short for catalog, alphabetizes your directory before displaying it on the screen. I found this useful when using single-density DOSPLUS to get rid of its directory, which is very distracting and useless if I do not need to know what size the files are. This program has the same limitations as Map, except it reads the entire directory of an 80-track drive.

Erase gives you three different modes for killing files. All three are compatible with NEWDOS80. Only two are compatible with TRSDOS and NEWDOS+. Only one works with LDOS. In mode 1 you just type "ERASE file1/bas file 2/cmd file 3.password, etc." It kills each file as you typed it. If an error is encountered, or the file cannot be found, it prints Not Erased next to the file nothing was done to and Erased next to those killed.

"All the programs are well documented with many examples."

In mode 2 you first call up the directory and type "Erase.!" A flashing cursor appears over the first file in the directory. It can be moved using the arrow keys. To kill the file depress Enter and Clear at the same time. Pressing Break returns you to DOS Ready. In this mode you cannot call up the directory with DIR (A). Doing so might inhibit Erase from finding a file properly. Erase has the same limitations as Cat with the exception of mode I which does work in double density.

Included in the package is the source code for each file. This, I presume, is for people with knowledge of Assembly language who might want to alter them. All these programs will benefit most computerists.

All the programs are well documented with many examples. Utility Pack comes on Model I disk with versions for both Model I and Model III. On the Model III all the programs work in double density and not single density. They have filled a vast void in my software library.■

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Scrinput
John Acres
ACR Consultants
R.R. #2, Box 229
New Palestine, IN 46163
$27

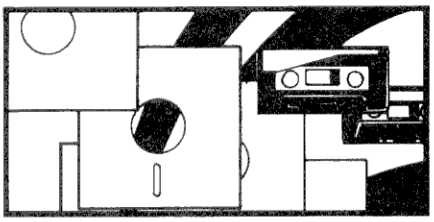
by Richard C. McGarvey

Imagine being able to sit down at your computer and enter data by simply filling in the blanks. Imagine that once filled in, you could edit that same data until it was perfect. What if you could define the field lengths, specify what type of data each field accepts and had a high speed, non-destructive cursor that you could fully control during data entry? With data input like that you could let anyone sit down, fill in data and get perfect results every time. Scrinput does all that and more.

Other programs may use a similar input technique but they do not measure up. Many input routines use flashing cursors and fill in the blank style but you can out-type the cursor. Once completed fields are inaccessible for alteration. The programs are usually tied to a sort routine that makes editing time consuming. Those programs are also usually rigid format programs that limit their use in other program applications.

With Scrinput you can set up your CRT just like a data input form and then fill in the blanks. The Scrinput utility is completely adaptable to any program use.

Scrinput is a well written utility program that allows the Basic programmer to set up his CRT into data-entry fields. The Basic programmer can store formatted data directly on the screen and then write the entire screen onto disk or tape, send it to a printer, and manipulate or use it in calculations. You can also display and edit previously entered data or display the calculated results of Scrinput input data.



Although Scrinput is written in Assembly language (source code is supplied with the documentation), the user enters it in a Basic program. This makes it easily usable by the non-machine-language programmer. The Assembly-language speed is obvious in the high-speed cursor that cannot be out-typed.

Simple PRINT@ statements build a video display. Minor instructions to Scrinput inject the cursor into the first logical field. Scrinput allows up to 80 fields on the screen at a time so you can enter a great deal of data. You can enter data into each field with complete cursor control. When the data entry for the entire display is complete, the Enter key or another control key returns the program to Basic. The assigned data will be in Basic variables. From this point on, the Basic program handles the data as if it had been entered with an Input statement.

"You can call John Acres. . . if you have any trouble. That should be enough to help any Basic programmer get on the right road to proper Scrinput use."

When the CRT is fielded the cursor can appear only within the data fields. If the entry clerk wants to change the order in which the fields are filled with data he must skip tab to the next field. Shift right arrow skips tab to the next logical field. The next logical field depends on your programming, but if you program right to left and top to bottom, you must skip tab one field to the right. Shift (left arrow) skips to the previous logical field. There is complete wrap for the skip-tab feature. Under non-shift conditions the arrows move the cursor either one space left, right, up or down. They *do not* destroy the data they pass over. The space bar spaces and *removes* any character in its path.

During field specification you can tell Scrinput what type of data to accept in any given field. For example, in a zip-code field you can exclude upper and lowercase letters and include only numbers. In another field you can include only alpha-characters and exclude numbers. This eliminates many common data-entry errors. You can search for punctuation, uppercase alpha, lowercase alpha and numerical entry in any combination. The program ignores all keystrokes that are not specified as acceptable.

Enter, Break and Clear keys are normal control keys. Clear clears all of the data in the fields without clearing the entire screen. Break breaks and Enter signals the end of data entry, returning control to the Basic program. You can reassign or ignore these control keys or you can use other control keys. Shift down arrow and any letter A–Z held at the same time can be a control. Control P, for example, turns on the printer for data output from the display to the printer.

Documentation

John Acres has documented Scrinput well. There are thorough instructions on using Scrinput. Two sample programs show Scrinput at work. He then breaks down the programs (listings are provided) and explains how the important features of the program relate to Scrinput. Two utility programs aid data storage and recovery. You can use these utilities with Scrinput or without it in non-Scrinput programs. A complete source code with comments is provided. Flowcharts document the program's operation. These are seldom seen in program documentation.

There are some problems. The documentation does not lead you by the hand through Scrinput's operation. Some unclear points may cause trouble for an inexperienced Basic programmer on his initial excursion into Scrinput.

You can call John Acres (the documentation includes his phone number) if you have any trouble. That should be enough to help any Basic programmer get on the right road to proper Scrinput use.

As with most software, ACR Consultants offer Scrinput on an "as is" basis. The producer accepts no liability for damage caused by the program's operation or failure. Unlike most software, ACR Consultants offers a 10-day money-back satisfaction guarantee. If you do not like Scrinput of if you cannot use it, you can get your money back.

Scrinput is useful if you want to write or update any data collection program, whether it be a mail list, business accounts, recipes, or even hobby data. ■

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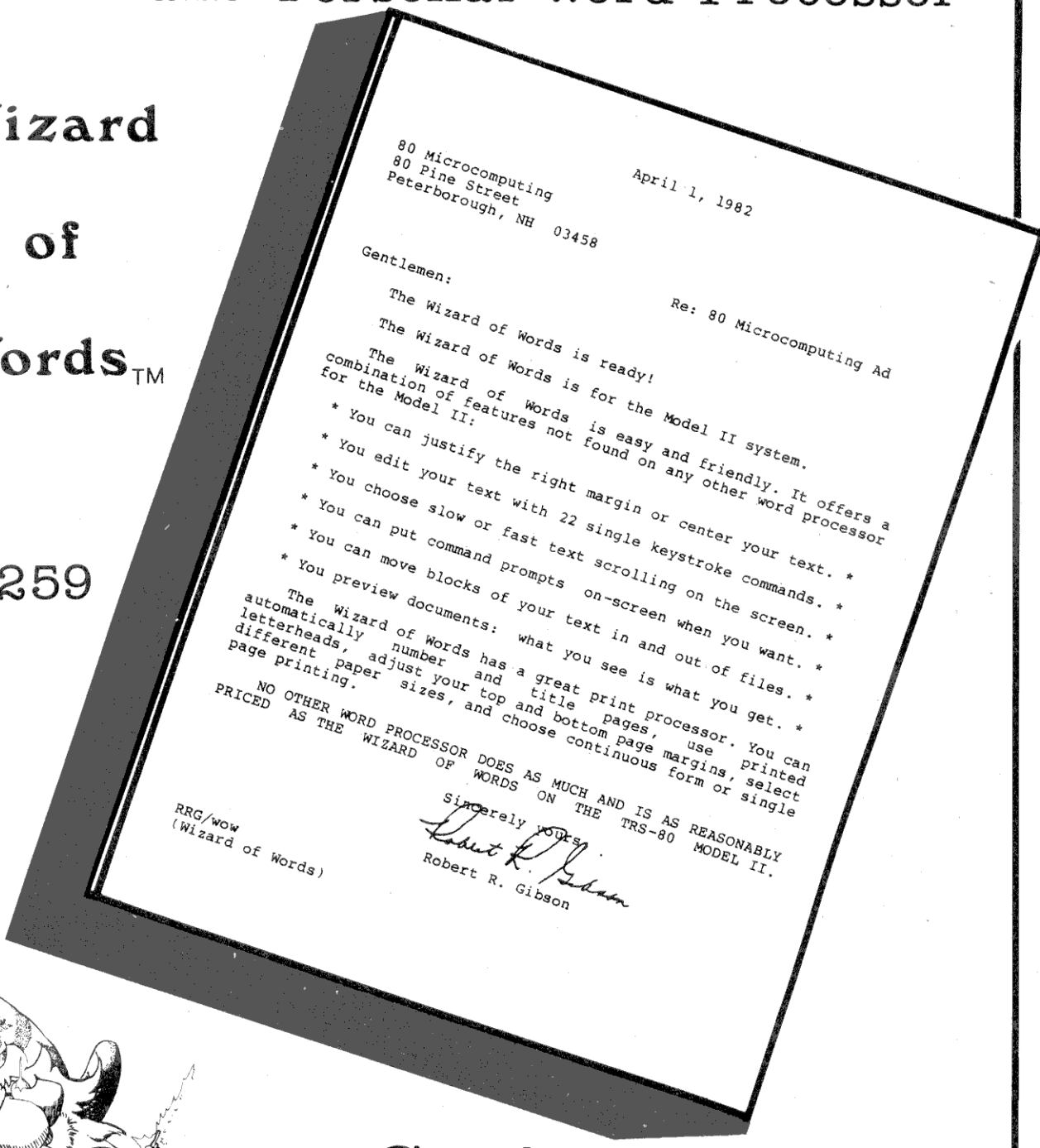

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April 1, 1982

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Parsector 8
Ants
Space Ace 21
New Starship Battles
Synergistic Solar Inc.
P.O. Box 560595
Miami, FL 33156
$14.95-$19.95 cassette

by W.D. Ives

Synergistic Solar has finally answered my pleas and made their software disk-compatible. No matter how good a game is, I am not likely to play it more than a couple of times if I have to struggle through a CLOAD every time I want to relax with a game. I will not buy software, not matter how tempting the ads, unless I know that I can transfer it to a disk after a successful CLOAD.

New Starship Voyages

The weakest offering of the lot, and the only one I cannot recommend, is yet another trek game called New Starship Voyages. This is a fairly good Trek program, but it has been done before, many times, many ways. All of the old standard features are here: one supership with an inexhaustable energy supply blowing away dozens of enemy ships ranging in strength from pitiful to wimpy; a base where what little damage one might suffer can be repaired; a battle computer to make sure you never miss when you fire; a magical device called a "scanner" which infallibly locates every enemy ship in the whole galaxy for you; and so forth.

These ideas are incredibly stale. Synergistic Solar added a few new twists to NSV: Each of the 16 commands, for instance, takes up a different amount of time from the amount you are allotted for each turn.

If you are waiting for someone to do something new and original with the 10-year-old bare bones of Trek games, you will have to wait a little longer. As I said, I cannot recommend this game. If you get a chance to pick it up as a freebie on another order, do so, but otherwise, let it slide.

Ants

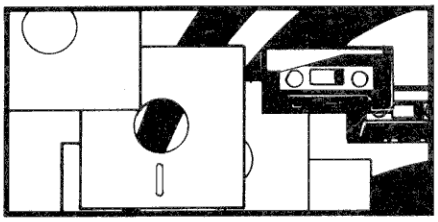
In the war-gaming industry someone will inevitably write in and say, "Wouldn't it be neat to have a war game between two colonies of ants?" There are very sound reasons why it would not be very neat, and I will point them out as I discuss the game, Ants.

Brian Rodolante of Miami did it. Ants pits (you guessed it) the Red Ants against the Black Ants. Now, the first problem with a game about an ant war is that it is a silly topic; and a silly topic starts off with an awful burden of proof because all games have to trick the player into taking the situation seriously enough to care who wins. It is a testament to the programmer's skills that when I loaded Ants just to make sure of my facts I ended up frittering away all of yesterday afternoon and two hours today—and that, mind you, on a "silly" game.

"Ants ranks high on the 'mindless entertainment' scale."

The second problem with a game about an ant war is that ants are, after all, insects, and insects are not what one would call masters of the art of war. Strategy to an ant colony consists of finding another colony. Tactics are when ants from the attacking colony walk up to ants from the other colony and try to eat them. Further, if you are going to call them ants, then you can not diddle too much with reality that is, if they are ants, then you, as the leader of the colony, must be limited to making only very basic decisions which only indirectly affect the ongoing conflict. Thus, if you are the queen of the colony, a game would be less than honest if it allowed you any real control over your soldiers and workers on the actual field of battle.

Why did I spend eight hours playing this silly game? Well it is a visually entertaining game. There are eight distinct types of ants (two sides each having



drones, workers, soldiers and guards) in addition to the immobile queens. The mobile ants scurry about on the screen in a charming, and really quite apt, parody of the way real ants move. The sound effects are helpful, too: rapid-fire beeps when the ants move, and lots of zots and fweeps and other noises when anything interesting happens. The game allows six speed settings, ranging from one, where the action is so fast it is over before you know it is started, to six, which is the only speed which allows mere mortals to keep track of what is happening on the screen.

The fast speed settings cause the game's action to resemble a berserk version of high-speed Life more than anything else. By the time you look at the screen, things are vastly different and you have to interpret what happened. At all speeds, though, the game remains entertaining. Ants ranks high on the "mindless entertainment" scale, being a game that you will not have to take notes for, that you can expect to finish in 10 minutes, and that stays busy.

But there is more to Ants than entertains the eye. The only command decision that the player in this game gets to make is the type of ant to produce in a given turn. But that is the secret to this game's ability to keep me interested. Once produced, the ants scamper out onto the field, moving either glacially (the guards) or like lightning (the workers), in response to a randomizer that moves the critters in the general direction of the other side of the screen.

If an ant comes up against an enemy, he will attack the enemy if one of his moves directs him into the location occupied by the enemy and one of the combatants will die. In general, stronger ants (like guards and drones) will kill weaker ants (like soldiers and workers), but not always.

You can win two ways: either by getting a bunch of your ants off of your opponent's edge of the screen (which is a task best fitted for the speedy workers, who can zip around the other colony's flanks) or stinging the enemy queen (which means a drive up the middle, work for the plodding, but powerful, guards or the even stronger, but defenseless, drones), and each method requires a different mix of forces.

The challenge of this game is in the selection of the proper force both to counter your opponent and to achieve your own ends. Aside from this decision, the player has no control over the game. Surprisingly, rather than being a source of irritation, this limitation allows the players to sit back and enjoy the graphics and make extensive production plans.

I must also point out some serious deficiencies in the game. First, there are eight different types of ants displayed on the screen, and TRS-80 graphics/letters combinations are really not up to the task. The display is highly confusing at first, so much so as to be completely meaningless to someone new to the game. It was an admirable try, but the game cries for color.

You can get used to it after a few games, though towards the end of the game, when the screen is crowded with ants, the display often lapses into incomprehensibility.

Second, even at the slowest speeds, the game moves too fast. When watching the game, the players never know which ant is going to move next (though there is a rough order to their movement), and by the time you have spotted the one that is going to move, it is already finished. It has also already finished any attacking or defending. A major attack may dissolve without the player ever seeing it disappear.

Finally, this game uses a lot of machine-language subroutines, so the user has to be very careful having other routines in conflict with the ants routines. (The NEWDOS Version 2 Clock function sometimes causes Ants to wander off into the ozone.)

Space Ace 21

Space Ace 21 is an entirely different type of game from Ants. Space Ace 21 is an accurate, complex simulation of ship-to-ship space combat, and definitely not an arcade game.

War-gamers will recognize the three-dimensional movement/display system used in this game as being very similar to the system used in a popular game from Simulations Publications a few years ago called Battlefleet Mars and later used in several other games. Space Ace 21, though, has a great deal to offer beyond the old cardboard and paper games.

Space Ace 21 is not a simple game: Without a computer to keep track of the minutiae, I expect that it would be impossible. With the computer, though, the game is quite entertaining—especially if you are looking for a simulation, rather than a game.

"Space Ace 21 is an accurate, complex simulation of ship-to-ship space combat."

The first order of business in SA21 is ship design. Your spaceship is designed on a 3 by 7 grid. Each space can be filled by one of 12 different types of structure: armor to shield adjacent modules; distributors for close-range work; engines; fuel tanks; missile pods, torpedo launchers, and phasers for long-range combat; sensors to improve one's accuracy; cargo; and several required modules. Bridge, generator and life support modules must be part of every ship's design.

Ship design is a game in itself: You are asked what to place in each area on the grid, and when you decide, the program draws the selected element in the specified location. Thus, not only do you have a theoretical knowledge of how your spaceship is designed, you also see it. The players can experiment with different ship designs, building multi-engine ships with no armor but ferocious acceleration capability; or slow, super-strong tortoises that never get anywhere, but can blast any ship they meet, or anything in between. Even if this game did not perform well in its other areas I would enjoy it for the ship-building alone.

The only problem with the ship-building routines is that they are unforgiving: If you blow your design, there is no going back and fixing things—you have to restart the program. I recommend that new players sketch out their planned designs on a piece of paper before entering the designs in the program. The graphics can be quite confusing until you learn the difference in appearance between a disruptor pod and a missile launcher. I found myself, when I was just learning the game, continually forgetting what I had specified for the earlier pods and unable to figure out what the graphics meant.

The game is played in 10-second turns and is, I repeat, a simulation. Movement is strictly Newtonian—once your ship starts moving at a set speed and in a particular direction, it will continue to move that way until you do something to change its movement. One of the easiest mistakes to make in this simulation is to build up so much speed that you can not brake fast enough and zip past your opponent.

If you want to change your heading, you must apply thrust to turn your ship in the desired direction—and remember, your velocity from previous turns will not go away. For a neophyte, just getting an opponent's ship within decent disruptor range is an accomplishment to be proud of—for that matter, just not to run out of fuel before getting back to base is somewhat of an accomplishment.

The map of the action is actually a pair of maps, one showing the two ships in the X-Y plane, and another showing them in the X-Z plane. When seen together, the displays provide an easy visualization of the three-dimensional battle area. The scale of the displays is constantly changed to keep the ships distinct from one another.

"Ship design is a game in itself."

There are four types of commands: status reports, which will give you a numerical readout on the status of your ship; maneuvers, where you specify any direction changes to be made in the upcoming turn; speed changes, where you decide how much fuel to burn in your maneuvers; and weapons, where you blast the other guy.

The combat is just as much fun as the ship design because your beautiful spaceship is now shot full of holes! Whenever your ship is hit by the enemy's weapons, the program determines how much damage is done to the ship, and pokes holes in your ship's diagram to indicate where and how seriously you have been hit. It is much more meaningful to watch your ship get ripped to shreds by a lucky hit than it is to read some message like "engines down to 70 percent effectiveness." And it is a great deal more fulfilling to watch your own deadly salvos rip great chunks from your enemy's ship. The displays correspond exactly to the simulated reality, also each bit of damage to your ship affects its abilities in some incremental way: reducing acceleration, damage done to your enemy, fuel carried, etc.

Space Ace 21 is a very good game and an excellent simulation. It is one of the best computerized war-games I have seen. I strongly recommend it.

Parsector 8 and 5

Parsector 8 is Synergistic Solar's best game. It is a spacewar game intended for two players, though Parsector 5 has a computer opponent.

The game comes with a sheet of instructions and a template for making a screen divider, which splits the screen in two and allows each player to see only his half of the screen. This secrecy is the reason that Parsector 5 and 8 are such good games.

Computers will be the savior of realistic simulations, as can be seen in Parsector.

Your forces in Parsector are hidden from enemy sight, as are the opponent's actions, though some of these can be interpreted. The action in Parsector is simultaneous, except in a few isolated and unimportant cases, so the game has an overall feel of grand strategy.

Parsector is played in a flat universe of anywhere from two to eight units on a side. Each player controls a mothership. The mothership launches bases, cruzers and fyters which either solidify ownership of an area (in the case of bases) or move independently of the mothership in search of enemy units (in the case of the cruzers and fyters) to fight. In addition, the mothership can fight, launching weapon bolts either singly or in spreads to destroy enemy ships or bases. Finally, the mothership can move throughout the flat universe, trying to destroy as many enemy bases as possible while leaving as many friendly bases as possible, and more importantly, trying to leave friendly forces in locations and concentrations that will block or slow down enemy attacks.

The trick, of course, is to find the enemy's bases and destroy them while protecting your own. Neither player in a game of Parsector has any idea, initially, of where the enemy is located, or what parsectors are under his control. When a combat turn is completed and your status display reveals that you have lost one parsector and two bases, you know that this indicates an enemy attack, but you do not know where! All of this leads to a very stimulating game as the players try to find and attack each other while protecting their own forces.

Parsector is Synergistic Solar's best game, but I must qualify this support. Space Ace 21 is actually a much better design, and a much more realistic game—and it is the best simulation that I have seen to date. However, Space Ace is not an easy game to play. You have to do a lot of hard thinking to win at it. Parsector, while not nearly as good a simulation, is a better game because the players can sit back and relax. ■

Profile II, Profile Plus
Tandy/Radio Shack
Forth Worth, TX
Model II
$179, $299 disk

by Craig Hilton

A data base manager (DBM) is a program that allows the user to easily manipulate a collection of data. Most programs only manipulate input data within program parameters. A DBM manipulates data by literally writing a program in either compiled code or Assembly language. We tell the DBM what type of data we want manipulated and in what form, the DBM tells the computer how to go about doing it.

This saves thousands of hours learning to write bug free in Assembly language. It saves us from buying new programs each time our needs change. It lets us concentrate on what we want the computer to do, not so much on how to get the computer to do it.

The ability to develop ideas into useable programs depends on the sophistication of the DBM and the user. Data base manager programs run the gamut of sophistication. The simplest DBM may function as a cross-reference. Increased sophistication can integrate a filing operation with mathematical functions, word processing and subprogram integration.

DBM's benchmark features usually include allowing the user to create guidelines for entering data and customizing the input format. It provides powerful editing capabilities for updating, changing or deleting data coupled with search/sort capabilities. Mathematical computations on

Table 1. Benchmark Comparison

BENCHMARK	Profile II	Profile +
DOCUMENTATION		
What is the level of user sophistication?	beginner	competent
Quality of supporting documentation	sufficient (lacks index)	poor
EASE OF USE		
General use of entire DBM	good	excellent
Editing a file	good	excellent
Creating a file	good	excellent
Screen/Report customization	excellent	excellent
MATHEMATICS		
Mathematical capabilities included	limited (+, −)	yes (standard arithmetic)
CREATION OF THE FILE		
Can fields be altered once created	no	yes
Can one file access another	no	yes
How large is key field	85 characters	85 characters
How many blocks can be chained together into 1 record	3 + key field	3 + key field
Number of data field types	6 (alphameric, numeric, protected, + and −)	15 (all as previous + date fields (2), last update fields must fill fields (5)
Maximum number of records possible (key field only)	20,000 (with 4 drives)	20,000 (with 4 drives)
Maximum number of records possible (with 500 characters per record)	1800 (with 4 drives)	2400 (with 4 drives)
Can parts of a block be used in chaining together 1 record (selectable record length)	no	yes
EDITING OF THE FILE		
Can one file update other files	no	no
Can groups of records be altered or updated with a single command	no	no
High speed file index capabilities	no	yes
Number of screen/report formats available to a file	4 screen/5 report	4 screen/5 report
SORTING/SEARCHING OF THE FILE		
Number of layered sort levels possible	0	0
Can associated fields be clustered into search groups	no	yes
Maximum sort length	30,000 characters	30,000 characters
Maximum number of sort criteria	36 fields	36 fields
Number of sort comparison criteria	5 (GT,LT,GE,LE,Range)	5 (GT,LT,GE,LE,Range)

Table continues

Reader Service for facing page ✓29→

MISSION: TO DEFEND... AND SURVIVE!

by Jeff Zinn

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Programs are all 100% machine language for high quality graphics. Disk version saves high scores to disk & is compatible with TRSDOS. Sound effects are playable through the cassette AUX plug. Please call or write for information on all of our products. TRS-80 & TRSDOS are trademarks of Tandy Corp.

entered data are often made automatically, as are merge functions and high speed indexing. Many systems allow the input of data from unrelated programs and interaction between various files within the system. A sophisticated reporting option lets the user specify (or customize) what type of reports are needed, how they should look and from what data source. Reports can include labels, statements and letters. All DBMs don't have all these functions. That is why we are comparing two systems against these benchmark functions.

The first DBM, Profile II, is simple and comparatively inexpensive. The second, Profile Plus, is the improved version of the first. It is more expensive and more capable. For the average user they offer the features and price to make it an excellent starter system.

Table continued

REPORTING OF THE FILE		
Is there a screen report option	no	no
Are subtotals generated on reports	no	no
Is there a label generator option	yes (6–99 lines)	yes (1–8 lines)
What types of reports are available	columnar (single line)	columnar (single line) columnar (double line) summary reports
GENERAL FEATURES		
Can non-DBM program data be accessed or tied in	no	no
Can non-DBM programs be run in conjunction with DBM programs	no	yes
Is the system upward expandable to fixed disk	no	no
Is there a built-in word processor	no (can interface with Scripsit II)	no (can interface with Scripsit II)
Does it support single sheet feed for word processor printers	no	yes
SPEED		
Time to allocate 1 block of 1000 records	excellent 1 min 20 sec	excellent 1 min 5 sec
Time to sort 1000 records on 2 sort criteria	excellent 35 sec	excellent 31 sec
OVERALL		
Cost of program per 1000 records of 1 block length	$110.	$132.
Overall evaluation (% of all possible total points)	30%	59%

Profile II

Profile II functions more as a reliable filing cabinet with cross references. The system is lacking in many areas. The first-time user should purchase the auxiliary manual with cassette tape explanations along with the program. Serious first-time users should consider the Profile Plus additions as being worth the extra $220.

". . . Profile II is simple and comparatively inexpensive."

Profile Plus

Actually this is an add-on package to Profile II, providing some of the features needed to move Profile II into the true DBM class. The system is well priced. Profile Plus may be the least expensive DBM in its class. The system works quickly. With a few additions it could be a first-class system.

It needs a better documentation package. It also lacks a layered sort capability, subtotal options and tie-in capabilities to non-DBM file data. ■

Star Warrior
Automated Simulations
P.O. Box 4247
Mountain View, CA 94040
$39.95 disk or cassette

by Dan Cataldo

Star Warrior transforms you into one of the Furies, paid agents of justice and revenge. The oppressed inhabitants of the planet Fornax hired you to free them from the government of the Stellar Union.

The game consists of two scenarios. In the first scenario you have been dropped with one of your fellow Furies onto the surface of Fornax. Your partner's mission is to move south and kill the Governor. To create a diversion, you move north creating destruction and mayhem. You want to be seen and shot at (Furies being either exceedingly brave or incredibly stupid). You select your combat suit, the number of minutes the scenario will last and level of difficulty. There are five levels.

The second scenario reverses the roles. Your mission must be accomplished as quickly as possible. Find the Governor, kill him and escape. The Governor can move around; his forces will shoot you on sight. There is no time limit to this scenario, but you lose points if you take more than 20 minutes.

Each scenario takes place in an area 7 by 9 kilometers, divided into squares one kilometer on the side. Your monitor displays one square at a time. There are four types of terrain: plains, swamps, mountains and forests. The terrain maps for the two scenarios are completely different.

In Star Warrior plains are represented by a blank monitor screen. The swamps, mountains and forests are represented by randomly scattered symbols. The graphic representation of the Furies is an improvement over other Automated Simulations programs, such as Morloc's Tower.

Each of the Furies' powered armor suits has different characteristics: flight speed, armor strength, shield strength, infravisibility, decoys, size of blaster and powergun and number of missiles and blaster charges. Disk version users can build a custom suit. Cassette users can do almost as well by making the appropriate adjustments to the data lines of the program.

The enemy has many different types of weapons: robot tanks, nitron guns, maulers, flitters and infantry. They are all deadly.

The handbook is well designed and easy to understand.

Star Warriors uses a varied assortment of chirps, whines and other interesting noises. If you choose not to use sound the game proceeds much too quickly.

The price seems a bit steep. If you can afford it Star Warrior is a very fine program. ■

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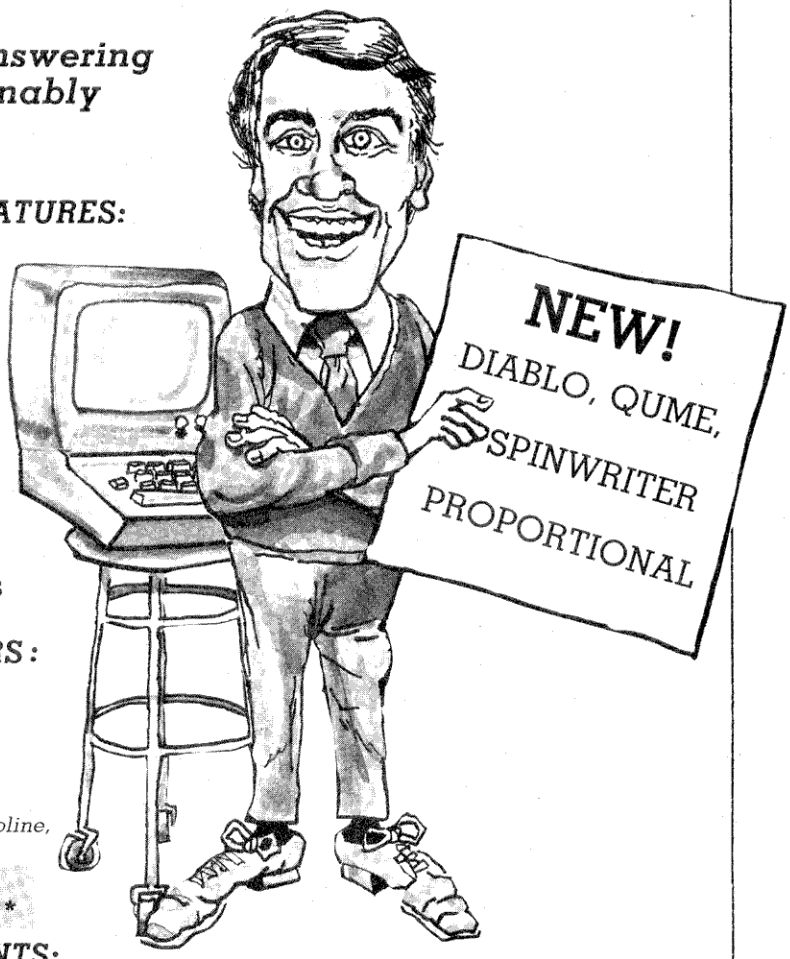

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Models I or III, 48K, two disk drives
Builder: $149.95
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by John P. Mello Jr.
***80 Microcomputing* staff**

Put a thesaurus on disk and save yourself some thumb wear. At first blush, it seems like an unimpeachable idea. But unfortunately, it is an idea that lives and dies by its host—the microcomputer.

If—as David C. Whitney, quoting an English lexographer, observes in his introduction—the strength of Roget's tome is also its chief weakness, then the same is true of the Refware Thesaurus.

This thesaurus consists of three 5.25-inch disks, one consisting of nouns, one of adjectives, and one a builder allowing you to create a specialized thesaurus of up to 6,200 words. Each disk is sold separately. According to Marketing Director Robin Vaughn, verbs and adverbs are in the prototype stage along with a Model II version of the thesaurus.

All three programs are very easy to use, so much so the three user's manuals seem almost superfluous.

"All three programs are very easy to use, . . . the three user's manuals seem almost superfluous."

After booting up your disk operating system, loading Disk Basic and running the program, a series of "billboards" appear on the screen. One defines nouns or adjectives. Another suggests you can use the thesaurus to find hard-to-spell words: Think of a synonym for the hard-to-spell word and have the thesaurus list synonyms for the synonym. The hard-to-spell word, properly spelled, should be in the list.

The thesaurus lists on your monitor or prints a list of 10 synonyms. However, unlike a conventional thesaurus, it also inserts the synonyms for the word you want replaced in your sentence. In the sentence "The terms of the agreement were not disclosed," the thesaurus printed:

The terms of the conclusion were not disclosed.
The terms of the harmony were not disclosed.
The terms of the concord were not disclosed.
The terms of the treaty were not disclosed.
The terms of the pact were not disclosed.
The terms of the concordance were not disclosed.
The terms of the accord were not disclosed.
The terms of the assent were not disclosed.
The terms of the consent were not disclosed.

After you compile your first synonym set, the thesaurus asks if it should find a different group of alternate words for your noun or adjective. If you reply positively, the thesaurus determines if it has such a group and if so, either prints or lists the set.

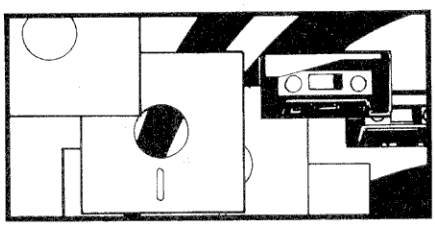
All this is done very fast; faster than a search through a conventional thesaurus, if you find a suitable word in the first group the Refware Thesaurus gives you. Chances are, however, you won't. Here's why:

Take the word *agreement*. A conventional thesaurus lists 13 synonym categories. Most times, you can immediately spot the category closest to the meaning of the word you are looking for. With the Refware work, the computer chooses the category. If it isn't the correct one, you must request another group of words. This adds to the time it takes to find a synonym in the microcomputer thesaurus. Also, you never know if there is another synonym set, so every time you call up one set, you must call up another to see if it is there and if it is there, to see if there is a more suitable word on it.

While the microcomputer thesaurus is initially faster than finding a word manually, it oftentimes seems like it is taking longer because you spent time waiting, while time spent thumbing through a conventional thesaurus is time spent doing.

The microcomputer thesaurus, because of disk space considerations, excludes words with more than 12 letters. It contains 6,200 nouns and the same number of adjectives. This is a significant limitation when you consider the fourth edition of Roget's book, published by Harper and Row in 1977, contains 250,000 words.

Another limitation of the microcomputer thesaurus is it can't be accessed while you are in a word-processing program. If you are composing with a word processor and need a synonym for a word, you have to break out of the word processor, load Disk Basic, load the thesaurus, find a synonym, break out of Disk Basic, reload the word-processing program, call up the file you were working on and insert the word you were looking for. A cumbersome process to say the least.



The eight utility programs in the nouns and adjectives thesaurus are sold separately as a builder enabling you to construct a reference work and possibly make some extra cash. Thesaurus author Whitney, who has edited the *World Book Encyclopedia, Encyclopedia Americana, Reader's Digest Almanac* and *Yearbook* said in the user's manuals for the three programs:

"Any user of the Refware Thesaurus Builder who constructs a comprehensive specialized thesaurus that may be useful to others in a given field or profession should send a copy to the Refware division so that it can be evaluated. If the user's specialized thesaurus is judged to be commercially viable, the Refware division will undertake to market it with royalties paid to its author."

The builder lets you enter synonyms in groups of 10 ("dummy" is used to reserve spaces in blocks with less than 10 words). It also allows listing or printing the blocks or all the words in your thesaurus in alphabetical order. The builder is a tremendous boon for someone preparing a thesaurus, but after it is prepared, the author must face the difficulties accompanying the thesaurus' brethren, nouns and adjectives.

Whitney noted in the user manuals for the Refware works, "With the ever-expanding memory size and storage capacities of microcomputers, it seems likely that massive printed reference works like a (Roget's) thesaurus, will soon go the way of the dinosaur." After viewing the Refware programs, Roget's heirs needn't sweat over loss of royalties . . . not for awhile yet. ■

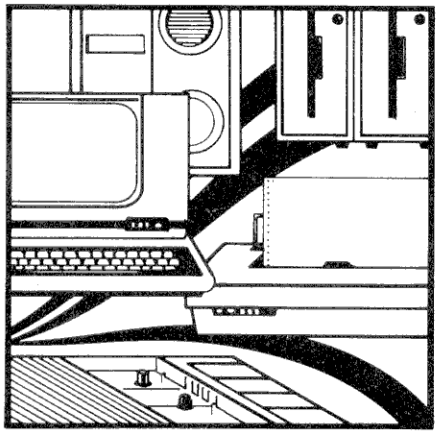
Floppy Disk Controller
A.M. Electronics
3366 Washtenaw Ave.
Ann Arbor, MI 48104
$400

by John Ratzlaff

The popularity of the Model III has been accompanied by a veritable host of companies supplying after-market equipment, including disk drives and controllers. These typically offer several advantages over the Radio Shack-installed drives, including lower price and greater flexibility. Most of the available controller kits support double-sided drives.

The A.M. Electronics Floppy Disk Controller Board kit includes the controller board and all mounting hardware,cables and power supply, but not the disk drives. I chose two Tandon double-sided, 40-track drives, without case or power supply. I also purchased DOSPLUS 3.3 from Micro Systems Software. The total cost for my disk system came to about $1,170.

The installation instructions were thorough and easy to follow. The exceptions were minor. A few nuts and bolts for mounting the controller board were missing and the description of the controller board power supply cable did not match the cable I found. I determined the proper orientation by referring to the pin numbers. There were no traces to cut and no soldering was necessary. I was impressed with the way the kit fit perfectly into the Radio Shack design. The most difficult operation was breaking out the plastic face-plates that cover the disk drive openings in the computer housing.



The disk drives must be configured to the system. I called A.M. Electronics and was told to remove the terminating resistor packs from both drives and break certain DIP jumper connections on the

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Reduce your programming time significantly with Snappware's EXTENDED BASIC. The program is written entirely in machine language for super fast execution and is fully integrated into the TRSDOS* BASIC interpreter, requiring no user memory. Here are just some of the ways EXTENDED BASIC can make your programming task easier:

- Quick way to recover BASIC program following a New, System or Accidental re-boot.
- Single character abbreviations for the most frequently used commands.
- Six single key stroke commands to list the first, last, previous, next or current program line. Even edit current line.
- A powerful cross-reference facility with output to display and/or printer.
- Ability to trace a variable through the code.
- Determine easily if a variable is in use.
- Permits programmer to display and/or print the value of any or all program variables.
- Identifies the variable type for all variables.
- Lists each element of any array separately.
- Program line renumbering facilities allowing for specification of an upper limit of the block of lines to be renumbered, relocation of renumbered blocks of code and duplication of blocks of code.
- Cross reference facility for key words and character strings including global replacement of key works.
- Compresses your BASIC program to an absolute minimum by removing extraneous information.
- Merge lines.
- Deletes statements that could not be executed.

If you consider your programming time to be worth money, call us and let us show you how to get more of it.

*TRSDOS™ Tandy Corporation

MODEL II $200.00
MODEL III $125.00

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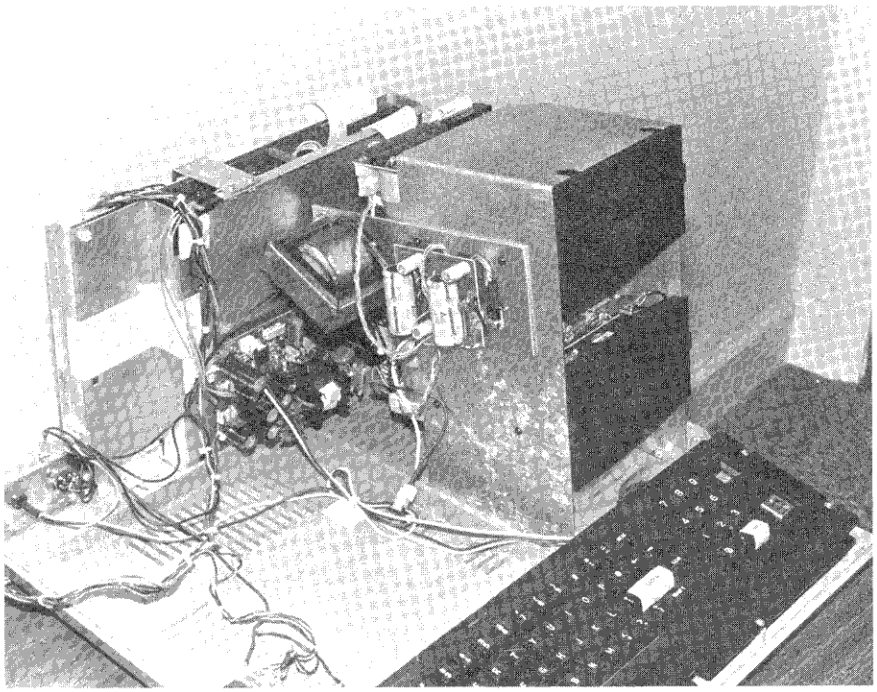
drives. Which connections to break will differ with different drives. Photo 1 is the completed installation before putting the computer back together.

After installation, I booted the system up and it worked! However, upon attempting a backup I ran into trouble—DOSPLUS declared about half the tracks on the disk flawed and rejected the backup. At this point I learned one of the disadvantages of assembling your own system from various suppliers: If something goes wrong, it may be difficult to determine which part is faulty. I ruled out disk failure because it rejected the same tracks every time, even with high-quality disks. I ruled out DOSPLUS failure as TRSDOS did the same thing. I called A.M. Electronics and was told it was probably a faulty controller board.



A.M. Disk Controller Installed.

With the new board installed the system worked perfectly. It was particularly gratifying to be able to ask for DIR:0B (back-side of drive zero). I now have the equivalent of *four* disk drives with a capacity of roughly 720K bytes.

The A.M. controller kit is compatible with all existing Model III DOSs, although TRSDOS will not support the double-sided capability. DOSPLUS was chosen for this reason.

I highly recommend the A.M. Electronics controller kit, along with double-sided drives and DOSPLUS as a reliable, easy-to-assemble, large-capacity system. It must be mentioned, however, that there is a substantial trade-off: Radio Shack will not service, much less honor the warranty on a system with an after-market disk controller and drives installed. If something goes wrong, the unit must be disassembled and the disk system removed before Radio Shack will service the computer. It is easier to find a non-Radio Shack repair facility when servicing is needed. This is an acceptable price to pay for the increased flexibility and lower system cost. ■

IDS 460 printer
Integral Data Systems
Milford, NH 03055
$1,095

by Dennis J. Wilkins

I now own my third line printer. I use my system for word processing and to print business forms and engineering reports. It took only a few months to realize my first printer was not up to the task.

I looked at new product releases in several magazines and became interested in Integral Data Systems model 440 printer, dubbed the Paper Tiger. I sold my original printer and purchased a 440.

The IDS 440 had a number of good points. Its lowercase was quite legible, though not great. It was considerably faster than my first printer and had more intelligent functions, including auto page feed and out-of-paper sensing. It could print eight different column widths on an 8-½-inch wide sheet of paper. I was very happy with my 440, until I saw a sample printout from the new IDS 460.

I bought the new Paper Tiger in January, 1981. It plugged into the 440 cable and worked on the first try. The type style is nearly as good as a typewriter.

The IDS 460 is a microprocessor-controlled, bi-directional, dot-matrix line printer, available with a 2K character buffer and raster scan graphics option at $1,095 list. It has a nine-wire ballistic printhead with true descenders. It handles paper widths from 1.5 to 9.5 inches (tractor feed only—an optional single-sheet feeder is available for 8-½ by 11-inch paper).

The IDS 460 can underline text with a solid line. The paper can be moved under software control, allowing subscripts, superscripts, or equations to be printed. Up to eight vertical tabs can be programmed. Vertical movement can be controlled to the nearest 1/48th of an inch.

The user controls the margins, tabs and intercharacter spacing. Character widths are available in 4.8, 5.8, 8, 10, 12 and 16.5 characters per inch.

The 460 has constant pitch and proportional spacing modes for all character widths. Fig. 1 shows examples of type size, margin control and proportional spacing. The proportional spacing mode prints letters with a constant space between the end of one letter and the beginning of the next, rather than at a fixed spacing from center to center. Proportionally spaced type looks more pleasing than constant pitch.

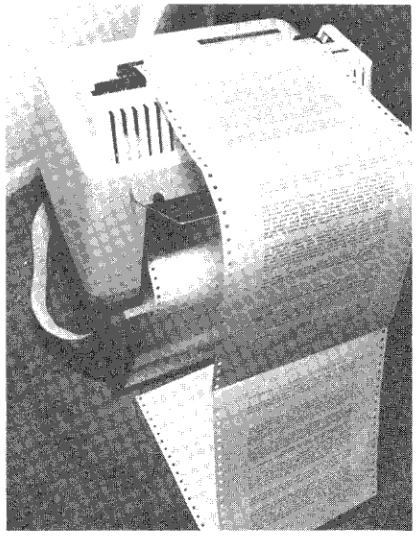
The 460 also has form features. Page length can be set at power-up to one of eight lengths. Under software control, the page margins, top, bottom, left and right can be set in increments of 1/48 inch vertically and 1/20 inch horizontally. Line spacing can be set at power-up to six or eight lines per inch, but can be set to any spacing via software in increments of 1/48 inch. The IDS 460 has right margin justification built in. The right margin can be made straight under printer control, even in the proportional spacing mode. Fig. 1 shows an example of this capability also.

The IDS 460, like its 440 cousin, has

both serial (RS-232) and parallel (Centronics style) interfaces built in. The interface is selected by moving jumpers in a socket on the main circuit board. All other logic default controls, including on/off of auto line feed with carriage return, fixed or proportional spacing, parity select and baud rate (for serial interface), form size, line spacing and automatic paging at form boundaries are selected by switches located at the top of the printer.

The 460 (Photo 1) has a footprint 15.75 inches wide by 12.5 inches deep. It is over 12 inches high. This tall design has its advantages. There is room for over 500 sheets of paper under the printer.

The height allows for straightforward placement of the main circuit board behind the paper path. IDS used the extra height to mount the mode select switches, form feed and line feed controls directly on the upper edge of the board without extra cables. The height also provides efficient convection cooling of the circuitry.



The IDS 460 Paper Tiger

The 50-page owners manual includes maintenance and troubleshooting sections, as well as complete operational descriptions. The manual is well written with plenty of line drawings and photographs.

I have printed over four million characters with my 460 so far. I am on the second ribbon (even though the first one wasn't too light when I replaced it—IDS suggests about 5 million characters per ribbon). The ribbon costs about $13 and is not too messy to replace. It works well, producing even inking across the page. The 460 has performed faultlessly, save one problem.

My IDS 460 will do just about anything. Mine tried to self-destruct when I sent it the right (wrong?) code sequence. Luckily, the only damage was a blown fuse in the

"I BOUGHT IT"

"My biggest loss of programming time using Snappware's EXTENDED BUILT IN FUNCTIONS is spent inserting my diskette."

SCOTT ADAMS - PRES. OF ADVENTURE INTL.

Snappware's EXTENDED BUILT IN FUNCTIONS is a collection of much needed additions to the TRSDOS* BASIC interpreter which greatly extends its convenience and utility. The following features become part of your BASIC language and provide the enhancements without requiring any additional memory. The most important component of EXTENDED BUILT IN FUNCTIONS is an in-memory sort routine, guaranteed to be the fastest general purpose in-memory sort on the market. Along with this you also receive other EXTENDED BUILT IN FUNCTIONS. Here is a sampling:

SRT—Sorts one or more arrays into a specified sequence
FMT—Arranges data into a string variable as with PRINT USING
PDAT/UDAT$—Permits user to do arithmetic on dates.
PK$/UPK$—Compresses strings to save disk space.
ETIM$—Shows the difference between two times.
CLEAR—Specifies the number of file blocks to be allocated when you specify high memory and string space.
DELETE—Allows you to dynamically remove portions of a BASIC program.

In addition to these, there are functions unique to Model II and to Model III. The exclusives to Model II are long error messages and PEEK/POKE. The exclusives to Model III are:

SWAP—Supports exchange of variables with a single statement.
HEX$—Converts numbers to hexadecimal strings.
RESTORE—Allows you to set READ pointer to location of choice.

If you consider your programming time to be worth money, call us and let us show you how to get more of it.

MODEL II **$100.00**
MODEL III ..... **$ 75.00**

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The following was produced on an Integral Data Systems 460G dot-matrix printer.

This is an example of fixed pitch at 12 cpi abcdefghijklmnopqrstuvwxyz.
This is an example of proportionally spaced 10 cpi type abcdefghijklmnopqrstuvwxyz.

Below are samples of all six type sizes :

ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz123456789*?)(/!#$%&'=-@+;)(
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz123456789*?)(/!#$%&'=-@+;)(
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz123456789*?)(/!#$%&'
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz123456789*?)
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqr
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghi

This is an example of margin control and right justification with 10 char/in proportional spacing. The printer keeps track of all margins, and spaces characters to provide even left and right borders as programed on the printer.

This is an example of margin control and right justification with fixed pitch type. Compare this block of text with the block of proportionally spaced type at the left. Which looks more legible to you? The IDS 460 can print either style.

Figure 1

motor power supply. I called Integral Data Systems and gave them the code sequence that caused my printer to go nuts.

A few days later they called to tell me what caused the self-destruct mode. The problem occurs when an escape code (decimal 27) is sent, putting the printer in the programming mode and then a decimal 3 is sent. This is not a legal sequence and should not occur in practical use. It causes the printer to try to do everything at once.

I have had no other problems with my printer. Its capabilities optimize the operation of several word processors and operating systems. Its form feed, line feed, and forward/reverse feed are conveniently located and logical in operation. One control is useful but not so conveniently located: the print head-to-platen spacing adjustment. This adjustment finely optimizes the printhead spacing for different thicknesses of paper, or multiple part forms. You have to remove the cover to reach it. It is only necessary when a considerable change in form thickness is made. I use it often. Others may never need this feature.

The 460 printing rate varies depending on character size. At 10 cpi, proportionally spaced, it outputs about 150 characters per second. Since it prints in both directions, the throughput is very nearly this great. In enhanced modes it outputs about 80 cps.

The graphics mode provides complete individual dot control. In this mode it prints unidirectionally to assure better line to line synchronization and is slower. There have been a number of screen dump routines published. At least one company has a graphic driver available for high resolution (84 by 84 dots per inch) plots.

The IDS 460 is not the least expensive matrix printer on the market, but it has about every feature anyone would want and prints the finest looking font of any matrix printer I have seen for under $1,500. A wide platen version is available (IDS 560) for 15-inch paper capability ($1,395 suggested retail price). If I had it to do all over again, I would still buy an IDS Paper Tiger.■

Anderson-Jacobson Selectronic 841
Anderson-Jacobson
521 Charcot Ave
San Jose, CA 95131
$1,095

by Robert A. Batty

It is difficult to believe after reading ads for the IBM, Wang and DEC word processors costing $5,000 to $8,000 that the TRS-80 owner can invest less than $2,500 in a word processor and get a stand-alone computer that will do things the commercial processors will not. Granted, the TRS-80 system is not as efficient as those costing double or more, but the output can be identical.

As a freelance writer I need a printer that produces high-quality output. Because dot-matrix printer manuscripts are not acceptable to many editors, the printer for word processing should be a daisy wheel or type-ball model. I chose an Anderson-Jacobson 841 with parallel interface for the following reasons: It is less expensive than the daisy-wheel printer; it is a reconditioned IBM Selectric, noted for superior print quality; it is intended for computer input/output or word-processing applications, and therefore is more rugged in construction than secretarial models; it is compatible with the TRS-80, and although Radio Shack does not support or recommend it, it works well with the cables available from the A J Distributors and Radio Shack; its stand-alone diagnostic will isolate problems to it or the computer; and service on the printer is usually available locally.

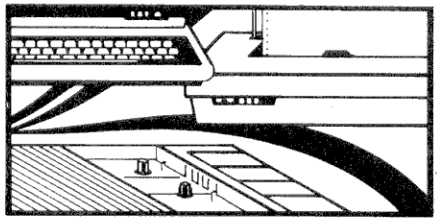
The remainder of the word-processing system consists of cables, the lowercase option, and Scripsit.

This inexpensive word processor has some deficiencies. There is little memory available for text after you enter Scripsit. All that remains for text in a 16K system is 4,100 characters, less than three double-spaced pages. You can overcome this shortcoming by frequently saving the edited material on the cassette tape. If you monitor how much memory remains you will know how much text to process for two pages of manuscript.

"As a freelance writer I need a printer that produces high-quality output."

The lesser consequence to writers is the slow printer speed and the TRS-80/Selectric line-feed problem. The latter involves single spacing the paper when the program requests a double space. Setting the line space lever on the printer to "double" solves this defect as manuscripts are double-spaced anyway.

The program does not automatically underline. To underline disconnect the printer from the computer (a switch on the



printer) and manually key the underline.

The A/J printer, in offline mode, functions as a secretarial model with a variety of print fonts available by changing the type ball. Many word processors do not have this stand-alone capability; the printer cannot be separated from the system and usually has no keyboard of its own. Any printing must take place through the processor.

You can add more memory to the system making the frequent tape saves unnecessary. You can also add disk memory. ■

"I BOUGHT IT"

"My biggest loss of programming time using Snappware's AUTOMAP and AUTOFILE is spent inserting my diskette."

SCOTT ADAMS - PRES. OF ADVENTURE INTL.

When working with direct files or creating a formatted screen, Autofile and Automap are indispensible aids.

Autofile is designed to automate for the BASIC programmer the task of moving data elements to and from a direct file. Previously, this was a time consuming chore because the FIELDed variables may not be directly referenced by user logic. The FIELD statement was eliminated, thereby relieving you of the guessing game as to where the FIELDed variable is. In addition, the LSET and the CVx functions are performed automatically. The software, when installed, becomes part of your BASIC interpreter providing the enhancements without additional memory.

Automap is designed to automate for the BASIC programmer the task of presenting information on the video display and accepting information from the keyboard operator. The software consists of two main components: the OFF-LINE COMPONENT used to describe to the system the screen formats and the ON-LINE COMPONENT from within your BASIC program to initialize a screen, send data to the video display and receive data from the keyboard operator. This facility when installed, becomes part of your BASIC interpreter.

Both products complement one another and, if used in conjunction, can save a significant amount of programming time.

If you consider your programming time to be worth money, call us and let us show you how to get more of it.

Automap	MODEL II	$100.00
	MODEL III	$ 75.00
Autofile	MODEL II	$ 75.00
	MODEL III	$ 60.00

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MDX-2 PC Board & User Manual
Micro-Design
P.O. Box 748
Manchaca, TX 78652
$74.95

Complete Kit of Parts
Computex
321 El Dorado
Webster, TX 77598
$269

by Ronald Cangro

If a direct-connect modem, 4K EPROM, serial port plus all the features of the Radio Shack Expansion Interface sound interesting consider the Micro-Design alternative.

The interface is available either as a kit or assembled. The kit is not intended for inexperienced assemblers. Knowledge about electrical components and their markings are needed as well as experience in soldering techniques. You can purchase only the PC board and manual from Micro-Design and individually buy the parts. Or buy the parts in module form from Computex and build only particular features.

The PC board can be built at your own pace with a minimum of duplication in components. The different modules available are listed in Table 1.

The interface is completely software compatible with the Radio Shack interface. The added features are not available on any other expansion board currently on the market. However, the advertising is a little misleading on several features. The RS-232 port must be used for modem operation and is unavailable for another use. If you wanted to use the modem and serial interface at the same time, you are out of luck. The dual cassette port is nothing more than an output telling when the cassette drive has been accessed. Additional external circuitry is required for proper operation. Finally, the direct-connect modem requires an off-board coupling transformer and switch to function properly.

The kit goes together fairly well. There are a few minor errors in the instructions and schematic. The errors are nothing a little common sense would not fix. Some of the shipped components have different lead spacings than what the printed circuit board is laid out for. It was difficult to find placement of some components. The printed circuit board is made of a high-quality, double-sided plated through material with a component legend and solder mask. There does not seem to be any rhyme or reason to the component labels silk screened on the board. R1 might be found on one side of the board next to R53. With a little searching all components can be found.

One major deficiency of the printed circuit board is the edge connect fingers are not gold plated. Only time will tell if it will cause a reliability problem in these connections. The edge connectors on the Radio Shack interface are not gold plated either.

Two resistor packs are required in the board layout. Neither is provided in the Computex kit. Instead, instructions for building your own are given. No headers are supplied to facilitate the task.

Another inconvenience, is the lack of Radio Shack power packs by Computex. A transformer assembly of the power cord, external diodes and wiring has to be constructed.

"The kit goes together fairly well."

The printed circuit board layout is well designed incorporating several features to make the kit nicer to build and use. The use of DIP switches for programming baud rates is nice. The inclusion of the originate/answer switch on board, along with a DB25 connector is convenient.

To fit the modem on board components have to be stood on end making assembly awkward. There is not enough room on board for the coupling transformer either. It would be nice if the on-board power regulators could provide enough power for at least one disk drive. The whole power supply could have possibly been designed to power the main computer assembly (keyboard) as well as the expansion interface eliminating the need for the extra power pack on the main unit. Perhaps the next generation board will include a double-density floppy-disk controller and 1,200-baud modem capability with auto answer and dial. Even without these features the MDX-2 is impressive.

The manual is severely deficient if the board does not work the first time. A 24-hour hotline is available for technical questions. At this writing an answering machine took messages. Technical assistance was only available after 5 p.m. Texas time. They were helpful when I called.

The line printer, modem and memory all function flawlessly. Your printer has to have an auto line feed on receipt of a carriage return to function properly. This has nothing to do with the expansion interface, but is a result of the Radio Shack software.

The floppy-disk controller has a tendency for read and parity errors on the inner tracks. The circuitry is critical to disk alignment. A better data separator circuit should have been included.

The Micro-Design expansion interface alternative is well worth the money. But, be prepared to spend some time building and troubleshooting the board. ■

PS1 (Power Supply) Provides all power for completed expansion board. Plus or minus 12 volts and plus or minus five volts. The transformer is not board mounted and must be supplied externally.

MEP1 (Memory Expansion) Includes all circuitry to expand system memory to 32K of RAM.

EPM1 (EPROM Expansion) Includes all circuitry to overlay the upper 2 or 4 K words of memory with a 2716 or 2732.

CASS1 (Dual Cassette) Provides all decoding for using two cassettes on your TRS-80. The relay is not board mounted and must be supplied externally.

DCM1 (Direct Connect Modem) Includes circuitry to operate a 300-baud originate or answer modem. The coupling transformer is not provided on board and must be supplied external to the PCB.

LPB1 (Centronics Parallel Line Printer Bus) Circuitry to allow any Centronics parallel type printer to be used at the same address as in the Radio Shack Expansion Interface.

RS-232 (RS-232/20 MA Serial Interface) MDX-2 PCB supports both RS-232 and current loop devices without external boards or parts.

RTC1 (Real-Time Clock) Includes circuitry to use Radio Shack equivalent interrupt-driven clock.

FDC1 (Floppy Disk Controller Kit) MDX-2 allows standard five-inch disk drives, single density, to be interfaced to your TRS-80.

Table 1.

Micromouth
Micromint Inc.
917 Midway
Woodmere, NY 11598
$150 Kit, $175 assembled (Model I)
$200 assembled (Model III)

by Dennis Bathory Kitsz

I M the T R S 80 . . . I M under 1 thousand dollars-ss and I have over 1 hundred 40 2 ss-A . . . I ss-A: "Danger! Danger! Check flow control! It is lesser than the limit. The speed is 2 percent less. Stop it. Try 2 stop it." Ss-o, U R in time 2 have it." This is Digitalker.

Micromouth is certainly a treat to hear. One of the most convincing speech attachments for the home computer, its original speech was done by a human, then digitized. The digitized voice was placed into read-only memory and made part of the Digitalker product set manufactured by National Semiconductor. The first complete TRS-80 (or Apple) attachment using the National electronics is Micromouth.

Micromouth comes in a plastic box with cable and power supply and attaches easily to the TRS-80; an amplifier is built in, but a small speaker is needed to plug into it. Then it's ready to go. Typing OUT 127,0 calls the sign-on phrase (the only one in a female voice), "This is Digitalker." A vocabulary of 143 elements is provided with the unit (31 numbers and number parts, 26 letters, 79 words, five silences and two tones—see Fig. 1); other vocabularies are being developed by National Semiconductor. From the basic word set, many others can be easily constructed. "Endangers" is made with N + dangers + ss, "delimit" is D + limit; even such a word as "extenuate" (X + 10 + U + 8) can be forced. Over 200 words can be created this way, plus all possible number combinations from 0 to 999,999,999. Most words needed for Basic are there (an unfortunate exception is Print), as are many simple words used in bookkeeping or clerical work.

Without the immediate availability of exchangeable vocabularies, though, Micromouth is limited to simple stimulus-response tasks ("2 high, please try again"), use with games ("50 second + ss left. Speed up! Danger!), or just as an all-purpose, amaze-your-friends toy. Upon seeing my Micromouth, programmer and author Jack Decker immediately used it to read the computer's real-time clock in Basic; it was maddening. Nevertheless, a machine-language program can trigger the Micromouth to read the time with virtually no loss of program time.

See List of Advertisers on page 338

"I BOUGHT IT"

"My biggest loss of programming time using Snappware's COLLEGE EDUCATED GARBAGE COLLECTOR is spent inserting my diskette."

SCOTT ADAMS - PRES. OF ADVENTURE INTL.

The Snappware College Educated Garbage Collector (SNAPP-VI) is an intelligent processing function which greatly improves performance of typical BASIC applications. And here's why.

Microsoft uses a 'variable length string' in the BASIC interpreter. Each time the string is assigned a new value, it is relocated in a string pool. Periodically the string pool must be reorganized and condensed into a single contiguous area. Performing this string space reclamation is time consuming and inefficient because this approach evaluates and collects each string individually. The time required is roughly proportional to the square of the number of active strings in the resident program. During reclamation the system seems to 'lock-up' and does not respond to the operator until the process is completed.

This time consuming approach requires a better solution. Snappware has developed a solution which takes advantage of the auxiliary memory available. SNAPP-VI requires only four bytes per active string as a work area. When free storage space is available, our system temporarily borrows, uses and returns the space to the free storage pool when completed. If storage is not available, our system will temporarily transfer out to disk enough of the BASIC program to make room for our work area and return the 'paged out' information to its correct location when completed.

Benchmarked times show, in some situations, SNAPP-VI performs one hundred times as fast as the Microsoft approach.

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Thirty to ninety (in tens)

Hundred, thousand, million

Letters A to Z (forming words a, be, bee, see, gee, eye, jay, el, am, em, an, en, oh, pea, queue, are, tea, you, ewe, why; prefixes be-, de-, em-, en-, ex-; suffixes -sy, -dy, -y, from E, -gy, -en, -py, -ty,- zy)

again, ampere, and, at

cancel, case, cent, centi-, check, comma, control

danger, degree, dollar, down

equal, error

feet, flow, fuel

gallon, go, gram, great (grate), greater

have (half), high (hi), higher, hour (our)

in, inches, is, it

kilo-

left, less, lesser, limit, low, lower

mark, meter, mile, milli-, minus, minute

near, number

of, off, on, out, over

parenthesis, percent, please, plus, point, pound, pulses

rate, re, ready, right (rite)

-ss-, second, set, space, speed, star, start, stop

than (then), the, time, try

up

volt

weight (wait)

Fig. 1. The Micromouth vocabulary. Words in parentheses can be created from or are variants of the words in Micromouth. All words can be pluralized and some can be created with the -ss- sound.

Micromouth is, in fact, very efficient. It has a self-contained, crystal-timed clock and all latching circuitry necessary for operation. In other words, a quick command produces the entire preprogrammed phrase; a running program can continue as Micromouth speaks. There are no software drivers or other programming baggage beyond commands for the words the user needs. Here's how it works: OUT 127,N triggers a phrase. When INP(127) equals 254, the word is still in progress; when it reads 255, the word is complete. An interrupt-driven program might check port 127 on each sweep through the interrupt service routine (say, part of the real-time clock or keyboard scan), sending the next phrase when it finds Micromouth open—er, ready.

The device is provided with good documentation and full schematics. Detailed information was published in *Byte*, since Micromouth was designed by columnist Steve Ciarcia. The vocabulary ROMs (two 64-kilobit chips) are socketed, so new vocabularies may be inserted at any time.

There is one very amusing feature of Micromouth. Because of the electronic arrangement, any data greater than 143 sent to port 127 produces garbage. Normally, garbage isn't very useful, but spoken garbage is hysterical gibberish. A real treat is OUT 127,171—the sound of my mind after living with Micromouth for six months (sort of a waah-BLEAAAhh!-woo-wow-woingggg). Nothing like it to tell folks they just entered some pretty dumb input (pun intended). Also, Micromouth can be made to stumble and stutter by interrupting the word being spoken at random intervals with the same or another. It starts over until allowed to finish.

In summary, Micromouth is an excellent example of the progress of speech synthesis, excellent for specialized applications, and very easy to use. For prompting, experimenting and game programming it is very attractive. ■

Pocket Computer Printer/Cassette Interface
Tandy/Radio Shack
Fort Worth, TX
$149.95

by Howard Berenbon

The Printer/Cassette Interface is an amazing little printer. It has a 5 by 7 dot-matrix impact printer head that prints 16 columns per line. It uses an inexpensive ($2.75) replacement ribbon and tiny rolls of paper, 1.78 inches wide (six rolls for $1.75). The printer, with cassette interface, easily fits into a small briefcase.

Other accessories included with the Printer/Cassette Interface is an ac adapter which is also used to recharge the Ni-Cad battery. When the battery gets low, a low-battery indicator blinks. It takes about 15 hours to charge. One charge prints approximately 8,000 lines. The Printer/Cassette interface weighs only .9 lbs, and comes with three paper rolls, a ribbon cartridge, a cassette connection cable, a charger adapter and instructions.

Operation

Connect your Pocket Computer by removing the connector cover from its side. Make sure both the computer and printer are off. Carefully slide the computer onto the printer/interface until the printer pins are inserted into the computer's connector. Install a roll of paper by turning the printer power switch on and feeding the paper through the mechanism using the paper advance button.

To print, turn on the printer power and print switches. Then press the computer's on key twice. This sends the computer's output (Print and List) to the printer instead of the display. By entering List the program currently in memory is listed on the printer. If you run a program, it prints the output.

To return the computer to the display mode, turn the print switch on the printer to off and press the computer's on key twice.

When using the cassette interface, the Remote switch on the printer controls the cassette recorder. When the Remote switch is on, starting and stopping of the recorder is controlled by the computer. When the Remote switch is off, the computer will not control this function. The power and cassette cables are connected at the right rear of the Printer/Cassette Interface.

Saving (using CSAVE) and loading (using CLOAD) programs with the Pocket Computer is a little slow, but it works well enough if you use the cassette recorder specified (Realistic Minisette 9), or another of similar quality. Loading can be a problem if you do not have your recorder's volume control up high enough. This level setting depends on the cassette recorder used. I use a Realistic Minisette 10-AM/FM Cassette Recorder with the volume set at 7, and it works well.

The TRS-80 Printer/Cassette Interface is necessary to complete any pocket computer system. It prints clearly and seems to be well made. ■

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Call our toll free number **800-543-4628** to put us on trial. We're sure your verdict will be: Snappware saves you time and money.

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Quic-N-Easi is the revolutionary screen-format-oriented application development system that thinks in terms of transactions, records and fields. The same way business thinks. **Quic-N-Easi** expects an application to include custom formatted key entry. It lets you set up the character, field, and record validity checks business wants by merely filling in the blanks. It automatically signals in real time when errors occur and "explains" what is wrong in plain English messages you select for each custom application.

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Minimum System Requirements
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Disk Formats
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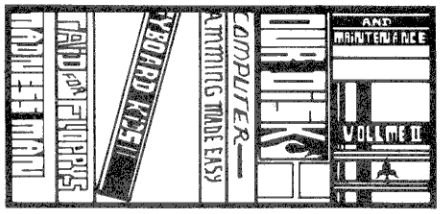
✓279

Computer Programming in Basic
A Self Instruction Course in 4 Volumes
Ian Williamson, Rodney Dale & Tim Elloart
Cambridge Learning Enterprises
Cambridge, MA
Softcover

by Kenneth Delp
and Bruce Eldredge

This series of four magazine-sized books from England is a great place to begin Basic programming.

This course of 60 lessons is designed for the complete rookie. Each booklet contains 15 to 20 lessons arranged sequentially from introductory math functions



through subroutines and For...Next loops. At least one lesson in each booklet is devoted to a broader concept such as computer problem solving, high and low-level languages, and compilers and interpreters.

The first book deals with getting the machine rolling with Read, Data and Print statements. It also introduces the Let statement early in the sequence. The second book places important stress on documentation. Important initial concepts such as flowcharting and REM statements are covered. The third volume moves into loops, arrays and random generation. The fourth, titled *Advanced Basic,* covers subroutines, files and strings among other topics.

"These books are a pleasant surprise."

The booklets are liberally spiced with examples and immediate answers along with complete explanations. The clarity of these explanations was impressive.

This set of books could easily be used as a text in an introduction to computer class. Since the books can be used without a computer at hand, they are ideal for classroom work where computers may not always be available. Because the books are not geared to a specific system, they are a suitable introduction to Basic without regard to the quirks of various hardware.

Each book contains the same summary of Basic with statements and commands listed along with math functions and operators. These are referenced with the lessons which deal with those topics. The table of contents and lesson abstracts are complete and useful.

One of the more subtle yet helpful aspects of the series is the format. The lessons are broken into small concepts with clear examples and complete explanations. The authors include extra examples on particularly difficult concepts.

Another useful format characteristic was that the information is divided into four separate booklets. The publishers achieved two goals with this format. First, there is a sense of accomplishment when each book is finished. For the advanced programmer this is unimportant, perhaps even awkward, but for the beginner the task of learning Basic seems much less formidable if he senses accomplishment. Second, the books easily stay open and flat on the table next to a computer. Spines don't have to be broken to get the book to stay in its place.

Most books dealing with beginner's Basic do not show how to test a program for correct output. Yet this one features lessons on debugging and error statements and where and how to start correcting the bugs.

A couple notes must be made concerning the language of the books. It is British. "Behavior" is spelled "behaviour;" "airplane" is "aeroplane." You can even play naughts and crosses (tic-tac-toe). This is no problem, but we noticed it. More importantly, the language is very straightforward. The authors have accurately anticipated the beginner's questions and answered them honestly.

We found only two minor problems. Some lessons in the first booklets deal with math concepts that may cause some people trouble. The lessons on scientific notation and trigonometric functions in book 2 require some math background and could be confusing. The strength of these books lies in their appeal to the beginner, although these advanced math concepts seem inappropriate.

Since the books are written for a worldwide audience, metric units are used. This may be a problem for those unfamiliar with metric conversions. The authors carefully avoid using the British monetary system.

These books are a pleasant surprise. They do not look impressive since they are not typeset or overly illustrated. However, they are durable and practically bound.

After reading the books independently we both remarked that the more we read and used them, the more impressed we became with their completeness, clarity, organization and emphasis. For a beginner they provide instruction in Basic and a useful future reference. ■

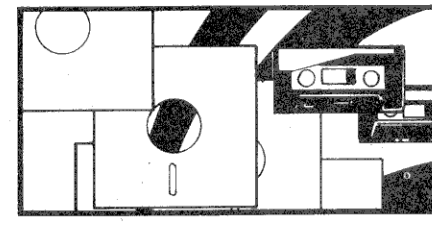
Tanktics
Avalon Hill
4517 Harford Rd.
Baltimore, MD 21214
Models I & III, 16K or 32K
$24 cassette
$29 disk

by David G. Bartlett

Avalon Hill's historical simulation board games require hours or even days studying battle manuals, maps and working out intricate strategies. Avalon Hill's new game, Tanktics, is better than any previous simulation game. It does not take days to play but does use a mapboard, markers and a battle manual.

The board has 768 numbered hexagons superimposed over a countryside map. The object is to defeat the computer's tanks. There are five different scenarios and several different combinations of tanks and antitank guns to choose from. Although you have up to eight tanks, the computer gets twice as many.

The computer plans its moves, referees your moves, determines results of combat and tells you when your tanks have sighted the enemy. You never know when the enemy will appear or where they went after an attack. The cassette version loads in two parts. It can be run from disk with a utility such as Twodisk from the



Alternate Source.

Avalon Hill has suceeded in keeping the best part of their board games and letting the computer do the tedious parts for you. ■

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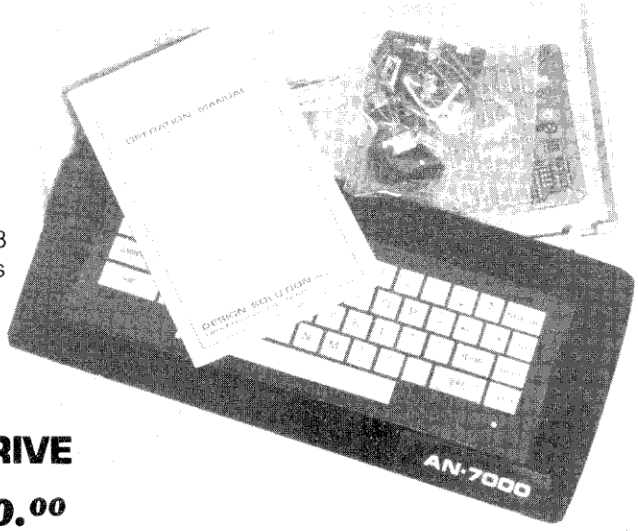
DSI AN-7000 COMPUTER

True TRS-80™ work-a-like capability is now available in kit form from DSI. The AN-7000 provides a full 16K of dynamic ram, with a complete modulated video interface system for use with standard televisions, Z-80B Micro-processor, cassette interface, membrane keyboard, finished case and power supply module, as well as every component needed for ROM-less assembly. Save hundreds of dollars by assembling the AN-7000 processor yourself with only common hand tools. Step by step instructions with clear cut pictorials and schematics create a very straight-forward work environment as you assemble your own system from scratch. Totally flexible, the AN-7000 will interface with all Model I Level II hardware accessories including the DSI AN-760 FDC and AN-1000 Megadrives. The AN-7000 system represents the most significant break-through in user assembled computer equipment available. The AN-7000 kit comes complete with all parts necessary for a full 16K, Z-80 based CPU, less the 12K basic interpreter ROMS.

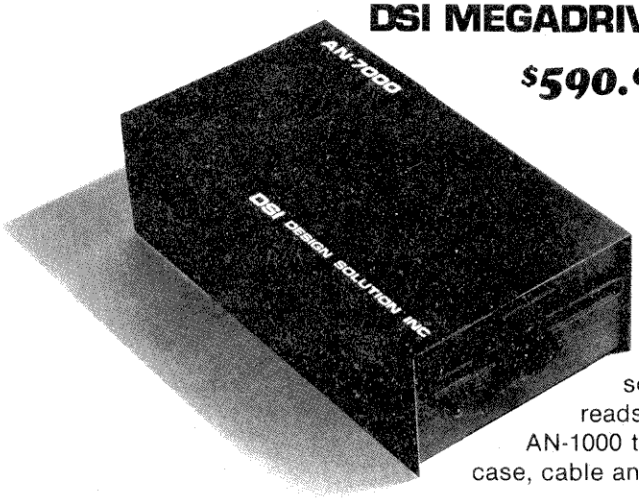
New DOS 80™ ver 2.0 is available at special package purchase rates for the AN-760 and AN-1000. Contact tact DSI for complete DOS pricing.

A Registered Microsoft™ TRS-80 Level II work-a-like 3 chip set with manual and complete documentation is available for the AN-7000. The Microsoft-DSI basic package lists at $89.95.



DSI MEGADRIVE

$590.00



This single or double density 80 track dual sides 5¼" floppy disk drive is a must for all serious TRS-80 and DSI systems users. With almost 1 million bytes of unformated data storage capacity in the MFM double density mode the AN-1000 provides the utmost in stability of performance at a very reasonable price. Track to track access time 3 ms, soft error rate $1\text{-}10^9$ reads, hard errors $1\text{-}10^{12}$ reads, and media life 4×10^6, clearly represent the AN-1000 technology. Complete with power supply, case, cable and operation manual.

All connections made to AN-SERIES products from your breadboard are simply pushed through the front panel. Custom connectors on the P.C.B. provide super reliable connection for thousands of operations. All AN-SERIES products are warranted for a full 90-DAYS under DSI's limited warranty policy. Complete documentation is provided for each model in an attractive folder, including theory of operation, and special interest projects and applications. All units are supplied with external power supply modules that connect through a mini-jack on the front panel.

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HARDWARE BREAKTHROUGH

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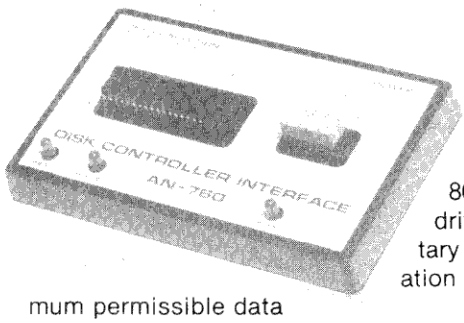
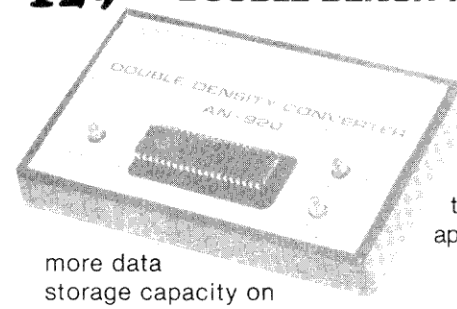
$99.95 DISK CONTROLLER



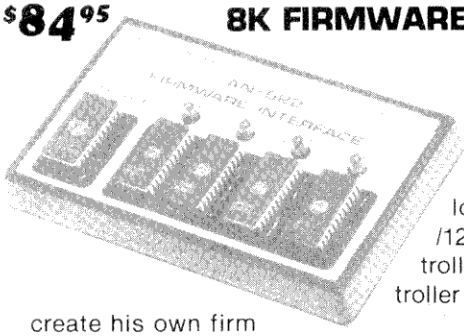
An affordable multidrive floppy disk interface. The AN-760 supports 35, 40, 80 and 160 track drives. Using proprietary Digital Data Separation Techniques, maximum permissible data transfer integrity is assured. Read, write, and step LED indicators prompt operator during all disk I/O. The AN-760 comes complete with power supply module and operation manual. (Operating system software optional.)

$129.95 DOUBLE DENSITY CONVERTER



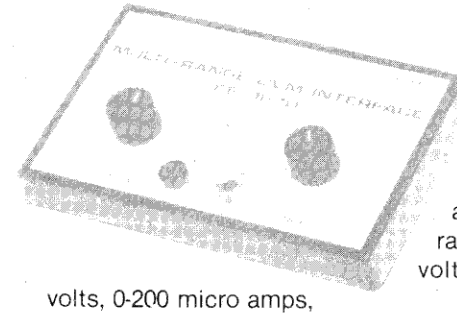
Using DSI Proprietary Data Separation and Write Precompensation Techniques, the AN-920 provides approximately 1.6 times more data storage capacity on your 5¼ disk drives. The AN-920 can be used in conjunction with the AN-760 FDC or the TRS-80 expansion interface. Double Density System comes complete with power supply module and operation manual. (Required Newdos-80 Ver 2.0 Disk Operation System Optional.)

$84.95 8K FIRMWARE INTERFACE



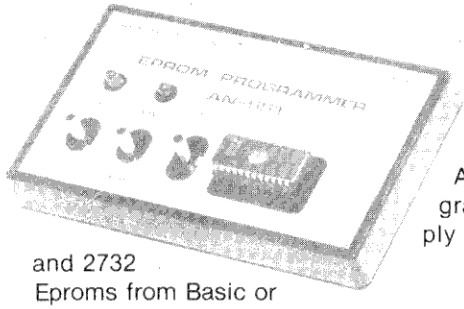
8K Bytes of User Programable Firmware (4-2716 Eproms) are automatically loaded by system /12345 Command controlled by a 2716 controller chip. The user can create his own firm operating system to load and execute programs from Eprom or to provide user defined arithmetic functions. Comes complete with power supply, operation manual and controller chip. (The AN-522 requires AN-551 Eprom programmer.)

$99.95 MULTI-RANGE DVM INTERFACE



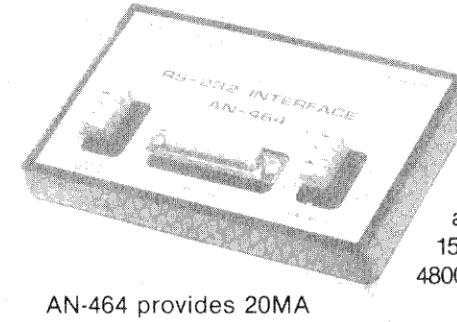
Analog Signal Interface is now as easy as turning a knob. EE-1670 provides DVM functions volts, and milli-amps and 8 ranges, 1-200 millivolts, 0-2, 0-20, 0-200 volts, 0-200 micro amps, 0-2, 0-20, 0-200 milliamps, standard banana jacks and test leads create perfect connection scheme for real time analog data acquisition. EE-1670 system is complete with power supply and manual of operation.

$99.95 EPROM PROGRAMMER



An enhanced version of our original Eprom Programmer, the AN-551 will now program the single supply 2516, 2716, 2532 and 2732 Eproms from Basic or machine language. Software provided will load Eprom from TRS-80 Ram or load TRS-80 Ram from Eprom with complete on-screen verification. The AN-551 comes complete with power supply and operation manual.

$89.95 RS-232 INTERFACE



Can be configured to communicate with data communications equipment or data terminal equipment at 110, 150, 300, 600, 1200, 2400, 4800 and 9600 Baud. The AN-464 provides 20MA loop output and RS-232C through a DB-25P connector. Software selectable odd/even parity, 5-8 bit word lengths and stop bit formats are standard along with power supply module, software driver, and operation manual.

All connections made to AN-SERIES products from your breadboard are simply pushed through the front panel. Custom connectors on the P.C.B. provide super reliable connection for thousands of operations. All AN-SERIES products are warranted for a full 90-DAYS under DSI's limited warranty policy. Complete documentation is provided for each model in an attractive folder, including theory of operation, and special interest projects and applications. All units are supplied with external power supply modules that connect through a mini-jack on the front panel.

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EDUCATION 80

by Earl R. Savage

"The 'meat and potatoes' of the Cheaptalk package is a multi-purpose program permitting you to record. . ."

Warning—

There are left and right-hand edge card connectors. If you or one of your students need to repair or build a ribbon cable connector, be aware that you *can* damage your computer, accessory, or both if you don't take note of the above.

We occasionally use a Y connector (a ribbon that permits connecting two or more accessories to one socket). Somehow a contact in one of them became damaged and needed to be replaced.

I picked up an edge card connector at a local parts store. Since none of us had previously repaired a ribbon cable, we almost mated a left-hand connector with a right-hand connector. The mixture would have *reversed* the wires of each pair in the cable.

The problem is that some connectors attach the outside pin to the top of the card and some attach the outside pin to the bottom of the card (see Fig. 1). Unfortunately, there is no way you can twist the connector or the cable to turn one type into the other if there are an even number of pins.

You know as well as I that school equipment gets changed more frequently than it does in the typical home. Even with the greatest care, one of those sliding connectors is going to get damaged sooner or later. When it happens to you, be sure that you watch for the left- and right-hand connectors when making repairs.

You know. . . that school equipment gets changed more than home equipment."

Computer Talk

Sure, sound effects and music are possible with your computer. But how can you make it talk without spending the big bucks the administration can't seem to provide? The answer may be easier than you think.

Alan Saville's program, Cheaptalk, (P.O. Box 5190, San Diego, CA 92105) gives you speech synthesis for about $20. Of course you will need some type of amplifier or speaker connected to the cassette output jack.

You cannot get high fidelity speech from Saville's program, but it is intelligible. Imagine the excitement of an elementary student when the computer actually talks!

The Cheaptalk package comes with plenty to chew on. A System program loads the memory with the names of the digits (zero through nine) and the words alpha, bravo, charlie, delta, echo, and fox. The second program, in Basic, calls on the previous memory dump to give an audio readout of the hex contents of any selected portion of your computer's memory. Further, the program displays the memory contents so you can check the audio readout.

The "meat and potatoes" of the Cheaptalk package is a multi-purpose program permitting you to record your own words, play them back and rerecord until you are satisfied. You can then save them for later use in the program of your choice.

Recording on the Model III requires only a microphone and a small audio amplifier connected to the printer port. Clear instructions are provided. There is a choice of two methods of recording on the Model I. The first method requires a three-IC accessory on the expansion port. The second method requires a couple of minor wiring changes inside the keyboard unit.

Note that no changes are necessary to *run* talking programs on either a Model I or a Model III. In addition, the Radio Shack RS 227-1008 amplifier/speaker can be used for both recording and running programs.

All things considered, Cheaptalk can be an interesting educational aid. Why not *tell* your students "good" and "very good" and "try harder" instead of simply printing it on the video screen.

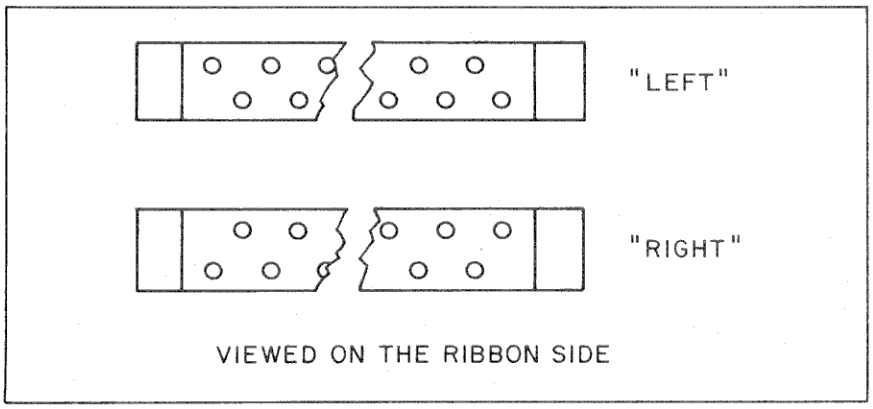

Fig. 1. Two types of edge card connectors.

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A Light Pen?

I hate to admit it but I thought a light pen was just a toy to attach to a computer—an interesting plaything, nothing more. Having now used a light pen, I have completely reversed my thinking about their educational applications.

We selected a light pen from the 3G Company (Rt. 3, Box 28A, Gaston, OR 97119) because it was completely self-contained. It came with a demonstration tape and instruction manual. The pen simply plugged into the cassette jack.

A light pen is a pencil-like device attached to the end of a small cable. Just point it at the screen and a properly-programmed computer can tell where you are pointing.

When the pen arrived, I was prepared to endure a bit of playing until the novelty wore off. Instead, I discovered a valuable adjunct to the computer. Of course, the pen can be used in a wide variety of games but it has plenty of serious uses, too. Let me give you a few examples.

First, how do you get responses from a young child who does not know the alphabet or numbers—you guessed it: with a light pen. If you work with young children, you can see a multitude of learning applications for the pen.

"How do you get responses from a young child who does not know the alphabet. . ."

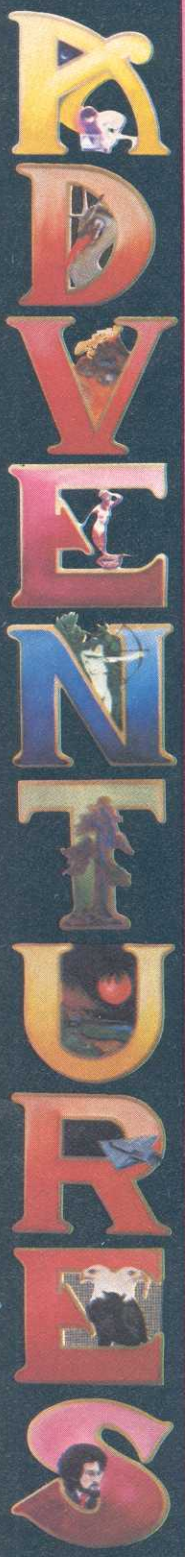
Another example of the pen's usefulness is with handicapped children. In addition to those students who lack the coordination to use the keyboard, many are intimidated when confronted with the complexity of the keyboard. With a light pen, the keyboard can be ignored.

The serious use of light pens is not limited to these two groups of children. The light pen has great potential for educational use.

Programming to utilize the light pen is not difficult. 3G's demonstration tape and manual provide all the information you need to create your own programs or to modify existing programs for this purpose.

Try a light pen. It will add another resource to your arsenal of teaching/learning tools■

The Scott Adams Adventure Series AN OVERVIEW



I stood at the bottom of a deep chasm. Cool air sliding down the sides of the crevasse hit waves of heat rising from a stream of bubbling lava and formed a mist over the sluggish flow. Through the swirling clouds I caught glimpses of two ledges high above me: one was bricked, the other appeared to lead to the throne room I had been seeking.

A blast of fresh air cleared the mist near my feet and like a single gravestone a broken sign appeared momentarily. A dull gleam of gold showed at the base of the sign before being swallowed up by the fog again. From the distance came the angry buzz of the killer bees. Could I avoid their lethal stings as I had managed to escape the wrath of the dragon? Reading the sign might give me a clue to the dangers of this pit.

I approached the sign slowly.

And so it goes, hour after hour, as you guide your microcomputer through the Adventures of Scott Adams in an effort to amass treasures within the worlds of his imagination.

By definition, an adventure is a dangerous or risky undertaking; a novel, exciting, or otherwise remarkable event or experience. On your personal computer, Adventure is that and more.

For the user, playing Adventure is a dangerous or risky undertaking in that you better be prepared to spend many addictive hours at the keyboard. If you like challenges, surprises, humor and being transported to other worlds, these are the games for you. If you dislike being forced to use your common sense and imagination, or you frustrate easily, try them anyway.

In beginning any Adventure, you will find yourself in a specific location: a forest, on board a small spaceship, outside a fun house, in the briefing room of a nuclear plant, in a desert, etc.

By using two-word commands you move from location to location, manipulate objects that you find in the different places, and perform actions as if you were really there. The object of a game is to amass treasure for points or accomplish some other goal. Successfully completing a game, however, is far easier to state than achieve. In many cases you will find a treasure but be unable to take it until you are carrying the right combination of objects you find in the various locations.

How do you know which objects you need? Trial and error, logic and imagination. Each time you try some action, you learn a little more about the game. Which brings us to the term "game" again. While called games, Adventures are actually puzzles because you have to discover which way the pieces (actions, manipulations, use of magic words, etc.) fit together in order to gather your treasures or accomplish the mission. Like a puzzle, there are a number of ways to fit the pieces together; players who have found and stored all the treasures (there are 13) of Adventure #1 may have done so in different ways.

In finding how the pieces fit, you will be forced to deal with unexpected events, apparent dead ends and Scott's humor, which is one of the best parts of the puzzles.

If you run into a barrier like not being able to discover more rooms, don't give up. Play the game with some friends; sometimes they'll think of things you haven't tried.

While I pondered how to reach the throne room — which I was sure contained the treasures of Croesus — the fog grew thicker and the hours passed. I realized I would not be able to outwit Adams today...but maybe tomorrow. I marked my present location on my tattered map and began the long trip to the surface. As I dragged myself off to bed, I thought about other possible Adventures.

But enough for tonight. Tomorrow — another crack at the chasm. —by Ken Mazur

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The 12 Scott Adams Adventures ✓19

Adventureland • Pirate Adventure • Mission Impossible • Voodoo Castle • The Count • Strange Odyssey • Mystery Fun House • Pyramid of Doom • Ghost Town • Savage Island-Part 1 • Savage Island-Part 2 • Golden Voyage

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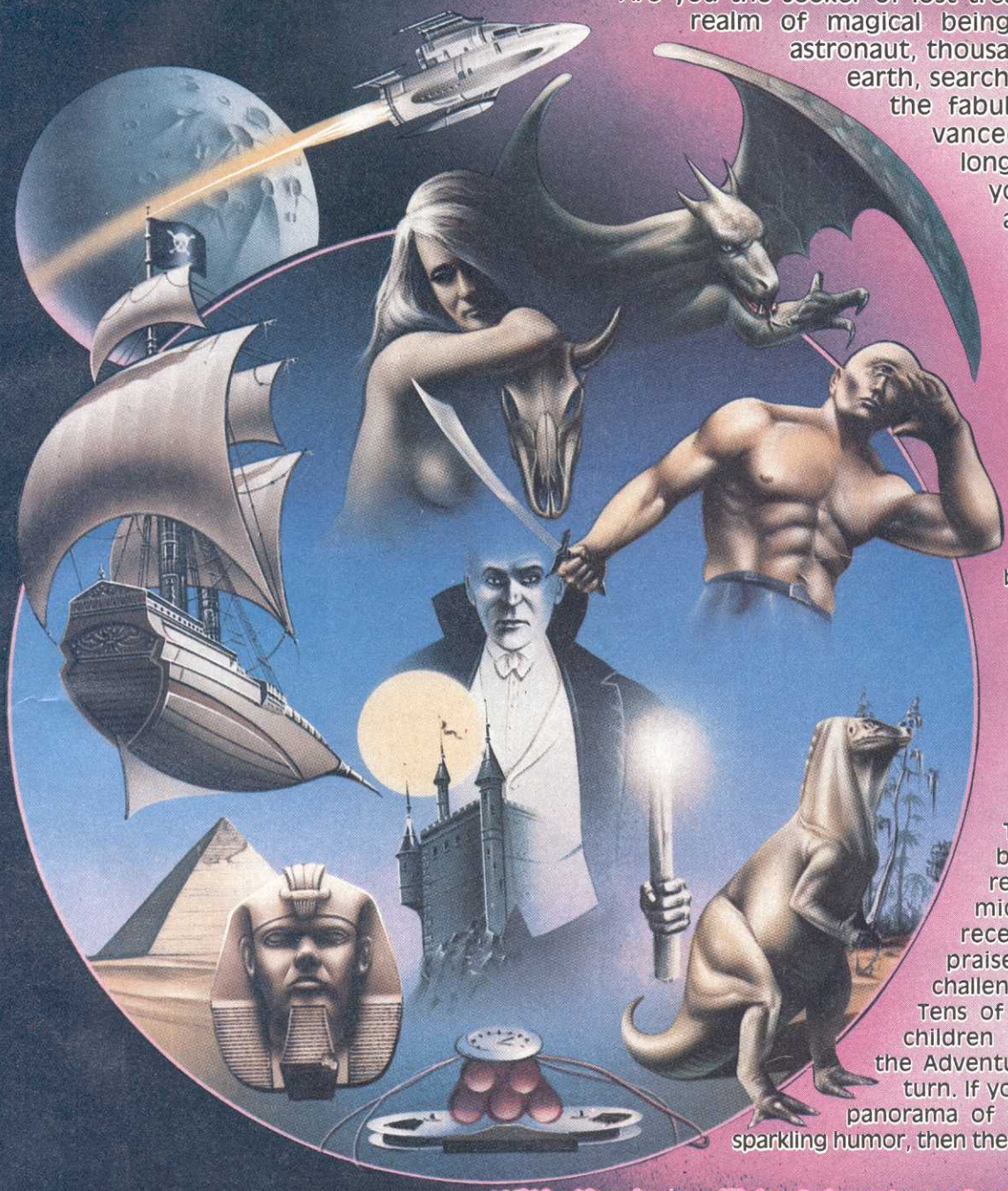

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Another winner from Radio Shack.

Line Printer VIII

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Radio Shack's newest printer is certain to become one of the standard accessories for TRS-80 computers. It not only has all the features of the old (now discontinued) Line Printer IV, (including condensed, elongated and proportional characters, subscripts, superscripts and underlining), but also includes bit graphics and sells for $100 less than the old LP IV.

Printing Modes

The Line Printer VIII operates in three printing modes: Data Processing, Word Processing, and Bit Graphics. The only real difference between the Data Processing and Word Processing modes is how the printer responds to a line-feed command.

In the Data Processing mode any command affecting line feeds, such as reverse line feeds and setting different line spacings, is stored in memory until the printer receives its next line-feed command. In the Word Processing mode line-feed information is acted on immediately, allowing the printing of superscripts, subscripts, equations and other items requiring half line feeds. Word Processing's additional capabilities slow printing speed slightly.

In the Bit Graphics mode, many control codes available in the other two modes are ignored. Alphanumeric character sets are not accessible from the Bit Graphics mode, but the printer can be switched in and out of this mode easily, so graphics and text can be mixed within the same line.

Character Sets

The LP VIII is an impact dot-matrix printer. It prints all 96 ASCII characters, 30 block graphics characters and 32 European and special characters. A 9 by 8 dot matrix (9 by 7 was used in the LP IV) is used to print the 10 character per inch (cpi) ordinary character set at 80 characters per line (cpl), the 5 cpi double-width elongated ordinary set at 40 cpl, the 16.7 cpi condensed set at 132 cpl, and the 8.3 cpi elongated condensed set at 66 cpl.

The proportional spaced character set prints with a 9 by n dot matrix, where the character width (n) varies from 9 to 23-dot columns. The dot density in the proportional set is the same as in the 16.7 cpi condensed set, 1,600 dots in an eight-inch line. (The proportional characters in the LP IV had a density of only 1,160 dots in the same space.) The length of a proportionally spaced line varies from 69 to 177 cpl. Block graphic characters are printed in a 6 by 12-dot format.

The proportional character set is not as good as an IBM Selectric typewriter, but is certainly adequate for most reports and correspondence. All numbers in the proportional mode are the same width (15-dot columns) and can be easily aligned vertically in tabular output. Samples of the various print modes are shown in Fig. 1.

Program Listing 1 is the program used to obtain the printouts in Fig. 1. Note the difference between the elongated and normal characters.

Hardware

The printer has a parallel interface that connects to the parallel printer port on the Model I (directly to the CPU or through the expansion interface), Model II and Model III. The printer is equipped with easily operated switches to select serial (7 or 8-bit) or parallel interface. It can be used with the Color Computer (or any other computer with an RS-232 port). The serial transmission rate can be set to either 600 or 1,200 baud. Although the Color Computer normally sends data to a printer at 600 baud, the output rate can be increased to 1,200 by executing a POKE 150,41.

The printer is housed in the traditional Tandy black and gold plastic case. It is small: 15.4 inches wide by 11 inches deep by 4.7 inches high and weighs only 16.5 pounds. It accepts standard 9 ½ by 11-inch fan-fold tractor-feed paper. The printer also has a friction-feed platen for using single sheets with up to two carbons. It is equipped for using roll paper as well.

Printing Speed

Normal printing speed with ordinary (10 cpi) characters is 80 characters per second (cps) and 55 lines per minute (lpm) with a 20-character line and 23 lpm with an 80-character line. Condensed characters print at 100 cps and 18 lpm with 132 character

DEC	SYMBOL	DATA/WORD PROCESSING MODE	GRAPHICS MODE
08 nn	BS	Backspace nn dot columns	Ignored
10	LF	Full Line Feed	5/48 inch LF
13	CR	Carriage Return	Carriage Return
14	SO	End Underline	Ignored
15	SI	Start Underline	Ignored
18	DC2	Select Graphic Mode	Ignored
19	DC3	Ignored/Select DP Mode	Ignored
20	DC4	Select WP Mode/Ignored	Ignored
27 1-9	ESC 1-9	Proportional Spacing	Ignored
27 14	ESC SO	Start Elongation	Start Elongation
27 15	ESC SI	End Elongation	End Elongation
27 16 n1,n2	ESC POS n1,n2	Positioning, Dot Column	Positioning, Dot Column
27 17	ESC DC1	Select Proportional Char.	Ignored
27 19	ESC DC3	Select Ordinary Char.	Ignored
27 20	ESC DC4	Select Condensed Char.	Ignored
27 10	ESC LF	Full Reverse Line Feed	Ignored
27 28	ESC FS	Half Forward Line Feed	Ignored
27 30	ESC RS	Half Reverse Line Feed	Ignored
27 56	ESC 8	¾ Forward Line Feed	Ignored
28 n1,n2	FS n1,n2	Repeat Print Data n1 = # repeats, n2 = data	Repeat Prt. Data
30	RS	Ignored	End Graphics

Table 1. Printer Central Codes

"Any character or bit graphics image can be printed up to 256 times."

lines. Elongated ordinary characters print at 40 cps. Bit graphics are printed with a speed of 480 dots per second.

The printer senses when a line contains less than 80 characters, stops the print head at the last character and line feeds to the next line. It will only move toward the left margin as far as necessary to print the first non-blank character in a line. These two features permit fast short line printing.

Graphics

The LP VIII generates graphics in two ways. First, decimal ASCII codes 225-254 print the 30 block graphics designs shown in Fig. 2. The second, much more detailed method is to use the Bit Graphics mode of the printer.

In Bit Graphics mode, you can print any combination of seven dots in a dot column. A line feed moves the paper up approximately 1/10 inch. The small paper advance allows for continuous printing without spaces between lines. The dot density is 960 dots per line with 480 addressable dot-column positions. A Position command allows you to position the print head horizontally at any of the 480 dot-column positions before printing. Absolute column positioning is also available in the text modes, with 800 available dot positions in the condensed and proportional character sets.

Another useful feature of both the text and Bit Graphics modes is the Repeat command. Any character or bit graphics image can be printed up to 256 times, which is particularly useful for plotting points on a line. The Bit Graphics commands are completely compatible with those of the LP VII, except for the LP VIII's lack of a character column addressing command. Since the function of that command can be performed by dot-column addressing in both printers, any program for the LP VII can be written to work without modification on the LP VIII.

Both block graphics and word processing applications benefit from the variable line spacing allowed. In the Data Processing or Word Processing modes, the normal line spacing is six lines per inch. Both eight (¾ line) and twelve (½ line) lines per inch are also available. Forward and reverse line feeds are program selectable when six or twelve lines per inch is set.

Controlling the Printer

All printing capabilities are selected by sending a series of control codes to the printer (Table 1).

In Basic, control codes are sent to the printer using the LPRINT statement. LPRINTing the decimal code for the ASCII control character with CHR$ causes the printer to respond accordingly. For example, LPRINT CHR$(15) starts underlining and LPRINT CHR$(14) ends underlining. Some commands require two or more codes be sent to the printer. These should be separated by a semicolon to avoid having the carriage return/line feed sent between them.

The sequence LPRINT CHR$(27); CHR$(20) sends the ASCII characters ESC (decimal 27) and DC4 (decimal 20) to the printer and causes all subsequent text to be printed in the condensed character set. To return to the ordinary character set just use LPRINT CHR$(27); CHR$(19). Different character sets, carriage motions and other options (such as underlining) can easily be mixed within the same line.

Printer Test

Holding the restart switch down while turning on the power causes the printer to print all its characters. There is also a built-in test for carriage movement which does not print any characters.

Instruction Manual

The 49-page instruction manual is comprehensive and detailed. Unfortunately, it is so detailed it reads more like a technical manual than a "how to" manual. The sections on proportional spacing, repeated printing, absolute positioning and bit graphics are difficult to understand without some background in bit/byte addressing. Another irritating aspect of the manual is the preponderance of typographical errors (some rather serious). The booklet does contain some helpful examples, but is not as helpful as it could be. (It is substantially inferior to the Epson MX-80's 107-page manual, for example).

Comparison Summary

One of the most positive features of the LP VIII is the overwhelming similarity between its control codes and those of the LP IV (or its Centronics equivalent). Most programs written for the LP IV such as patches

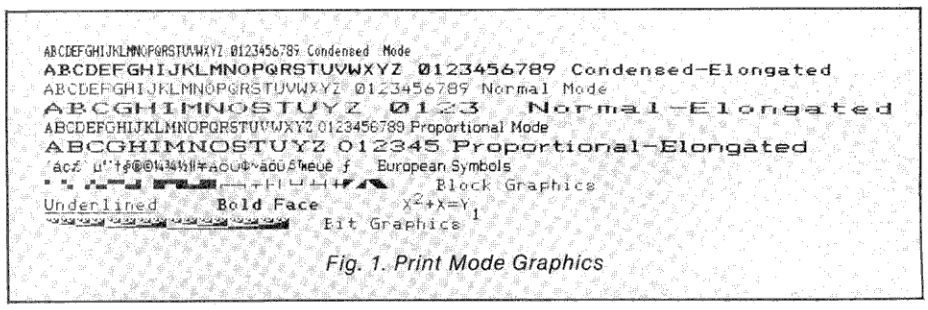

Fig. 1. Print Mode Graphics

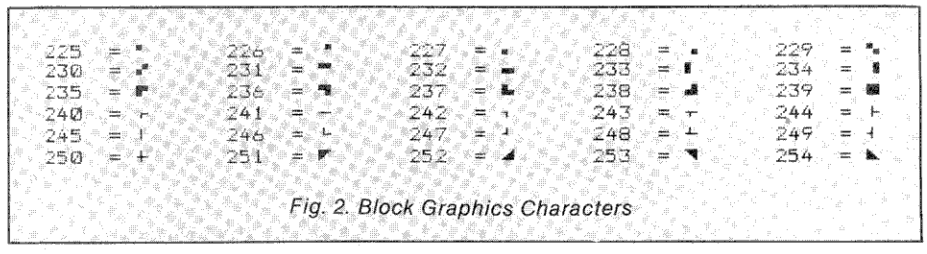

Fig. 2. Block Graphics Characters

```
4 '***** LINEPRINTER VIII PRINT MODES *****
5 LPRINT " ":LPRINT " "
10 LPRINT TAB(5) CHR$(27);CHR$(20);"ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 Condensed  Mode";CHR$(27);CHR$
(19)
15 LPRINT TAB(5) CHR$(27);CHR$(20);CHR$(27);CHR$(14);"ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 Condensed-El
ongated";CHR$(27);CHR$(15);CHR$(27);CHR$(19)
20 LPRINT TAB(5) "ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 Normal Mode"
30 LPRINT TAB(5) CHR$(27);CHR$(14);"ABCGHIMNOSTUYZ 0123  Normal-Elongated";CHR$(27);CHR$(15)
40 LPRINT TAB(5) CHR$(27);CHR$(17);"ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 Proportional Mode";CHR$(27);CHR
$(19)
45 LPRINT TAB(5) CHR$(27);CHR$(17);CHR$(27);CHR$(14);"ABCGHIMNOSTUYZ 012345 Proportional-Elongated";CHR$(27);
CHR$(15);CHR$(27);CHR$(19)
50 LPRINT TAB(5) CHR$(27);CHR$(17);:FORI=160 TO 191:LPRINT CHR$(I);:NEXT I:LPRINT "    European Symbols";CHR$(2
7);CHR$(19)
60 LPRINT TAB(5);:FOR I=225 TO 254:LPRINT CHR$(I);:NEXT I:LPRINT "    Block Graphics"
80 LPRINT TAB(5) CHR$(15);"Underlined";CHR$(14);"    ";:A$="Bold Face":LPRINT A$;CHR$(08);CHR$(107);A$;"    ";
90 LPRINT CHR$(20);"X";CHR$(27);CHR$(30);"2";CHR$(27);CHR$(28);"+X=Y";CHR$(27);CHR$(28);"1";CHR$(27);CHR$(30)
100 LPRINT TAB(5) CHR$(16);:FOR I=128 TO 255:LPRINT CHR$(I);:NEXT I:LPRINT CHR$(30);"  Bit Graphics"
110 LPRINT " ":LPRINT " "
```

Program Listing 1. Normal

"Normal printing speed with ordinary (10 CPI) characters is 80 characters per second. . ."

to Scripsit, should work without modification on the LP VIII.

Programs using some of the additional control codes of the LP VIII (such as the graphics codes), should be easy to convert to that printer. Some programs will be easier to implement on the LP VIII because of its graphics capabilities (adding Greek letters, math symbols and equation capabilities to Scripsit).

Another obvious comparison is between the LP VIII and the Epson MX-80 (see *80 Microcomputing*, August 1981 for an excellent review of the MX-80). The MX-80 has all of the character spacings available in the LP VIII with the exception of proportional characters. The MX-80 attempts to achieve letter quality by either double-striking characters or striking them with more force. Both of these modes yield very good results and have a significant advantage over proportional spacing.

Model I and III Scripsit does not allow the use of right-justification, hyphenation, horizontal centering, or accurate tab commands with proportional spacing. The MX-80's method of producing good print does not interfere with these functions. The MX-80 does not, however, have such an extensive block graphics set, the European characters, or the Bit Graphics mode.

One final caution: None of the fancy word processing features of the LP VIII (superscripts, subscripts, underlining, backspacing, proportional spacing, European and word processing characters, block graphics and much of the ASCII set) are accessible from Scripsit. The proportional character set can be used by selecting that mode from Basic before loading Scripsit, but it cannot later be changed within Scripsit and many useful Scripsit commands cannot be used with proportional characters.

With the exception of the difficulties dealing with existing word processing software, there is no question the LP VIII is an exceptionally useful printer. It should have no difficulty capturing the large market once filled by the Line Printer IV. ■

```
4  '***** LINEPRINTER VIII PRINT MODES *****
5  LPRINT " ":LPRINT " "
10 LPRINT TAB(5) CHR$(27);CHR$(20);"ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 Condensed  Mode";CHR$(27);CHR$(19)
15 LPRINT TAB(5) CHR$(27);CHR$(20);CHR$(27);CHR$(14);"ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 Condensed-Elongated";CHR$(27);CHR$(15);CH
R$(27);CHR$(19)
20 LPRINT TAB(5) "ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 Normal Mode"
30 LPRINT TAB(5) CHR$(27);CHR$(14);"ABCGHIMNOSTUYZ 0123  Normal-Elongated";CHR$(27);CHR$(15)
40 LPRINT TAB(5) CHR$(27);CHR$(17);"ABCDEFGHIJKLMNOPQRSTUVWXYZ 0123456789 Proportional Mode";CHR$(27);CHR$(19)
45 LPRINT TAB(5) CHR$(27);CHR$(17);CHR$(27);CHR$(14);"ABCGHIMNOSTUYZ 012345 Proportional-Elongated";CHR$(27);CHR$(15);CHR$(27);CHR$(1
9)
50 LPRINT TAB(5) CHR$(27);CHR$(17);:FORI=160 TO 191:LPRINT CHR$(I);:NEXT I:LPRINT "     European Symbols";CHR$(27);CHR$(19)
60 LPRINT TAB(5);:FOR I=225 TO 254:LPRINT CHR$(I);:NEXT I:LPRINT "    Block Graphics"
80 LPRINT TAB(5) CHR$(15);"Underlined";CHR$(14);"     ";:A$="Bold Face":LPRINT A$;CHR$(08);CHR$(107);A$;"      ";
90 LPRINT CHR$(20);"X";CHR$(27);CHR$(30);"2";CHR$(27);CHR$(28);"+X=Y";CHR$(27);CHR$(20);"1";CHR$(27);CHR$(30)
100 LPRINT TAB(5) CHR$(18);:FOR I=128 TO 255:LPRINT CHR$(I);:NEXT I:LPRINT CHR$(30);"   Bit Graphics"
110 LPRINT " ":LPRINT " "
```

Program Listing 2. Condensed

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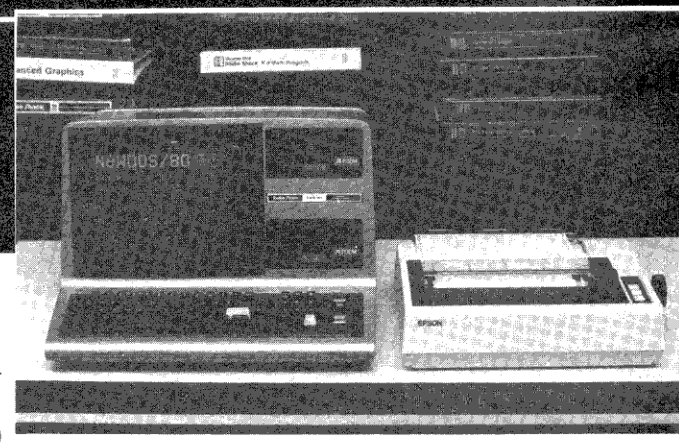

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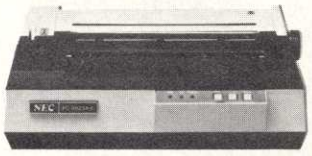

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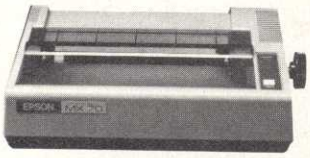

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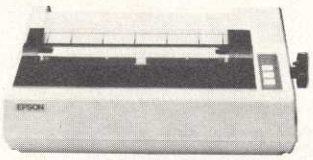

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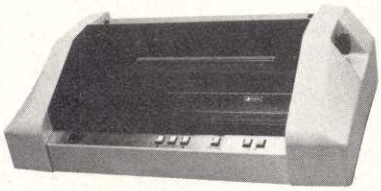

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ROM Bibliography

An annotated list of ROM literature.

Paul F. Secord
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rticles about ROM (Read Only Memory) abound, and many books claim to reveal ROM's valuable secrets.

About ROM

In the TRS-80 Models I and III, ROM is approximately 12K (over 12,000 bytes). This fixed memory makes it possible for you to communicate with your computer. ROM translates Basic program statements into machine language, checks them, reports errors, contains the routines for communicating with the keyboard and the video screen, and for accessing peripheral equipment (tape recorders, printers and disk drives). Essentially, ROM is an interpreter. If you communicate with your computer only in Basic or other high level languages, a knowledge of how ROM interprets is not necessary.

There are circumstances when it is helpful to know about ROM. ROM is stored in binary form but can be read as hexadecimal bytes. With the aid of a disassembler, it can be automatically translated and printed as Z80 assembly language instructions. If you program in assembly language ROM routines will be useful. If you program mainly in Basic, you can call from Basic assembly language routines to accelerate execution speeds.

ROM routines can usually be called from within assembly language programs. A call, similar to a GOSUB in Basic, sends control to the subroutine and returns when the subroutine is completed. Suppose you want to introduce a blinking asterisk in your assembly language program. You would include the instruction CALL 022CH. When control reaches that part of the program, an asterisk blinks in the upper right corner of the screen. Since this routine changes the contents of all registers, save those containing needed data.

ROM is the heart of any computer. If you are fascinated by how computers work, you should learn about ROM and machine language. The books reviewed here will provide new insights into the workings of computers such as the TRS-80.

Radio Shack does not support the use of ROM routines in programming. They want to be free to modify ROM as it becomes advisable. Then programs using ROM might not run on all machines. For example, a few unannounced changes have been made in Model I ROM since the first TRS-80 appeared, so not all Model Is are identical. Their lowercase fix for the CRT screen is a ROM modification. Some programs written for unmodified machines will not run on modified ones. And, of course, Models II and III have different ROMs from Model I.

Radio Shack's concern is well founded, yet this limitation can be exaggerated. Only a few modifications have been made in successive Model I ROMs. Except for the lowercase modification, the changes do not involve commonly used internal routines. At least one of the books I will discuss specifically details known ROM changes in the Model I, so programmers can avoid them. If you write programs only for your machine, ROM routines that work for you are not a source of trouble.

Radio Shack Basic was written by Microsoft and is protected by copyright. As a result, authors writing about TRS-80 ROM have published listings in incomplete forms. You can fill in the blanks if you have a disassembler for printing ROM contents in Z80 assembly language.

The Books

The following references are listed in order of publication:

Software Technical Manual. Bellaire, TX: Houston Microcomputer Technologies Inc. 1979. 39 pp. $40.00.

Fuller, Roger. *Supermap: Level II ROM Documentation.* Grand Prairie, TX: Fuller Software. 1979. 36 pp. $8.95.

Richardson, Robert M. *Disassembled Handbook For The TRS-80.* Vols. 1 and 2. Chautauqua, NY: Richcraft Engineering Ltd. 1980. Vol. 1, 69 pp. $10.00; Vol. 2, 174 pp. $15.00.

Daly IV, Raymond E. et. al., *The Book: Accessing the TRS-80 ROM. Vol. 1 Math.* Springfield, VA: Insiders Software Consultants, Inc. 1980. 132 pp. $16.45.

Blattner, John, and Bryan Mumford. *Inside Level II.* Summerland, CA: Mumford Microsystems. 1980. $15.95.

Nicholas, Robert F. *Pathways Through The ROM.* Milford, NH: Softside Publications. 1980. $19.95.

Wilkes, Richard P. and Stephen C. Hill. *The Book: Accessing The TRS-80 ROM. VOL. II: Input/Output.* Springfield, VA: Insiders Software Consultants Inc. 1981. 156 pp. $16.45.

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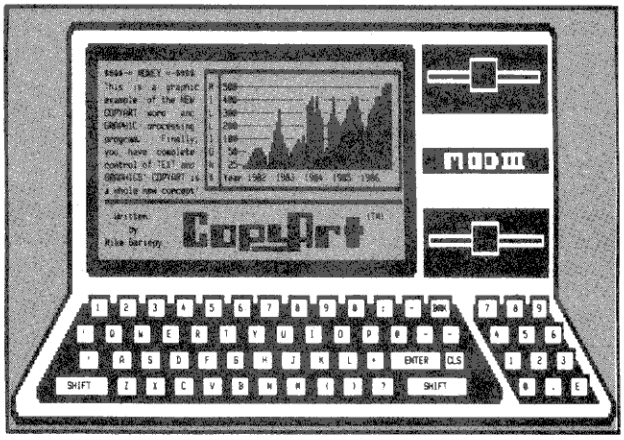

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"ROM is stored in binary form but can be read as hexadecimal bytes."

Farvour, James. *Microsoft Basic Decoded And Other Mysteries.* Upland, CA: IJG Computer Services. 1981. 310 pp. $29.95.

I will not treat *Pathways Through The ROM* separately. The package includes Volume 1 of the *Disassembled Handbook, Supermap,* a Controller Sheet for hardware buffs, two disk maps, and two printed items in the public domain (a disassembler and a Hex-Mem monitor).

The secrecy surrounding ROM in 1978 and 1979 heightened interest in it. According to speculation Radio Shack underestimated the serious programmer's interest in using assembly language. Their early manuals had little information concerning ROM reference points. The Editor/Assembler Manual was also skimpy on this point.

The first published booklet, the *Software Technical Manual,* revealed some of ROM's inner workings for the first time. This achievement came about through a mysterious gentleman named Hildebrand. The manual spells out in a terse and technical fashion how ROM can be used for data handling, logical comparisons, arithmetic functions, data conversions and to adapt Basic routines. It also provides information concerning I/O routines involving the keyboard, tape and disk. It offers a memory map, a tape copy program and ways for the Basic programmer to annex multiple assembly language routines. The manual is mainly of historical interest now. The information has been presented more clearly and in greater detail in other more reasonably priced references.

Supermap selects several hundred key addresses from ROM and documents what they do. Consider the following line from Supermap:

```
0060 DELAY LOOP BC IS COUNTER
14.65 MICROSECONDS EACH LOOP
```

This means you can set BC to a desired value and Call 60H to create a delay which is BC times 14.65 microseconds. You might want to display a graphic for this elapsed time and then move on automatically. The documentation is invaluable. It covers tape I/O routines, system tape format, video driver, cursor control, scrolling, printer driver, arithmetic routines, keyboard scans and input, Editor/Assembler source tape format, entry points for Basic commands, various tables in ROM, Basic tape format, key reserved addresses in RAM and much more. Since most of *Supermap* consists of single phrase documentations of hex addresses in ROM, it is primarily for experienced assembly language programmers. But you do not have to be an expert to use it.

Volumes 1 and 2 of the *Disassembled Handbook* also appeared fairly early, explaining the author's wild enthusiasm for ROM routines. He castigates authors for writing articles and books on programming arithmetic routines when supposedly all one need do is call arithmetic routines from ROM. He repeatedly claims the assembly language programmer can save pages of program statements by employing ROM routines and implies that any idiot can see how to do this. This is misleading, to say the least. ROM routines cannot be used without a thorough understanding of what you are doing.

Volume 1 has information about the location of ROM routines ordinarily activated by Basic commands for use by assembly language programmers. Little guidance is given. Their use is far from straightforward. Many do not end in a RET instruction, and merely calling them returns control to Basic instead of your machine language program. They are often inefficient, involving routines necessary to Basic but not machine language.

Space is devoted to explaining arithmetic routines for the three kinds of TRS-80 numbers: integer, single precision and double precision. Useful demonstration programs are provided. They are probably the strongest feature of the book, although I have not tested them. Other sections provide information about keyboard routines, video display and printer output routines. Unfortunately, the suggestions for printer output do not work with my setup. This leads me to wonder about other sections. Many pages list hex bytes in ROM without documentation. It is hard to imagine anyone finding information in that form useful.

"Thorough, clear, meticulous on . . . number crunching."

In spite of the author's statement that machine code without comments is useless Volume 2 has still more pages of hex bytes. Chapters deal with VARPTR (a Basic function) and its relation to the types of numbers used by the TRS-80, as well as its use with strings; more on single and double precision floating point numbers; an assembly language routine for tape users which prints the current contents of the screen when the JKL keys are pressed simultaneously; a program for a split screen; and exercises for the reader. I only tested the JKL routine and regret to report it does not work without modification.

The author sends each byte in screen memory (3C00H to 3FFFH) directly to the printer. He must have used a dumb printer that ignored everything but ASCII codes. Most printers today are intelligent, responding to control codes. Some even print graphics. My MX-80 Epson went berserk when it received bytes from this JKL program.

JKL routines must include sorting mechanisms for sending only ASCII codes and for converting control and graphics codes to other numbers. ROM contains some of these routines, but using them requires considerable sophistication. These difficulties emphatically make the point that you need to know exactly what you are doing when using ROM routines. Both volumes of the *Disassembled Handbook* fail in this respect.

Volume I of *The Book* is far superior to the *Handbook.* It is a thorough, clear and meticulous presentation on how to do number-crunching with the TRS-80. The authors begin with a lucid explanation of integer, single and double precision variables, and explain how these are stored in the variable tables at the end of Basic. Reserved RAM forms accumulators for manipulating these number types; these are described along with the register accumulators. Routines for manipulating these different data types are described, including not only appropriate calls to ROM, but also special routines provided by the authors.

A common problem in interfacing ROM routines has been that, if an error occurs, control jumps to Basic. An error-trapping routine is offered to solve this problem. Routines such as data conversion, movement of data, ASCII conversions, geometric functions and obtaining logarithms are explained with precautions. A commented disassembly of all the math routines is also provided. Appendices provide quick references to ROM entry points, I/O areas, storage areas, pointers and three sample math routine programs. This volume is indispensable for complex number processing.

The Book Volume II is an exhaustive treatment of I/O routines in ROM and how to use them. Typically, inexperienced assembly language programmers have their greatest difficulty in this area. The book begins by explaining the Device Control Block, data flow, drivers, flags, register usage and invalid requests. Successive chapters take up keyboard input, video and printer output, and tape I/O. Each chapter is followed by a complete disassembly of all relevant ROM routines, with line-by-line comments. Appendices offer the authors' own lowercase and printer drivers, an alternate System loader and various tables. Like its companion volume, the book is unique in its complete, detailed coverage.

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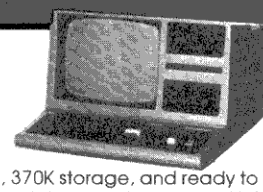

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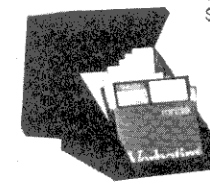

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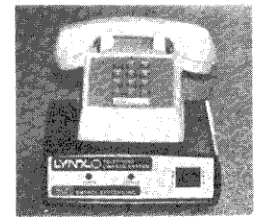

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"ROM translates Basic program statements into machine language . . ."

ical organization and thorough documentation. It is even useful for someone who knows only the rudiments of assembly language.

This book makes no attempt to present hundreds of ROM routines. Instead it picks out the most useful and efficient ones and tells you everything you need to know to use them.

Here, as in *The Book,* we gain a clearer understanding of ROM. ROM routines are intertwined with each other. They must serve both disk and tape users. They are written to support Basic, not assembly language programs. They are not always efficient and using them may have disastrous but subtle effects on some other part of your program. Blattner and Mumford are thorough in flagging these pitfalls. I have used most of the routines in their book and every one works perfectly. The book has no flaws; it is a perfect gem. Their knowledge of the TRS-80 so impressed me that I bought their Instant Assembler and their monitors, Micromind and Step-80.

The last entry, *Microsoft Basic Decoded,* is a monumental work, a gargantuan achievement, providing over 7,000 comments on ROM operations.

The first chapter is an overview of the Level II operating and disk systems. The second chapter selects critical ROM routines and details their use. The next two chapters detail cassette and disk operation. Chapter 5 explains how to add an additional sort routine command to Basic. Chapter 6 provides further information on how a separate program can be arranged to be executed by another Basic program. Chapter 7 details the newer ROMs in some TRS-80s. The remaining chapter (about 120 pages) documents ROM in a remarkably thorough manner.

This is a splendid book. If you know the rudiments of assembly language programming, you will get something out of this book, but not as much as from *Inside Level II.*

One shortcoming, shared by all of the books, is the lack of an index. Computer books are used for reference purposes, so this omission is inexcusable. Future writers take note.

Summing up, *Inside Level II* should be in the library of every programmer. A good complementary work would be either *Supermap* or Volume II of *The Book.* If you plan to do sophisticated number processing in assembly language, Volume I of *The Book* would be a great help. And if you want to add one more reference, certainly *Microsoft Basic Decoded* is the best choice. Finally, I have said nothing about magazine sources on ROM. Perhaps the best for TRS-80 assembly programmers is *The Alternate Souce,* a bi-monthly (1806 Ada St., Lansing, MI, 48910). One last caveat. A good monitor/disassembler that single steps through a program (including ROMs), and which displays register and flags contents at each step, should be used in conjunction with any of these books.■

Paul Secord is Professor of Psychology and Education at the University of Houston.

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EXCITING NEWS FOR COLOR COMPUTER USERS

FLEX, OS-9 and the Radio Shack Disk System ALL on the SAME Color Computer

Would you believe that you can run FLEX, OS-9 and Radio Shack disk software on the same Color Computer, and all you have to do is change the disk? That's right, just change the disk. If you have a 32K Color Computer with the Radio Shack disk system, all you need to do is make a trivial modification to access the hidden 32K, as described in the Feb. issue of COLOR COMPUTER NEWS and the March issue of '68' Micro. You can get FLEX from us right now. OS-9 will be ready by summer. Please note that this will only work with the Radio Shack disk system and 32K/64K memory chips that RS calls 32K. Maybe they put 64K's in yours, too. If you don't have a copy of the article, send a SASE and we'll send it to you.

Using this system to run FLEX and OS-9 has many advantages. First, it gives you 48K from zero right up to FLEX. This means that *ALL* FLEX compatible software will run with *NO MODIFICATIONS* and *NO PATCHES!* There are no memory conflicts because we moved the screen up above FLEX which leaves the lower 48K free for user programs.

What you end up with is 48K for user programs, 8K for FLEX and another 8K above FLEX for the screens and stuff. We are working on a multi screen format so you can page backward to see what scrolled by and a Hi-Res screen that will enable us to have 24 lines by 42 character display. That's better than an Apple!

We also implemented a full function keyboard, with a control key and escape key. All ASCII codes can now be generated from the Color Computer keyboard!

We also added some bells and whistles to Radio Shack's Disk system when you're running FLEX or OS-9. We are supporting single or double sided, single or double density, 35, 40 and 80 track drives. If you use double sided drives, the maximum is three drives because we use the drive 3 select for side select. When you are running the Radio Shack disk, it will work with the double sided drives but it will only use one side and only 35 tracks. Using 80 track drives is okay, but will not be compatible with standard Radio Shack software. You can also set each drive's stepping rate and drive type. (SS or DS - SD or DD)

In case you don't understand how this works, I'll give you a brief explanation. The Color Computer was designed so that the roms in the system could be turned off under software control. In a normal Color Computer this would only make it go away. However, if you put a program in memory to do something first (like boot in FLEX or OS-9), when you turn off the roms, you will have a full *64K RAM* System with which to run your program (FLEX or OS-9). When the roms are turned off, it is as if you had removed them from the computer. They are gone!

Now, we need the other half of the 64K ram chips to work, and this seems to be the case most of the time, as the article states. Of course, you could also put 64K chips in.

We decided that this was the best way to run FLEX and OS-9 on the Color Computer because it does remove the roms from the memory map and leaves the full 48K for user programs. If you just put in memory for FLEX and use the Basic hooks for I/O, all you have is a little over 30K for user programs. In addition, very few FLEX programs will run without being modified and some won't run very well, if at all (our DATAMAN + for example). Let me state it again. ALL FLEX COMPATIBLE PROGRAMS WILL RUN WITHOUT MODIFICATION!!! and the same goes for OS-9!

It is also the ONLY way OS-9 will run because 30K is just not enough.

Some neat utilities are included.

MOVEROM moves Color Basic from ROM to RAM. Because it's moved to RAM you can not only access it from FLEX, you can run it and even change it!! You can load Color Comuter cassette software and save it to FLEX disk. Single Drive Copy, Format and Setup commands are also included.

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ZBASIC 2.2 DOES NOT SUPPORT THESE BASIC COMMANDS:

1. ATN, EXP, COS, SIN, LOG, TAN, and exponentiation. (However, subroutines are included in the manual for these functions.)
2. ERROR, ON ERROR GOTO, ERL, ERR RESUME.
3. No direct commands like AUTO, EDIT, LIST, LLIST ETC, although these commands may be used when writing programs.
4. Others NOT supported: CDBL, CINT, CSNG, DEFFN, FIX, FRE.
5. Normal CASSETTE I/O. (ZBASIC supports it's own SPECIAL CASSETTE I/O statements.)
6. SOME BASIC COMMANDS MAY DIFFER IN ZBASIC. For instance, END jumps to DOS READY, STOP jumps to BASIC READY etc.
7. MEMORY REQUIREMENTS: to approximate the largest BASIC program that can be compiled in your machine (at one time), enter BASIC and type: PRINT (MEM-6500)/2. Remember, you can merge compiled programs together to fill memory.

ZBASIC 2.2 SPEED COMPARISON DEMO

To help give you an idea how fast compiled programs are, we have included this demo program:

ZBASIC 2.2 DEMO PROGRAM

Time to compile and run complete program	**: 0 MIN. 2 SEC.**
BASIC Execution speed MOD 1, LEVEL II	**: 7 MIN. 34 SEC.**
ZBASIC Execution speed MOD 1, LEVEL II	**: 0 MIN. 18 SEC.**
BASIC Program size (WITHOUT VARIABLES)	**: 895 BYTES**
ZBASIC Program size (WITHOUT VARIABLES)	**: 2733 BYTES**

(Remember that the ZBASIC program includes an 1879 byte subroutine package.) Program shown exactly as compiled and run in BASIC and ZBASIC.

```
10 '========= ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST========
20 CLS:CLEAR100:DEFINT A-X:DEFSTR Z:DIM AA(64,24),Z(50):RANDOM
30 AA=100:BB=-1000:CC=3:DD=-3:EE=-9999:ST$="START TIME "+TIME$
40 FOR I=1TO127STEP2 :FOR J=47TO1STEP-3:XX=POINT(I,J):SET(I,J)
50 XX=(I-J)/CC*(7+I+J) :XX=ABS(INT(RND(I*J)-AA)+7) :RESET(I,J)
60 XX=PEEK(I+J) :POKE15360+I+J,J :OUT255,J AND (3*J):XX=INP(I)
70 AB$=STR$(I+J) :BA$=LEFT$(AB$,2) :AA(I/2,J/2)=VAL(BA$)+AA*3
80 BA$=BA$+RIGHT$(BA$,RND(3)) :XX=INSTR(1,BA$,"9"):XX=SQR(I*J)
90 BA$=MID$(BA$,2,2) :MID$(BA$,1,1)=Z :IF XX THEN 100 ELSE CLS
100 IF LEN(BA$))3 OR SGN(XX)=1 AND ASC(BA$)=32 THEN PRINT"+++";
110 IFPOS(0))62 THEN TRON:TROFF:PRINT ELSE XX=NOT(RND(99))+100
120 A$=INKEY$:IF A$="Y" OR A$="y" AND I)120 THEN PRINT"TRUE.."
130 RESTORE :READA,C,Z(J),D:GOSUB170:GOSUB170:GOSUB170:GOTO210
140 NEXT :PRINT"*";:NEXTI:CLS:PRINT@512,ST$,"STOP TIME ";TIME$
150 STOP'============= END OF MAIN TEST LOOP ================
160 DATA 12345,-1,"TEST",-9999
170 ON RND(6) GOTO 180,190,200,180,190,200
180 RETURN
190 RETURN
200 RETURN
210 ON RND(9) GOSUB 180,190,200,180,190,200,180,190,200
220 GOTO140
```

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Line Printer VII

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I first saw the Line Printer VII at a computer show in Buffalo, New York. I knew at once it was the printer I wanted.

The two factors which most influenced my choice were size and price. The LP VII requires a level surface measuring at least 16 by 8¼ inches to rest upon. My system (a TRS-80 Model I, Level II, 16K) occupies a key place in my living room. The Line Printer VII intrudes no more on my living room decor than the rest of the system.

Setting up the LP VII was no problem at all, even for one as mechanically disinclined as myself. The instruction book is short (18 pages), has numerous misspellings and grammatical errors but does give clear information on how to get your printer working. The diagrams are most helpful.

My system requires the Printer Interface Cable (Cat. No. 26-1411 at $59.95), since I have no expansion interface. The instruction book for this cable is quite clear on how to connect the keyboard to the printer.

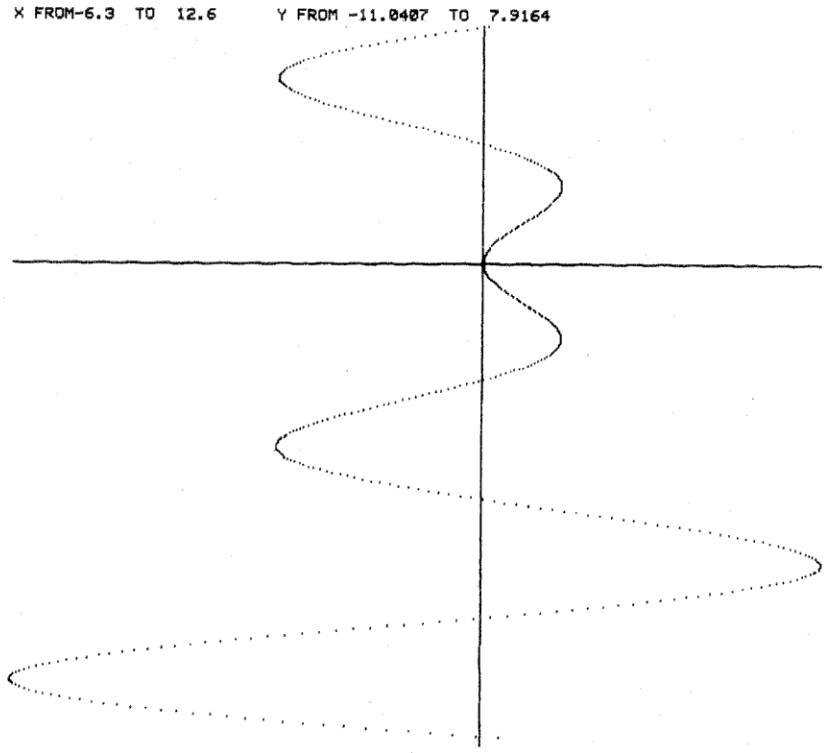
The Line Printer VII can be used with the parallel interface or with seven or eight-bit serial interfaces. The LP VII uses any tractor-fed paper 4.5 to 9.5 inches wide. Insert the paper in a slot behind the platen and it wraps around the platen and reappears in a slot in front. Adjust the tractors to fit the paper by sliding them along the bar where they are fastened. Four large rubber washers keep the paper flat under the print head.

It was all so easy that I was certain something was wrong—especially since the printer was not making any noise. The LED was glowing, so I tried something pleasant like LPRINT "HELLO". In an instant the buzzing noise was over and there was HELLO printed clearly on the paper. The LP VII prints the entire 96-character ASCII character set. I can even print lowercase from my uppercase-only keyboard. If U$ is an uppercase letter, LPRINT CHR$(ASC(U$) + 32) sends the corresponding lowercase letter to the printer.

Though I was impressed by the good quality of print the five by seven dot matrix produced, I was a little disappointed that lowercase letters did not have true descenders. The lines are printed at 80 characters per line, 30 characters per second. Though slow, this is fine for me and I would guess for anyone who only needs a printout occasionally. The print fades toward the end of long listings, though not significantly. I would not use the LP VII in an environment where it was printing hours on end.

The Line Printer VII can also print double-width characters at 40 characters per line. You can select this feature dynamically via the LPRINT CHR$(31) command. The ASCII code 31 does not cause any printing; it instructs the LP VII to convert to the 40-character mode. LPRINT CHR$(30) returns your printer to the 80-character mode. The LP VII also has a graphics mode which you can select dynamically by the LPRINT CHR$(18) statement.

Before discussing graphics in more detail, I want to point out that each character printed by LP VII is triggered by an ASCII code sent from the computer. LP VII is memory mapped to address 14312 (in the Model I). POKEing an ASCII code in that address sends that code to the LP VII's 90-character buffer. The character equiva-



*Graph of Y = X*SIN(X) Using Line Printer VII.*

"The LP VII. . . comes at a price low enough for the hobbyist to consider seriously."

lents of the ASCII codes in the buffer are printed if the buffer is full or an ASCII code 10 or 13 arrives. ASCII codes which are not printing characters but give instructions to the printer are called control codes.

The Graphics Mode

In order to understand the graphics mode more easily, I will explain more about a dot-matrix character. In the LP VII, a character is printed by a matrix six dots wide by seven dots high. In the character mode only the first five columns of dots are used, the last forming the space between letters. Thus an 80-character line is composed of 480 columns of dots, each column seven dots high. In the graphics mode, the LP VII can darken any seven dots in any of the 480 columns on a line. Once in the graphics mode, only graphics characters can be printed, all ASCII characters except control codes will be ignored.

Imagine that the dots in a graphics column are numbered from top to bottom as 0, 1, 2, 3, 4, 5, 6. Dots to be printed correspond to a 1 bit in a byte sent to the printer. For example, to print only the top dot, numbered 0, use LPRINT CHR$(129). Remember, this means the binary equivalent of the byte 129 goes to the printer; since 129 is 1 0 0 0 0 0 0 1 in binary, it signals a graphics character (most significant bit of 1) in which dot 0 (least significant bit is 1) is printed. Thus the byte 131 (or 1 0 0 0 0 0 1 1 in binary) prints the top two dots. All seven dots are printed by sending the byte 255 (in binary 1 1 1 1 1 1 1). Of course the byte 128 (1 0 0 0 0 0 0 0 in binary) prints no dots in graphics mode. In general, for each dot number n to be printed in a given column, add 2^n to 128 to compute the appropriate byte.

Once I realized that each line had 480 columns of seven dots each and that a single 8½ by 11-inch sheet of paper has 66 lines, I saw I was working on a 480 by 482 grid. When I compared this to 128 by 48 for the video monitor, I immediately decided to write a program producing high resolution graphs of mathematical functions. Y values are plotted horizontally by using a tab to the correct dot column. Although the LP VII recognizes a control code for a tab in graphics mode, certain tabs cannot be done via LPRINT because that routine intercepts some control codes (notably 10) and replaces them with others.

In the graphics mode, a tab is signaled by sending two bytes, first 27, then 16. The actual dot column to which the tab goes is presumed to be in the two bytes which follow these control codes. The printer assumes that the dot column has been sent as a two-byte binary integer with the high-order byte first, low-order byte second. Thus tabs to positions from 0 to 255 correspond to a high byte of 0 a low byte of the tab position. Tabs to columns from 256 to 479 have a high byte of 1 and a low byte of the desired position minus 256. In short, the two bytes required are precisely those used by Basic in the Level II ROM to encode that number, except that these are in the order low, high.

If you tried to do a graphics tab to dot column 10 by a Basic LPRINT command, such as LPRINT CHR$(27);CHR$(16); CHR$(0);CHR$(10), you would be disappointed because the LPRINT routine will not let the byte 10 through unaffected. The instruction manual points out this difficulty and says you must bypass the LPRINT routine to accomplish some graphics tabs. It does not even hint at how to do that. My solution is to POKE the required bytes into address 14312 (memory-mapped home for the LP VII).

One more problem though—if you POKE a value into address 14312 while the LP VII is busy printing it will not get the byte at all. When the printer is busy, the contents of 14312 is set to a value of 128 or higher. Thus PEEK(14312) > 127 indicates that any value POKEd into address 14312 will be lost. With this in mind, I designed a subroutine to perform a graphics tab to a position whose location (an integer from 0 to 479) is stored in the variable GT%:

```
5000 K = VARPTR(GT%)
5010 LPRINT CHR$(27); CHR$(16);
5020 IF PEEK(14312) > 127 THEN 5020
5030 POKE 14312, PEEK(K + 1)
5040 IF PEEK(14312) > 127 THEN 5040
5050 POKE 14312, PEEK(K) : RETURN
```

This solved the graphics tab problem and gave me full access to the graphic capability of the LP VII. The resulting plotter program produces graphs, though slowly, of excellent resolution.

All things considered, I have been very pleased with my LP VII. So far, it has not needed service or a new ribbon. Two problems have occurred on occasion. When it first starts printing, sometimes the ribbon jams the print head and prevents a return to the left margin. Until the left margin is attained, address 14312 indicates a busy condition and everything hangs up until you jiggle the ribbon a bit to release the jam.

Also, the cable connection at the keyboard sometimes comes loose. Once again the contents of 14312 indicate a busy condition (a value of 255, meaning not connected). I wiggle the connection a little to cure the problem.

The LP VII makes no idling noises at all, prints a readable clean copy, has outstanding graphics capabilities, and comes at a price low enough for the hobbyist to consider seriously.■

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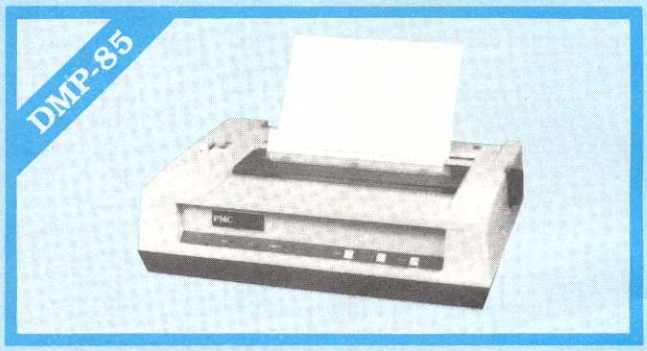

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Basic Misinterpreter

Basic Misinterpreter
Kitchen Table, Inc.
Sri Lanka

David D. Busch
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Ravenna, OH 44266

Basic Misinterpreter is another in a series of programs developed in the laboratories of Kitchen Table, Inc., and later deemed unworthy of marketing to the general public. Through a special arrangement with the fictitious software and hardware firm, *80 Micro* offers this significant regression in technology to its readers.

In use, the program waits for the unsuspecting victim to enter program lines. Commands entered are acted upon—within certain limits. The user can load an existing program, list it, add new lines and save the resulting file on disk. Syntax is identical to that in Disk Basic, and the familiar > prompts for input.

However, the Misinterpreter actually substitutes misspelled words for Basic key words in other programs. For example, Run becomes Ran, Read turns into Reed, GOSUB is transformed into GSUNK, and GOTO becomes GOOT. These changes do not become apparent until the user lists the lines, or loads the program from disk some time later.

Should the user spot an error, the line may be edited with most Level II commands. However, the results are worse than before. Some commands are met with a response of "Huh?", while any attempt to put more than one statement on a line is answered with "Sorry, only accepting one statement per line today."

The Misinterpreter's calculator mode offers another twist: When "PRINT 2+1" is entered, for example, the micro prints "2+1."

KTI thoughtfully included a provision allowing you to add your own preferred bugs and expand the altered key words. To make simple modifications to the Misinterpreter, consider the following program description.

How It Works

Normal key words are stored in a string array, E$(n), while the equivalent, phoney words are loaded into another array, SP$(n). Basic Misinterpreter (?BASIC, for short) currently has 18 key word/phoney word pairs. WRDS is defined as 18 in line 30; the arrays are dimensioned using WRDS instead of a constant in line 50. If you wish to add word pairs, change the value of WRDS, and append the pairs onto the end of the Data statements. The phoney word must have the same number of characters as the word it will replace.

The word pairs are read into the arrays in lines 110–160, with a space added to the beginning of each. The actual masquerade begins at line 210, where the > prompt is printed and followed by line 230's "LINE INPUT A$."

The program then waits for input (a command or a program line). Once Enter has been hit, lines 250–320 check the first few characters of A$ to see if a command has been entered. These include List, Save, Load, Run, New, Print and Edit.

If a match is found, control branches to a subroutine where the command is carried out. If not, A$ is an unrecognizable command or a program line.

In this case, ?BASIC looks for a quotation mark (indicating a prompt to be ignored) or a colon (marking a multiple-statement line). For processing speed, ?BASIC refuses more than one statement per line.

If a quote is located, the program looks for the second quotation mark and ignores any characters (including colons) between the two. Only the remainder of A$ will be examined for keywords.

Next, ?BASIC checks the first few characters of the line until it finds a space. All characters up to the first space are presumed to be the line number (LN). If LN is less than one, the input is an unrecognizable command. The program responds "Huh?" and returns to line 210 for more input.

If the program line number is less than 200 (the largest line number allowed in ?BASIC), a search for the key words begins. (To keep the Load and Save routines of reasonable size, as well as to shorten Lists, ?BASIC is limited to use with program line numbers less than 200. This step also conserves memory space. If you have memory to spare, or end up compiling this program in order to gain speed, you can increase the number of allowable lines by redefining LS in line 40.)

A For. . . Next loop from 1 to WRDS (lines 580-610) compares each good key word with the program line typed in by the user. When a match is found, a check is made to see if the key word is within quotes (and therefore ignored). If not, the phoney word is substituted.

The rest of the program consists of subroutines which carry out commands. If Load"filename" or Save"filename" is entered, that command is parsed to determine the file specification (lines 750–760.) Then the file NE$ is opened and all LS lines of the program are input or written to disk. Some of these will be null, of course.

The List subroutine is rather complex,

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"...striking C, D or I invokes some strange shenanigans."

because of all the List options. (List shows all lines; List 10 prints only that line. List 10-100 shows those lines, while List 100- lists lines from 100 to the end of the program.) If no hyphen appears in the command, ?BASIC assumes that all lines should be listed (as in the command List) or that only one line is wanted (as in List 10). When a hyphen is included in the command, the program extracts the beginning and ending line numbers specified.

When "Edit linenumber" is invoked, control drops to a routine beginning at line 1330, which closely simulates Level II editing—with a few surprises thrown in. The line number requested is pulled from the user's command. If no such line exists, an error message is printed. Otherwise, the program prints the line number, and enters an INKEY$ keyboard strobing loop. Each time the space bar is pressed (as in actual Level II editing), a character of the target line is revealed. Hitting the back arrow backs up the display. Pressing Enter concludes the editing session, while striking C, D or I invokes some strange shenanigans.

Final Points

This program should also be fairly easy to compile using a compiler which supports disk I/O functions. Just be sure to delete line 10 and use constants to DIM the arrays in line 50.

You may wish ?BASIC to be more subtle. Instead of always substituting PLIMT for PRINT, a random character could be inserted in the key word. Here is a subroutine to get you started:

```
705 E = RND(LEN(SP$(G)))
706 F = RND(26) + 65
707 MID$(E$(G),E,1) = CHR$(F)
```

That addition chooses a random position (E) in the key word (E) and places a random character from A to Z there. Substitute the real key word for the misspelled ones in the Data lines if you want the phoney words to start out normally. They will get weirder and weirder each time a key word is encountered. PRINT can become PRUNT, then YRUNT, and YRUNG, successively.

Or, store the value of the key word in a DUMMY$, and return it to its normal value after each replacement. Then, PRINT might appear as PLINT, PLIGT, or TRINT, with only one letter wrong each time.

To add new commands, simply add an appropriate line after line 320 and branch to your subroutine. For example, you might want ?BASIC to recognize CMD"S" and respond "Sorry, DOS is busy at the moment." ■

Program Listing

```
1 '       ***********************************************
          *                                             *
          *                BASIC MISINTERPRETER         *
          *                                             *
2 '       *              By:  David Busch               *
          *                   515 E. Highland Ave.      *
          *                   Ravenna, Ohio 44266       *
          *                                             *
3 '       ***********************************************

10 CLEAR 10000
20 DEFINT A-Z
30 WRDS=18
40 LS=200
50 DIM  E$(WR),CP$(LS),SP$(WR)
60 Q$=CHR$(34)
70 C$=CHR$(58)
80 SP$=CHR$(32)
90 CLS

100 ' ****** READ WORDS INTO ARRAY ******

110 :  FOR N=1 TO WRDS
120 :    READ SPAN$(N)
130 :    READ E$(N)
140 :    E$(N)=SP$+E$(N)
150 :    SPAN$(N)=SP$+SPAN$(N)
160 :  NEXT N
170 GOTO 210

180 DATA IF,OF,RUN,RAN,INPUT,IMPUT,LIST,LAST,END,FIN,PRINT,PLIMT
,READ,REED,DATA,DADA,THEN,THAN,FOR,FAR,STOP,STEP,NEXT,NXET
```

Program continues

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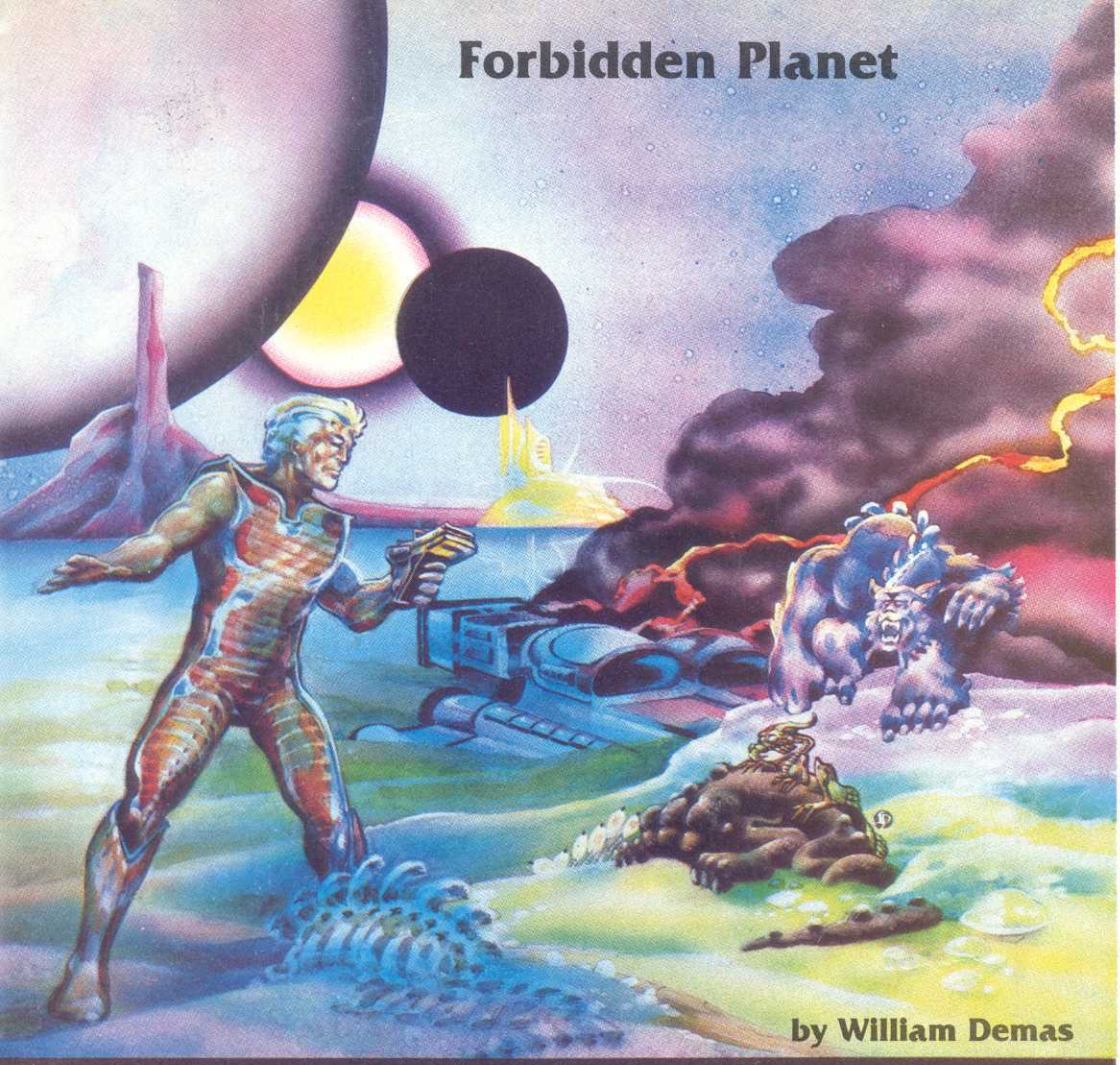
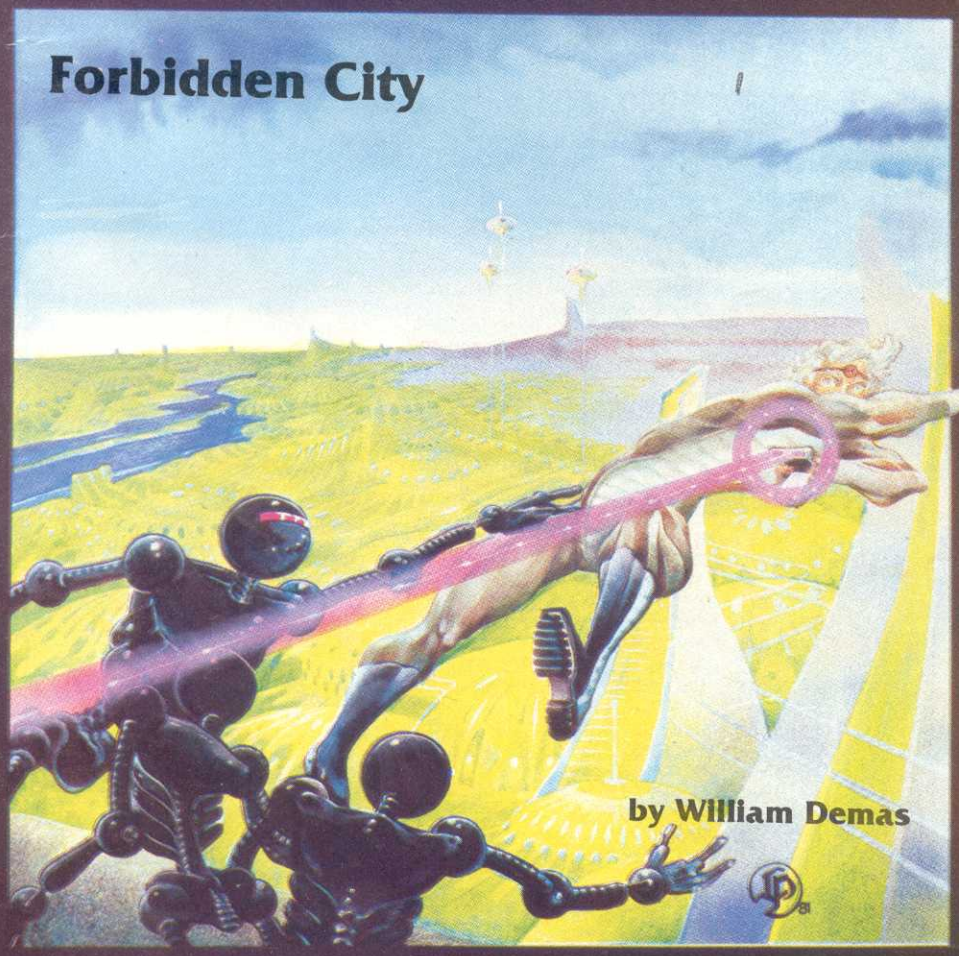
Program continued

```
190 DATA CLS,CSL,GOTO,GOOT,RESTORE,RESTART,GOSUB,GSUNK,RETURN,RE
TRNU,ON,IN
200
     '****** INPUT PROGRAM LINE ********

210 PRINT ">";
220 B2=0
230 LINE INPUT A$

240 '****** CHECK FOR 'COMMAND' ******

250 IF LEFT$(A$, 4)="LIST" GOTO 920
260 IF LEFT$(A$, 4)="SAVE" GOTO 730
270 IF LEFT$(A$,4)="LOAD" GOTO 850
280 IF LEFT$(A$,3)="RUN" THEN RUN
290 IF LEFT$(A$,3)="NEW" THEN RUN
300 IF LEFT$(A$,5)="PRINT" GOTO 1290
310 IF LEFT$(A$,4)="EDIT" GOTO 1330
320 IF A$="" :GOTO 210

330 '***** CHECK FOR QUOTES OR COLONS ******

340 A$=A$+CHR$(32)
350 B=INSTR(A$, Q$)
360 C=INSTR(A$, C$)
370 IF C=0 AND B=0 GOTO 480
380 IF B=0 GOTO 460

390 '***** FIND POSITION OF SECOND QUOTATION MARK *****

400 W$=MID$(A$, B+1)
410 B2=INSTR(W$, Q$)+B
420 IF C<B GOTO 460
430 IF C>B2 GOTO 460
440 GOTO 480

450 ' ****** IF COLON OUTSIDE QUOTES - TWO STATEMENTS ******

460 IF C<>0 THEN PRINT"ONLY ACCEPTING ONE STATEMENT PER LINE TOD
AY":GOTO 210

470 '***** CHECK FOR BEGINNING LINE NUMBER *****

480 TST$=""
490 :  FOR T=1 TO LEN(A$)
500 :     IF MID$(A$, T, 1)=CHR$(32) GOTO 540
510 :     TST$=TST$+MID$(A$, T, 1)
520 :  NEXT T

530 ' ****** IF LINE NUMBER VALID, ASSIGN TO ARRAY POINTER LN **
***

540 LN=VAL(TST$)
550 IF LN>LS THEN LN=LS-9
560 IF LN<1 PRINT "HUH?":GOTO 210

570 '***** LOOP TO SEARCH FOR ALL KEYWORDS *****

580 :  FOR G=1 TO WR
590 :     Y=INSTR(A$,SPAN$(G))
600 :     IF Y>0 GOTO 660
610 :  NEXT G

620 '***** ASSIGN LINE TO FINISHED PROGRAM ARRAYS *****

630 CP$(LN)=A$
640 GOTO 210

650 '***** CHECK TO SEE IF KEYWORD IN QUOTES *****

660 IF Y<B GOTO 690
670 IF Y>B2 GOTO 690
680 GOTO 610
690 L=LEN(E$(G))

700 ' ****** SUBSTITUTE PHONEY KEYWORD ******

710 MID$(A$, Y, L)=E$(G)
720 GOTO 610

730 '***** SAVE PROGRAM TO DISK *****

740 GOSUB 750:GOTO 780
750 NE$=MID$(A$,INSTR(A$,CHR$(34))+1)
760 IF RIGHT$(NE$,1)=Q$ THEN NE$=LEFT$(NE$,(LEN(NE$)-1))
770 RETURN
780 OPEN "O",1, NE$
```

Program continues





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Program continued

```
790 :  FOR N=1 TO LS
800 :    PRINT #1, CP$(N); CHR$(13);
810 :  NEXT N
820 CLOSE 1
830 GOTO 210

840 '***** LOAD PROGRAM FROM DISK *****

850 GOSUB 750
860 OPEN "I",1, NE$
870 :  FOR N=1 TO LS
880 :    LINE INPUT #1, CP$(N)
890 :  NEXT N
900 CLOSE 1
910 GOTO 210

920 ' ****** LIST SUBROUTINE ******

930 C4=INSTR(A$,"-"):IF C4<1 GOTO 1150
940 C3=INSTR(A$,"LIST")
950 ST$=MID$(A$,C3+4)
960 L1=VAL(ST$)
970 IF L1>LS THEN L1=LS-10
980 C5=INSTR(ST$,"-")
990 ST$=MID$(ST$,C5)
1000 IF LEN(ST$)=1 THEN L2=LS:GOTO 1110
1010 ST$=RIGHT$(ST$,(LEN(ST$)-1))
1020 L2=VAL(ST$)
1030 IF L2>LS THEN L2=LS-5
1040 GOTO 1110
1050 :  FOR N=1 TO LS
1060 :    IF CP$(N)<>"" PRINT CP$(N)
1070 :  NEXT N
1080 PRINT
1090 GOTO 210

1100 ' ****** LIST LINE NUMBER RANGE ******

1110 :  FOR N=L1 TO L2
1120 :    IF CP$(N)<>"" PRINT CP$(N)
1130 :  NEXT N
1140 GOTO 210

1150 ' ****** LIST SPECIFIC LINE OF PROGRAM ******

1160 V=INSTR(A$, SP$)
1170 IF V=0 GOTO 1240
1180 V2$=MID$(A$, V)
1190 V3=VAL(V2$)
1200 IF V3>0 THEN  PRINT CP$(V3) ELSE GOTO 1240
1210 PRINT
1220 GOTO 210

1230 ' ****** LIST ALL PROGRAM LINES ******

1240 CLS
1250 :  FOR N=1 TO LS
1260 :    IF CP$(N)<>"" PRINT CP$(N)
1270 :  NEXT N
1280 GOTO 210
1290 S$=MID$(A$,INSTR(A$,"PRINT")+5)
1300 PRINT S$
1310 GOTO 210

1320 ' ****** EDIT LINE ******

1330 LN=VAL(MID$(A$,(INSTR(A$,"EDIT")+4)))
1340 IF CP$(LN)<>"" GOTO 1370
1350 PRINT "UNDEFINED LINE NUMBER"
1360 GOTO 210
1370 PRINT LN;
1380 CU=INSTR(CP$(LN),CHR$(32))
1390 I$=INKEY$:IF I$="" GOTO 1390
1400 IF VAL(I$)>0 THEN NU=VAL(I$)
1410 IF I$="C" GOSUB 1480
1420 IF I$="D" GOSUB 1480
1430 IF I$="I" GOSUB 1480
1440 IF I$=CHR$(8) GOSUB 1540
1450 IF I$=CHR$(32) PRINT MID$(CP$(LN),CU,1);:CU=CU+1
1460 IF I$=CHR$(13) PRINT:GOTO 210
1470 GOTO 1390
1480 R$=INKEY$:IF R$="" GOTO 1480
1490 IF R$=CHR$(27) GOTO 1510
1500 MID$(CP$(LN),CU,1)=R$
1510 PRINT CHR$(8);
1520 CU=CU+1
1530 RETURN
1540 PRINT CHR$(8);:RETURN
```

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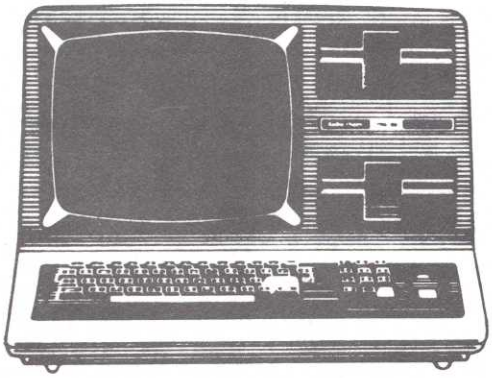

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With the proliferation of computer bulletin boards and the emergence of time-sharing services such as CompuServe and the Source, more and more TRS-80 owners are adding communication capabilities to their computers.

You can accomplish this by installing a Radio Shack RS-232 board in the expansion interface and obtaining a modem.

One other element is necessary. Your TRS-80 must be able to emulate a data terminal.

Terminal programs come in two basic forms. Dumb terminal programs have only the ability to communicate. The program included with Radio Shack's RS-232 is such a program. Smart terminal programs include many additional capabilities.

In the past, the smart terminal program considered to be tops was out of reach of many hobbyists because of its price.

David Lindbergh's Omniterm now offers a serious alternative. It is more affordable, in many ways easier to use, and features enhanced capabilities.

Omniterm is usable on both the Model I and III but before using it on the Model III, the disk must be processed with the TRSDOS Convert utility. I used the Model I for this evaluation.

On bootup, Omniterm is in a dumb-terminal mode. On the Model I it reads the sense switch settings on the RS-232 and configures the UART accordingly. If a lowercase modification is in the computer, Omniterm activates the lowercase driver. Since the Model III RS-232 has no sense switches, the Model III version uses a standard setting of 300 baud, 7 data bits, 1 stop bit and even parity—the only differences between the two models.

The Command Mode

The power of Omniterm is accessed by pressing the @ key twice. This places the computer into the Command mode. The video screen display is shown in Fig. 1. The information previously on the screen is not lost. It can be retrieved by hitting the Break key.

Although Fig. 1 looks bewildering at first, it is basically a menu and status display.

The current UART settings are shown at the bottom left. On power-up, this is the reading of the sense switches on the RS-232. The bottom right shows the number of errors which have occurred. Directly below this is a display of the I/O buffer status revealing the amount of characters currently stored and the number the buffer is capable of holding.

The top portion of the screen contains two columns of available commands. The commands on the left affect status flags and are invoked by pressing the single letter key listed to the left. It is not necessary to press Enter except after changing the screen format.

The letter P toggles the printer on and off. If the printer is not fast enough to keep up, Omniterm can buffer up to 2,048 characters. When the buffer fills an error message is printed and the printer is turned off. It continues to print until the buffer is empty, but no new data is forthcoming from the screen.

Screen reformatting lets you set your screen width. This is handy when communicating with, for instance, Apple bulletin boards which are set up for 40 characters across. By typing R and the number of characters, the screen may be set to whatever width you desire. This function also keeps words from being split at the end of a line.

C toggles the carriage return suppression function. In conjunction with reformatting, this enhances the ability to print neat, even lines. This is useful if you are communicating with a computer sending 80 character lines when your screen is formatted for 60. In this situation the TRS-80 prints 60 characters across, line-feeds, then prints the balance of the 80-character line. At this point the other computer sends a line feed leaving you with a short line. CR suppression prevents this.

L controls line-feed suppression. This is needed if you are communicating with another computer which sends only a carriage return at the end of a line rather than the standard carriage return–line feed.

The D command provides software control of half or full duplex. Default is full. If you communicate with a computer which does not echo your transmissions back to

"The buffer extends from the area Omniterm uses, to the end of memory, indicated by the HIMEM Pointer."

your screen and your modem does not have a half-full duplex switch, the setting may be toggled in Omniterm.

E turns on and off the Echo function which is used when you must supply an echo to another computer or terminal. Default is off.

G controls a CR/LF grouping function normally used when the TRS-80 is the host computer for a Teletype or video terminal.

I toggles the input to the buffer, this is used when downloading from a remote computer. The buffer extends from the end of the area Omniterm uses to the end of memory indicated by the HIMEM pointer. Omniterm will not write over any drivers that may be in high memory. If the buffer becomes full, an error message is printed and the buffer automatically closes.

O controls output from the buffer when sending to another computer. Omniterm provides for setting a delay between characters if sending to a slow machine. It also has the ability to provide prompted output. In this mode it sends a line and wait for a prompt from the receiving end before sending the next line.

The Command-mode functions in the right column do not have status flags. They are one-time functions that do their job and then finish. When the X key is pressed from command mode, the screen clears and the submenu in Fig. 2 is displayed. These are System functions. To leave the System mode, press Break and return to Command mode.

Q is a quick means of leaving Omniterm and returning to DOS.

C is a cold start. This acts as if one had gone to "DOS Ready" and then rerun Omniterm. All default values are reset.

Once you have Omniterm configured for a particular use, it is not necessary to repeat the process each time the program is used. Using the S key in the System mode allows your settings to be saved in a disk file, these can be loaded along with Omniterm in the future. It is possible to have many different files, each used with a different computer type.

If you are in Omniterm and wish different settings, pressing L while in the System mode brings up a prompt for the filespec desired. Type in the name, press Enter and your new settings are loaded.

Omniterm also provides for sending a string of characters as an auto sign-on, of up to 63 characters.

Using A while in the System mode allows creating or changing a sign-on message. This message can then be saved in the setting file.

Using I from the Command mode to open the input buffer causes the buffer to be cleared of any previous contents. If the buffer contains data and you want to add to it, use the R command. This command, when used in the system mode, reopens the buffer without clearing the contents.

Powerful Features

One of Omniterm's most powerful features is it allows translation of a byte to or from a device to any other byte. The Omniterm devices consist of the screen, the comm line, the disk file buffer and the printer. Typing T from the Command mode brings up the menu shown in Fig. 3. This function allows you to examine and modify seven byte translation tables, one for each possible device and one for each direction, to or from a device. The control key table and special command tables can also be modified.

The purpose of these tables is to translate any byte to or from a particular device to any other byte. This is useful for code conversions, or when customizing Omniterm for use with additional hardware. For example, if you have a printer built for use with IBM equipment, using EBCDIC code rather than ASCII, the needed conversion can be done while in Omniterm—no external program is needed.

While other terminal programs can support code conversions, Omniterm is the only one I have seen where the operation is self-contained.

An example of one of the tables is shown in Fig. 4.

Omniterm, on start-up, uses whatever parameters the sense switches in the RS-232 are set for. To change these, type U and make your adjustments to the baud rate, parity, number of data bits and number of stop bits.

Your micro interprets the Break key as a value of 1, the same as Control A, and by default uses this value to generate a true break. To send a Control A without generating a break, go into Command mode and type A. The Control A is sent and Omniterm returns to Normal mode.

From the normal mode, pressing the @ key twice causes entry to the Command mode. To transmit an @ character you must type it three times; the first two cause entry to the Command mode and the third transmits @ and returns Omniterm to normal mode.

Unique Functions

A unique function of Omniterm is the ability to scroll back the display. You can accomplish this by typing B while in the Command mode. Holding down the space bar causes the display to scroll. Omniterm holds in memory the last 2,048 bytes received at all times. If something goes by too quickly, just roll back the text and read it again!

Z sets the real-time clock to zero, enabling you to keep track of time on a computer system with time charges, or when paying for a long distance call. The Clock function must be activated from DOS before loading Omniterm so the clock displays on the screen.

To send a file out from the TRS-80, it must first be loaded into the I/O buffer. This is done with the F command.

Saving a received file to disk requires pressing the S key. Once this is done you are prompted for a filespec. This can be any name, so long as it is in standard TRSDOS format. In case of a disk error while saving, Omniterm closes the file so text already written is retrievable. The contents of the buffer are intact, so you can try again.

Omniterm changes all uppercase to lower and vice versa, so Shift must be pressed to get uppercase as on a typewriter.

If using the Model III, a shifted zero reverses this. Some operating systems for the Model I also allow toggling back and forth. If your system does not allow this, the FROM keyboard translation table may be altered so the two cases are no longer reversed. A sample is included on the Omniterm disk under the name UPPER/OMT

```
@                          OMNITERM Command Mode—Hit BREAK to quit

P PRINTER                  is:  OFF   X SYSTEM COMMANDS
R SCREEN REFORMATING       is:   54   T CHANGE/EXAMINE TABLES
C CR SUPPRESSION           is:  OFF   U CHANGE UART SETTINGS
L LFSUPPRESSION            is:   ON   A SEND CONTROL-A & QUIT
D DUPLEX                   is: FULL   @ SEND "AT" SYMBOL & QUIT
E ECHO                     is:  OFF   B SCROLL BACK DISPLAY
G CR/LF GROUPING           is:  OFF   Z ZERO REAL TIME CLOCK
I INPUT TO BUFFER          is:  OFF   F FILL BUFFER FROM DISK
O OUTPUT FROM BUFFER       is:  OFF   S SAVE BUFFER TO DISK

Baud Rate =     300     Parity Errors: 0
Data Bits =       7     Framing Errors: 0
Stop Bits =       1     Overrun Errors: 0
Parity    =    EVEN     Buffer: 0 of 25742 used
```

Fig. 1.

"While other terminal programs have the ability to support code conversions, Omniterm is the only one. . . where the operation is self-contained."

which may be loaded into memory with Omniterm.

Five Utilities

Five additional programs included on the disk are the following utilities:

- BINHEX/CMD converts binary files to ASCII hex files so they may be transmitted in standard format.
- HEXBIN/CMD converts the ASCII hex files back to binary.
- BINERR/CMD converts any type file to a special error-detecting, bit-packed format with checksums at the end of each line and a sum of all checksums at the end of the file. More efficient than BINHEX, this will pack 50 percent more data into the same amount of space.
- ERRBIN/CMD re-converts files made by BINERR and detects any errors in the file. If errors are found, the file should be retransmitted until none are found.
- TEXTED/BAS is a line-oriented text editor. This is useful for getting rid of garbage picked up when a buffer is opened too soon or closed too late. Just load the file into TEXTED, delete the lines with garbage and save the file back to disk. It is also useful when you save a Basic file in ASCII format and get a Direct Statement in File error because a line is too long when reloading. TEXTED makes correcting such problems easy. It can also create files to be transmitted by Omniterm.

Hit BREAK to quit
Table TO Display

00=00	01=01	02=02	03=03	04=04	05=05	06=06	07=07
08=08	09=09	0A=0A	0B=0B	0C=0C	0D=0D	0E=0E	0F=0F
10=10	11=11	12=12	13=13	14=14	15=15	16=16	17=17
18=18	19=19	1A=1A	1B=1B	1C=1C	1D=1D	1E=1E	1F=1F
20=20	21=21	22=22	23=23	24=24	25=25	26=26	27=27
28=28	29=29	2A=2A	2B=2B	2C=2C	2D=2D	2E=2E	2F=2F
30=30	31=31	32=32	33=33	34=34	35=35	36=36	37=37
38=38	39=39	3A=3A	3B=3B	3C=3C	3D=3D	3E=3E	3F=3F

Hit—for previous page, +/; for next, ENTER to alter value

Fig. 2.

Five file-setting table files are supplied with Omniterm. If necesary, they may be modified for a particular user's requirement. The five are:

- UPPER/OMT reverses the keyboard to standard TRS-80 format, shift for lowercase.
- SOURCE/OMT is for using the Model I with the Source. Three changes were made. The Break key sends Control P rather than a true break. The underscore character is translated to a semicolon. (The UPI news service on the Source fre-

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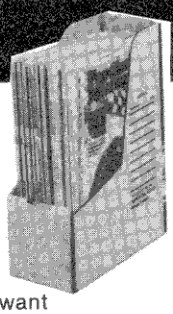

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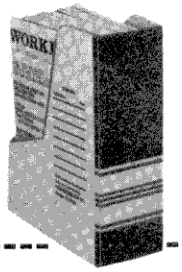

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"Dumb terminal programs have the Basic ability to communicate, that's all. . . smart terminal programs include many additional programs."

quently sends underscores rather than semicolons.) UPI also sends a decimal; 26 at times, which causes Omniterm to home the cursor, but not to clear the screen. This has been changed to a null. A sample auto-sign-on message for use with Tymnet and the Source is included with this file.

- SOURCE3/OMT is identical to the above, but for the Model III.
- MNET/OMT is used with CompuServe and Micronet (a subdivision of CompuServe). Changes refer to screen reformatting, which is turned off, and to the Break key, which now sends a Control C. A sample auto-sign-on message for use with Micronet is included. This table is for the Model I.
- MNET3/OMT as above, but for use with the Model III.

For the user in search of a top-flight terminal program at a reasonable price, Omniterm fills the bill admirably. Everything works as advertised and I've found no bugs.

The documentation is excellent. It consists of 76 pages of explicit directions as well as several appendices full of useful information such as code conversion tables, a glossary and more.

All registered owners are notified of changes and improvements, and upgrades are provided to owners for a $15 fee.■

System Commands—Hit BREAK to quit

Q Quit Omniterm and go to DOS	C Cold Omniterm Restart
L Load Omniterm Settings	S Save Omniterm Settings
A Auto Sign-on Message Change	R Reopen Input Buffer

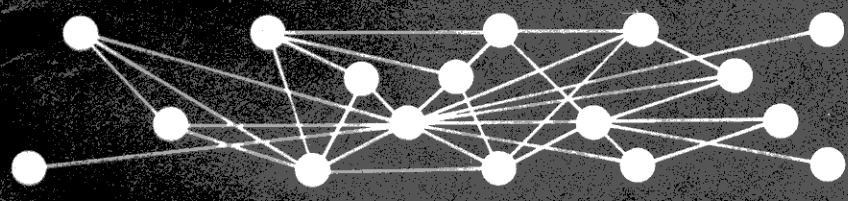
Current Auto-Sign-on message:

Fig. 3.

Select a table by number, or hit BREAK to quit

1) To Display table
2) To Comm Line table
3) To Disk Buffer table
4) To Printer table
5) From Keyboard table
6) From Disk Buffer table
7) From Comm Line table
8) Special Command table
9) Control Key table

Fig. 4.



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Cornucopia Software
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Walnut Creek, CA 94596
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Miz'Spell
Programs Unlimited
20A Jericho Turnpike
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$50
Proofreader
Aspen Software
P.O. Box 339-M
Tijeras, NM 87059
$84

Michael M. Finefrock, Ph.D.
The College of Charleston
Charleston, SC 29424

Will proofreading programs turn your flawed, imperfect scribblings into first-rate prose? As contradictory as it may seem, a spelling checker does not know how to spell. The program will remember the words it has been told to learn, but it does not know when to use them, nor does it know any of the grammatical rules involved.

As often as you might want to ask it for the correct spelling of a word, given the limitations of a 48K system, the program is never going to respond with suggestions to use other words. Programs that operate like an electronic thesaurus exist, but this side of a mainframe there is little likelihood that such a utility will ever be supplied with all the necessary features of a spelling checker.

Proofreading programs should be fast and versatile. On some occasions you might be entirely satisfied if the program does a fast check of your text and lists the unknown words. Under other circumstances you may want to have a video presentation of the suspect words, one by one, with an option to change the spellings in the original document file without having to reload the text with a word processor.

Spelling checkers could save a lot of time if they showed you suspect words in context, so you could verify the nature of the typographical error or misspelling involved before entering a correction. If the program has an interactive correction phase, then a single keystroke should be sufficient to tell it that a word it does not know is indeed valid, or should be added to its vocabulary or immediately changed.

Spelling checkers should be efficient, smooth to operate and well error trapped, and like any other sequence of computer operations, the ideal spelling checker should be able to perform with 100 percent accuracy. This is possible if the dictionary file is adequate in size and composed *only* of correctly spelled words, the words chosen are appropriate to the user's working vocabulary, and the program itself introduces no extraneous errors.

Which spelling checker measures up to the requirements that I have just specified? Table 1 provides a comparative list of the principal features of each program I have reviewed.

The Testing Process

The initial problem was how to give each program the same advantages or disadvan-

Name	CHEXTEXT	HEXSPELL	MICROPROOF	MIZ'SPELL	PROOFREADER
Price	$59.95	$69	$184.50*	$50	$84#
Model II available?	No	No	Yes($149.50)	No	Yes($119)
Model III available?	Yes	Yes	Yes	Soon	Yes($94#)
Pages of Documentation	8	7	30	5	10
No. of Disks in package	2	2	2	2	4
Comes with DOS?	No	No	No	TRSDOS	File XFER
Comes with LCDVR?	N/A	No	No	LC/CMD	LCDVR/CMD
Total size in grans	77	101	74	88	174
No. Drives, MEM required	2-48K	2-48K	1-32K	1-48K	2-32K
Word processor access?	Yes	No	Yes	No	No
Requires ASCII text?	No	No	No	Yes	No
Max. letters per word	32	17	32	any	40
Dictionary size, words	10,000	20,000	30,000	18,000	38,000
Main dictionary type	Literal	Code	Packed	Code	Hashing
Create alternate?	No	Yes	No	Yes	No
Expand dictionary?	Yes	No	Yes	Yes	Yes
Add to dictionary?	Yes	Yes	Yes	Yes	Yes
Auto add to dictionary?	No	No	No	Yes	No
Delete from dictonary?	Yes	Yes	No	Yes	Yes
Learned word file?	Yes	No	No	No	Yes
Create word file?	No	No	No	No	Yes
Correct source file?	No	Yes	Yes	Yes	Yes
Display context?	No	Yes	Yes	Yes	Yes
Full text scroll?	No	Yes	No	Yes	Yes
Elect to exit program?	Yes	Yes	No	Yes	Yes
Process another?	No	Yes	Yes	No	No

*Total price with Correcting feature and Word Processing Conversion.
#Total price with Proof-Edit.

Table 1. A Summary Presentation for Proofreading Program Features

Reader Service for facing page ✓47→

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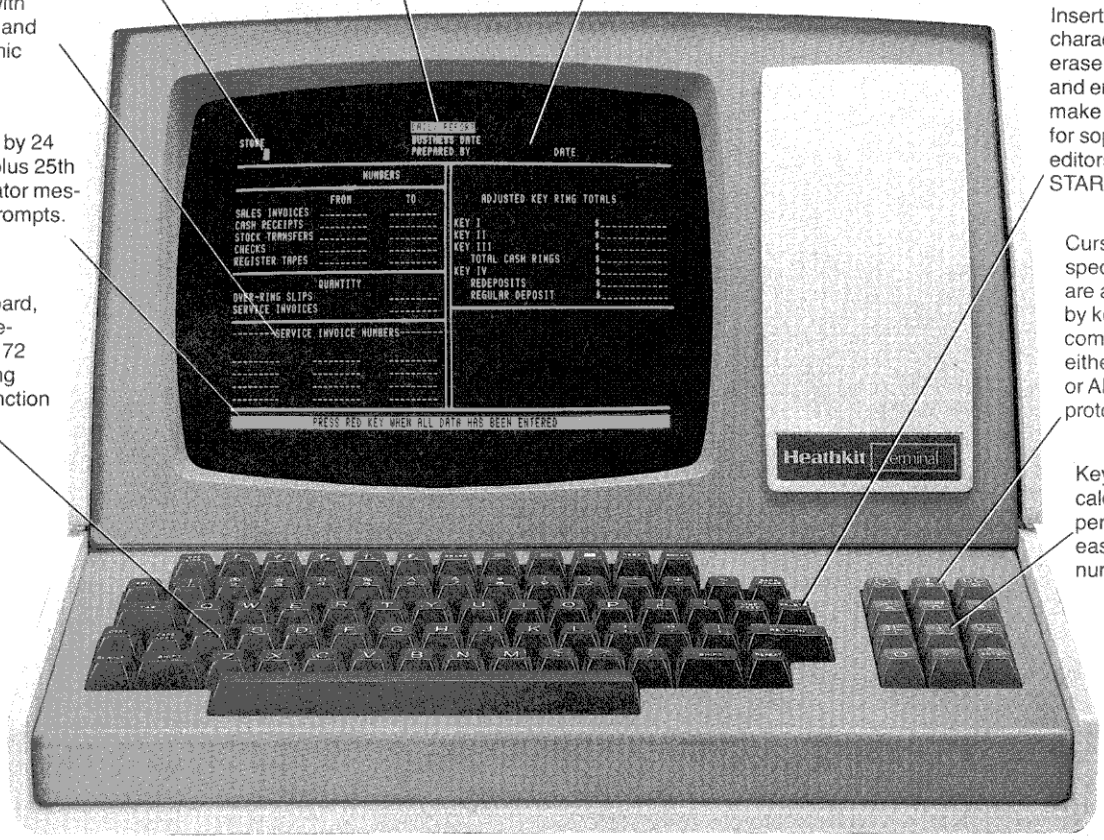
80 character by 24 line format, plus 25th line for operator messages and prompts.

Professional quality keyboard, standard typewriter layout, 72 keys, including 12 special function keys.



Insert and delete character or line plus erase to end of line and end of screen make the 19 ideal for sophisticated editors like WORDSTAR.

Cursor and special functions are accessible by keyboard or computer, using either DEC VT-52 or ANSI Standard protocols.

Keypad in calculator format permits fast, easy entry of numeric data.

*In kit form, F.O.B. Benton Harbor, MI. Also available the completely assembled Zenith Z-19 at $895. Prices and specifications are subject to change without notice.

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CP-202C

"I sprinkled my text with 15 intentionally misspelled words..."

tages the others enjoyed. First, I had to set up a test that would involve no disk swapping or any unnecessary drive access calls. That part was easy, since I have a 48K double-density system and two drives I can push to 44 tracks each. As a result I was able to put four of the five programs on a single disk along with the test document. Since only two of the spelling checkers I tested could be called from within a word processor, I did not include that function in the timed part of the test.

More complicated was the matter of how to run the programs once I had read and understood the documentation. Two programs will operate with little or no keyboard input, other than the name of the file to be checked. The other programs do not finish until they have gone through an interactive correction phase that could introduce the added factor of my own reaction time. Some of the spelling checkers have been programmed with their functions in the form of an INKEY string, while others require use of the Enter key. Thus the problem was how to time the programs, not my own ability or inability to use them as fast as humanly possible.

In this case the solution appeared in the form of an excellent disk operating system known as NEWDOS80 version 2.0, which can route all program requests for an operator input key to a chain file. This took a lot of experimentation, as I had to custom tailor a chain file for each program, but it proved well worth the time I spent. By using the lowercase drive that NEWDOS80 2.0 automatically loads into memory, I was able to reduce the number of unnecessary variables even further.

Then there was the problem of what to use for a test document. You want to evaluate the performance of the programs on both long and short texts, but the matter of what topic to choose was a very arbitrary decision on my part. I decided to use a letter about proofreading programs, requiring nothing in the way of specialized vocabulary.

Using a pen name to undertake a mythical correspondence with Wayne Green, I sprinkled my text with 15 intentionally misspelled words typical of the typographical errors my alter ego might make. These included: examples of nonstandard usage, *ain't* and *irregardless;* misspelled nouns, *speach;* words run together, *alot;* improper contractions, *allready* and *wo'nt;* incorrect prefix, *encorrect;* incorrect suffix, *truely;* incorrect plural form, *dictionarys;* dropped double letter, *irelevant, rightfuly, refered* and *writen;* and also some simple misspellings, *comparitive* and *abbominations.*

The latter word, which broke at the end of a line, did double duty as it allowed me to find out whether use of a hyphen made any difference to the proofreading programs. The letter also included two English spellings of common words, and eight other correct words that simply were used incorrectly or occurred as typographical errors.

I included one other typographical error in the test document, even though I knew that none of the spelling checkers would be able to catch it, since it involved typing an incorrect character, *s*, in place of the article *a*. The point to be made is that proofreading programs which can check single character words and catch that particular typographical error would not have been able to accept the B.S. abbreviation in the signature.

The 225-word test document is shown in Fig. 1 and the results of the test are given in Table 2, along with additional information

	Declared Errors	Correct Words Declared Suspect	True Errors Detected	Wrongly Used Words Detected	British Usage Caught	255-Word Test Speed	1650-Word Test Speed
CHEXTEXT	50	31	14	5	2	1:49	2:55
HEXSPELL	34	15	15	4	2	1:41	10:18
MICROPROOF	22	13	8	1	1	1:02	2:25
MIZ'SPELL	26	15	10	2	1	1:39	10:23
PROOFREADER	26	10	14	2	1	4:12*	6:55*

*The combined time of Proofreader and Proof-Edit.

Table 2. Test Results of the Five Proofreading programs for the Model I.

November 1st, 1981

Mr. Wayne Green, Publisher
80 MICROCOMPUTING
80 Pine St.
Peterborough, NH 03458

Dear Mr. Green,

Herewith, at long last, I am inclosing my comparitive review of five proofreading programmes for use on the TRS-80 Model I. As I believe you are allready well aware, such programs are not an absolute panacea for the woes of the word processor user--they do not function as electronic dictionarys and and wo'nt tell the user when he has chosen an encorrect or irelevant word for his context, nor will they catch the grammatical errors we all are prone to make alot of. But they are quite rightfuly refered to as "spelling checkers," for they do give the righter an opportunity to catch typographical errors and/or faulty usage such as "irregardless" and "ain't," tho such abbominations do seem to crop up ever more frequently in the colloquial speach of Americana.

The principle advantage to having such a peace of software in addition to s word processor is that proofing what one has writen need no longer be a burdensome and time-consuming task, done either in haste or neglected altogether. In fact, I would venture to say that just about anyone using a "spelling checker" will find it all two easy a way to polish one's pros.

Very truely yours,

Will Fullydone, B.S.

Fig. 1

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"Apparat's long-heralded text checker was the last of the lot to reach the market."

on the speed at which each of the programs processed a much longer document of 1,650 words.

Chextext 1.0

Pronounced "check text," Apparat's long-heralded text checker was the last of the lot to reach the market. Sold on two formatted data disks, it requires a minimum of 48K RAM and a two-drive, single-density or a one-drive, double-density system. Chextext is largely interactive, and while the documentation supplied does not explain every step of the program, it is quite adequate.

The Chextext package consists of an Assembly-language program and object file, an ASCII character dictionary (65 grans), and a patch to Scripsit which permits the user to activate Chextext and process a document simply by entering the special command "P,CHX." In a two-step operation CHEXTEXT/CMD first compresses the document by casting out all the duplicate words it finds, and then verifies the remaining list against its own vocabulary.

During the suspect word review, the user may elect either to ignore a word not recognized by the program, add it to the dictionary, or mark it with a # in the source text file.

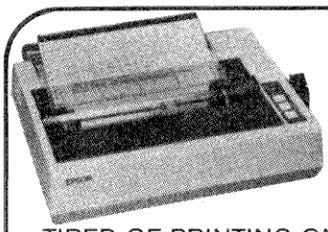
A separate dictionary maintenance function offers several useful options. You can list any portion of the dictionary to the screen simply by entering the desired parameters. This can be particularly useful when used with Chextext's updating feature, which makes it possible to manually add and delete words from the program vocabulary.

An important part of the Chextext dictionary is its 10-sector update file of user-added words. When this is completely full, the program prompts the user to do a reorder that incorporates his words into the main dictionary in alphabetical order. A notable decrease in the program's speed of operation results. Delete word requests are not effective until you run such a reorder, and if a large number of frequently used words are left to accumulate in the update file, the program's operating speed slows down considerably.

Using Scripsit's hyphenation feature before processing a document with Chextext affects the number of suspect words found, as the program ignores any word particle that includes the AD byte put in by Scripsit. During the test, Chextext refused to recognize *abbom-inations* as an error until the pseudo-hyphen had been either removed or replaced by the equivalent 2D ASCII character.

Chextext does not allow you to see the context in which your potential error has occurred, nor does it provide an easy way in which to create an alternate main dictionary. Chextext does not allow you to correct words while processing a document. Instead you can mark suspect words in the source file by changing the last character of each one to a #. This makes it necessary to do an additional series of three-step operations, using the word processor's global search function to locate each bad word in a document so you can correct the error and remove the # sign.

Chextext combines the accuracy of a literal dictionary with considerable operating speed, particularly noticeable on large documents. Although the author's decision to opt for ASCII format over word compres-



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". . . commonly used words accumulate at the front of the vocabulary where they are found fastest."

sion may appear to have been misguided, the program must be marketed on 35-track, single-density disks that hold only a very limited 10,000-word dictionary. However, Apparat offers all registered owners of Chextext the opportunity to obtain *free of charge* whatever size dictionaries will suit their own hardware configurations—up to and including a 50,000-word version on a dual 80-track, double-density disk!

Hexspell 1

Hexagon Systems was the first to market a spelling checker for the Model I on an international basis. The seven pages of documentation provided by Bernard Hughes, the creator of Hexspell, are clearly written and walk a first-time user through the entire program. During the test trial Hexspell was the only one of the five programs to prove 100 percent effective in detecting true errors. It has the same minimum system requirements as Chextext, but since its vocabulary is twice as large, Hexspell questioned only half as many correct words.

Hexspell is a Compiler Basic written program. Its components are a Microsoft run-time package BRUN/CMD and SP/CHN, the program files, and a compiled code dictionary (55 grans). Hexspell's initial vocabulary is smaller than the space that has been permanently allocated for the word list because the dictionary is divided into rows of words not necessarily in alphabetical order.

As words are called up during the text checking process they are moved to the head of their row. When the word list is full, a new word added at the front of the list pushes an old one out the back. As a result, commonly used words accumulate at the front of the vocabulary where they are found fastest. There is an almost human quality to Hexspell, for it seems to pick up speed as it becomes more attuned to the user's own vocabulary.

A principal feature of the program is that the source text is scrolled up the screen at a fast reading speed, with each suspect word displayed in full context. This gives the user an opportunity to change or add it to the dictionary on the spot. You must delete words in lowercase.

Hexspell's full text scroll feature means Hexspell's operating speed is slower than most other spelling checkers'. This becomes more noticeable with longer documents. You can increase the program's speed somewhat by electing not to check words with uppercase letters, such as names and addresses, control codes, and so on. But this means that the first word in every sentence will also not be checked.

The dictionary is small (a maximum of 28,000 words) because it is written in compiler code. Even if you have the available disk space of an 80-track, double-density system, you cannot expand the vocabulary file by so much as a single sector. If you frequently use foreign terms and expressions in your writing you will find Hexspell's word list limiting.

What can be seen as a disadvantage from one point of view may well be one of the program's strongest selling points. The "fast reading speed" video scroll of the full text offers an opportunity to run your own quality control on the document at the same time Hexspell is working. This gives the writer a convenient opportunity to catch any correctly spelled words that have been

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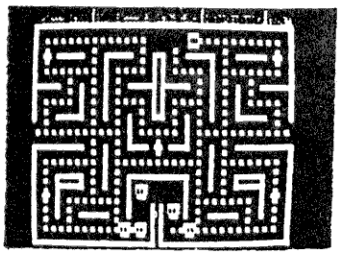

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"If speed were the sole consideration then Phil Manfield. . . would be king."

doubled up or used incorrectly (e.g., principle instead of principal) which no proofreading program would recognize as being in error. And while Hexspell's limited vocabulary size can be a problem, a utility program CLEAR/BAS makes it possible to create as many alternative word lists as you need.

An enhanced version of Hexspell may already be available by the time this review appears. Allegedly it will offer an expandable dictionary, text scroll speed control, an automatic vocabulary add function, and a programmable character set, as well as checking to see if the dictionary is present before prompting for a disk mount. With added features such as these, Hexspell 2 should be a formidable tool at proofreading time.

Microproof

In nearly every respect Cornucopia Software's entry in the spelling checker competition is in a class by itself. It alone will operate on a one-drive, single-density 32K system, and its documentation is at least three times the size provided by the other firms.

In the version tested the full Microproof program had 12 separate elements: a main program and dummy file, three dictionaries (56 grans total), plus PRINTDIC/CMD and ADDTODIC/CMD, programs which allow you to print and to expand the dictionary. Standard Microproof sends the list of suspect words to the screen and also the printer, if turned on.

The text correction feature is available as an option, as is a patch to either Electric Pencil or Scripsit that makes it possible to call the Microproof program, check and correct a document, and then reboot the word processor, all by issuing only a one-letter command. If you elect to see the context in which a suspect word occurs, Microproof displays only a portion of the source text, marking the screen location of the word by putting three question marks after it.

By using sorted word packing and by substituting one-character tokens for root words, Cornucopia was able to compress 30 percent more vocabulary into the Microproof dictionary. Any words added to the dictionary are compressed in the same fashion as the basic word list which comes with the program, and the user can easily learn to use the coding system. This involves no more than entering the root word followed by a space, a v for verb, n for noun, a for adverb, or j for adjective *and* adverb.

One of the principal criteria by which you judge a proofreading program, or for that matter a human proofreader, is effectiveness in detecting true errors. Where accuracy is concerned, Microproof made an extremely low grade on the test trial, detecting only 53 percent of true errors in the sample document.

A principal cause for the program's poor showing appears to be the root word, prefix, suffix coding system which gives Microproof its speed advantage. Each of the errors that went undetected were compound words: *ain't, comparitive, encorrect, irregardless, refered, truely,* and *writen.*

It seems that the prefix-suffix coding system can create a sizeable number of such artificial words, or at least enough to significantly reduce the 50,000-word equivalency claimed for the Microproof dictionary. This conclusion seems further justified when you compare the performance of Microproof and the other programs with regard to the number of correct words declared suspect when processing the test document.

The text correction module of Microproof should be easier to use. Keys selected for the two principal edit functions require an initial shift to uppercase, and have not been INKEYed. The initial video review of suspect words is done entirely in lowercase. As a result, when processing documents you must resort to the in-context display feature far more frequently than would otherwise seem necessary.

Unlike the other programs tested, Microproof does not offer the option to close files and exit to DOS if and when you desire, nor are you given a convenient means to delete unwanted words from the dictionary.

Cornucopia Software has provided far more program documentation than seems necessary. You find virtually the same explanation of the dictionary coding system in three different places, and a large facsimile of the correction-mode screen display is shown 16 different times in the text. If you want to learn how to use the program in the shortest time possible, check the table of contents to see which of the several appendices to read first.

If speed were the sole consideration then Phil Manfield, author of Microproof, would be king. While the advertising claims made for the program may seem to be a bit excessive, Microproof is *very* fast. The tests showed that when handling either long or short documents it was the fastest of the spelling checkers I evaluated.

Cornucopia Software has been very responsive to user feedback and already has made a number of improvements in their original version of Microproof. A 20,000 word literal dictionary will soon be available which should greatly improve the program's overall accuracy.

Miz'spell

The author of Miz'spell, Arnold Schaeffer, started college about the same time that Programs Unlimited began to market his

Reader Service for facing page ✓28→

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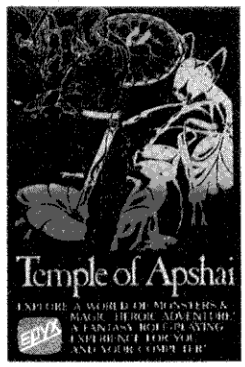

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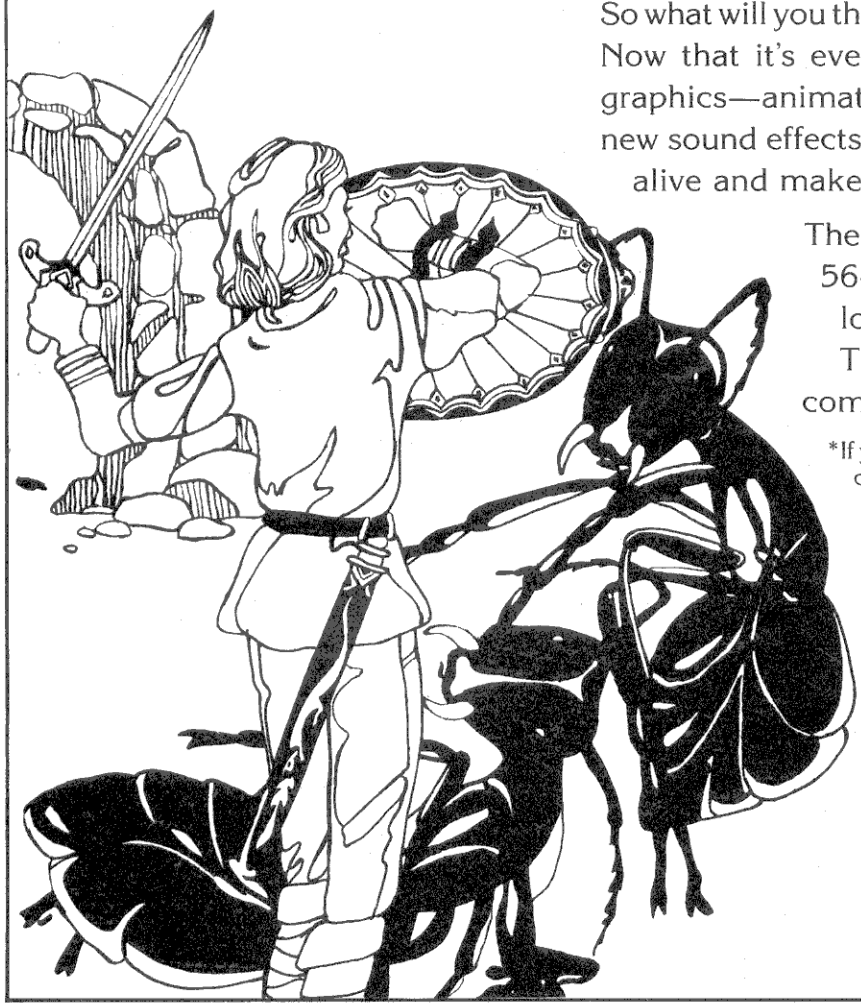

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EPYX COMPUTER GAMES THINKERS PLAY

"Miz'spell offers a number of features missing on other spelling checkers."

program. The documentation is very readable. The program comes on two TRSDOS system disks and works with only one disk drive, though it requires 48K RAM to operate.

A streamlined package of only five components, Miz'spell is another Compiler Basic-written program, and like Hexspell includes a Microsoft run-time package. However, it uses a different hashing routine to transform words into three byte values that can be stored in the dictionary.

The program first loads a basic vocabulary of 1,700 words into memory. When checking a word, it first looks through the words that are in memory and then goes to the dictionary file on the disk, which in its virgin state is about 16,000 words.

Upon initialization you can opt to reconfigure the program if necessary. This involves specifying the number of drives, the defaults for source and destination file extensions, a dictionary name default, and the minimum word length in characters for the program to check. The latter figure affects the program's operating speed; I used a value of 2 during the test.

Unhappily where accuracy is concerned, Miz'spell was true to its name and failed to identify one third of the true errors in the test document. Since these included not only compounds and contractions but also a root word, *speach*. I conclude that the hash codes generated by the program can be shared by more than one word.

Though it zipped along on the short test text, Miz'spell slowed considerably on the longer document. Miz'spell took more time on the long text than the other programs because it must leave room for its in-memory dictionary, and cannot load all of a large sized document at one time.

Those who use Electric Pencil, which writes documents to disk as ASCII files, will have no problem using Miz'spell. However, Scripsit fans must remember to use the "Save,A" option with any text to be proofread.

Miz'spell offers a number of features missing on other spelling checkers. There is an Auto learn command to automatically add all the new words in a document to the dictionary. This is an excellent feature to have if you intend to create alternative dictionaries, though you must take special care to ensure that *all* the words are indeed correct in any document on which you use this feature.

Like Hexspell, Miz'spell offers the advantages of a video scroll of the full text being processed. At the conclusion of the proofreading session Miz'spell displays statistical information on the total number of words checked, the number added to the dictionary, and the percentage of words recognized by the program.

Proofreader

Proofreader is the creation of Aspen Software, and is another component package that you can upgrade with the addition of a correction feature called Proof-Edit. The complete program is available on four disks which require a minimum two-drive, 32K system. Documentation is quite good.

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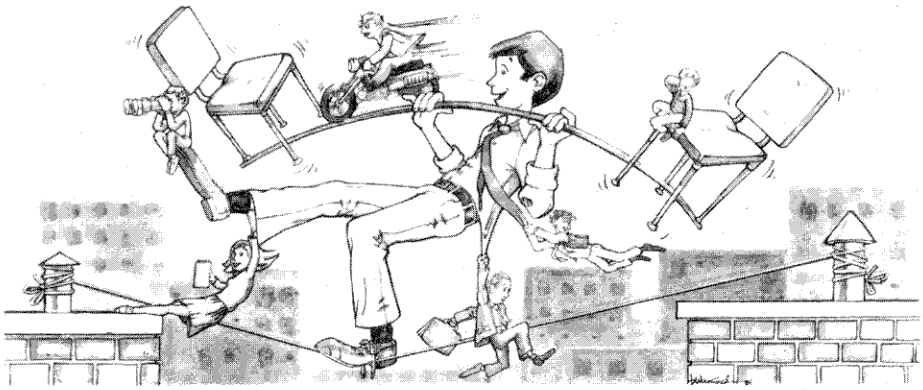

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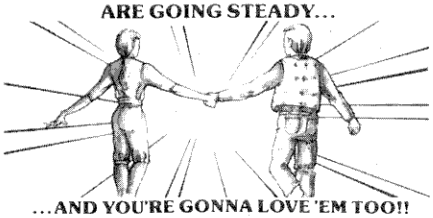

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". . . the ideal proofreading program has yet to be produced. . ."

adding to the basic word list. To get around the speed-versus-accuracy problem that has bedeviled their competition, the creators of Proofreader and Proof-Edit chose to employ a hashing algorithm.

Like Chextext, the program does an initial sort of the words in the text and casts out all the duplicates it finds. As a result, Proofreader can handle documents with as many as 1,600 different words, a limit seldom reached on a 48K system.

Proofreader creates a bad-word file with the extension/BWD which Proof-Edit then reads. The program has its own routines for identifying source and output files, but you can easily use two switches to override the defaults.

The program and dictionary together are huge. Nothing less than an 80-track, double-density system will permit the entire program to reside on one disk. Proofreader does not scan for the presence of Proof-Edit before exiting to DOS, nor have the edit functions been INKEYed.

The only true error that Proofreader failed to recognize in the test document was the word *dictionarys*. This is because the program uses a different technique to handle an s at the end of a word. If the letter before the s is not a vowel or another s, Proofreader assumes the word is a regular plural and drops the s in order to create the singular form. This may or may not be a problem, depending on the user's application.

Proofreader has all the advantages of the full text video scroll and accurate in-context evaluation of suspect words that Hexspell and Miz'spell offer. But the hashing algorithm Aspen Software used significantly reduces the amount of time required to process longer documents. This program is the only one that saves suspect words to a disk file for later reference. Proofreader's creators are also very responsive to user feedback.

Which Is Best?

It all depends on what you are looking for, on what your special application happens to be, on the particular hardware configuration of your system, and on how much time, effort and money you are willing to invest.

If operating speed and ability to call the program from within a word processor are the principal considerations, then either Microproof or Chextext are clear winners. If you demand accuracy combined with the convenience of a document correction feature, then the choice seems to be between Hexspell and Proofreader.

If you have only one disk drive and a single-density system, choose either Microproof or Miz'spell; but if that drive is a double-headed 80, then for the largest available literal dictionary choose Chextext. If you want value for your money, Miz'spell is a "best buy."

In my opinion the ideal proofreading program for the Model I, boasting 100 percent accuracy and lightning speed, has yet to be produced—and probably never will be, though even Radio Shack has plans to take a crack at it.

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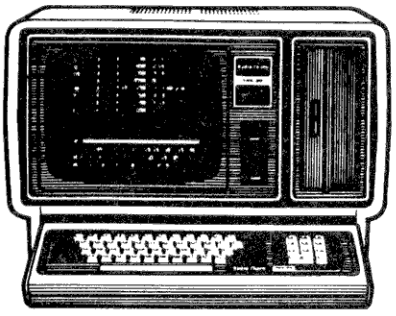

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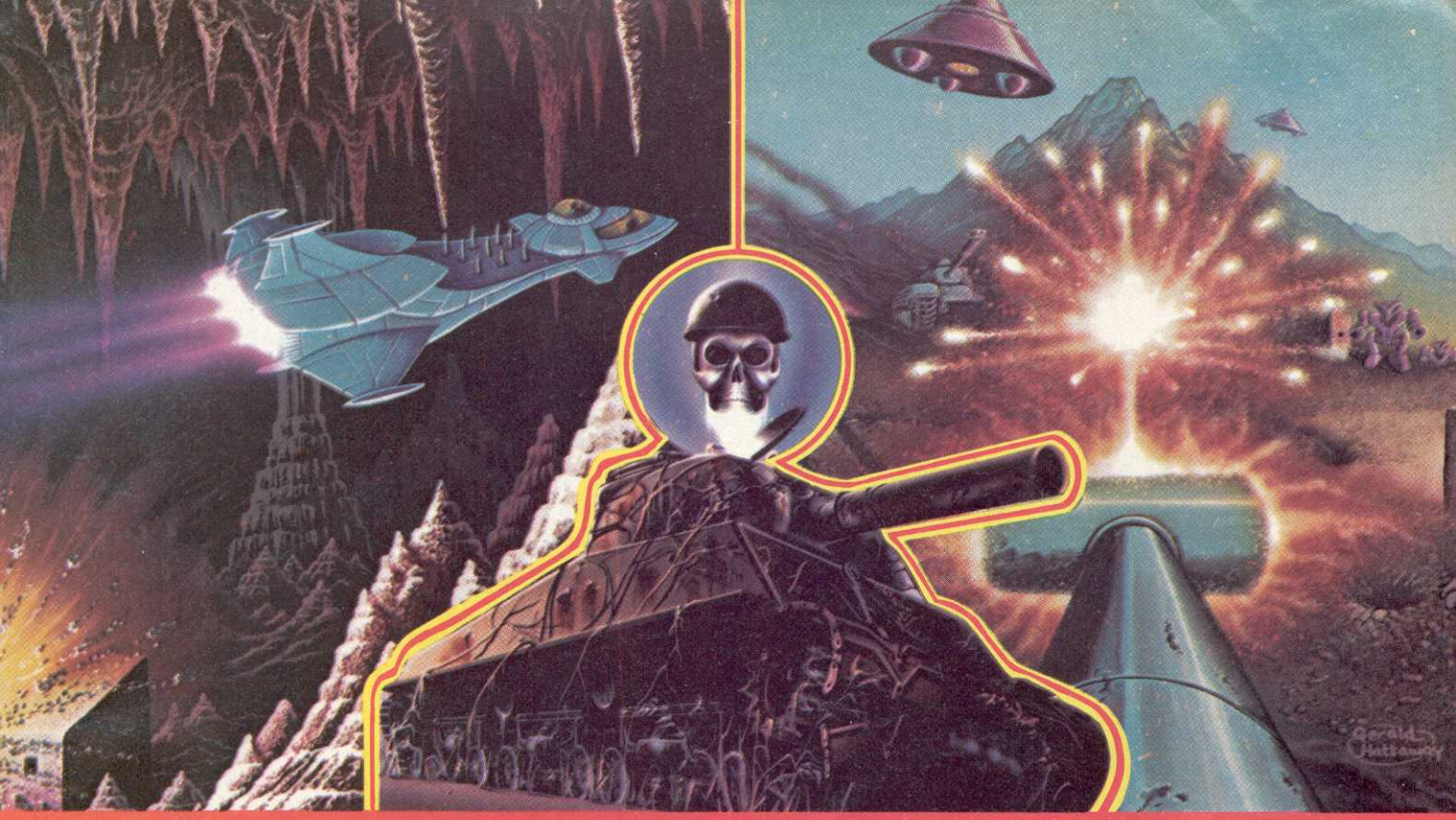

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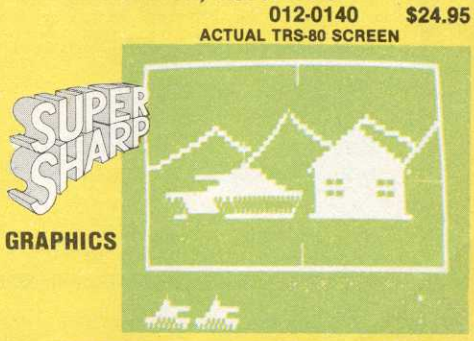

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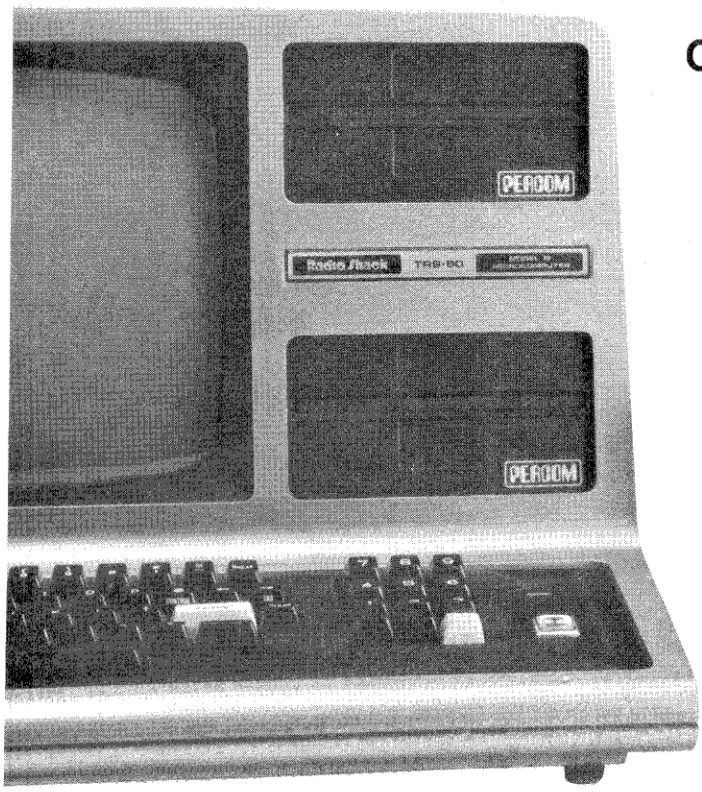

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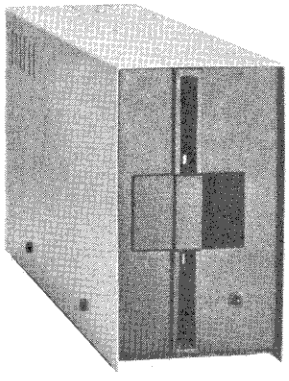

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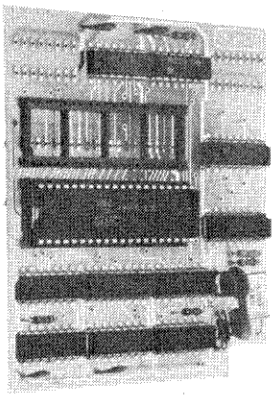

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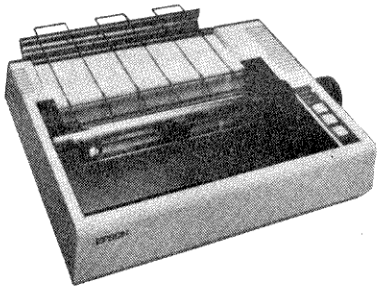

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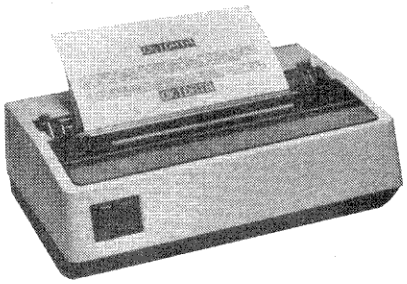

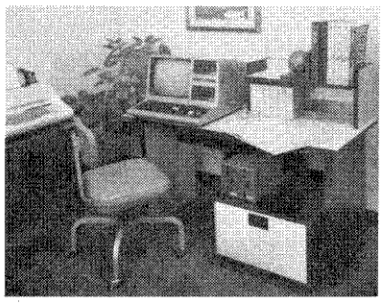

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Computers and the handicapped—a good combination for business.

BIPED

by Kerry Leichtman
80 Microcomputing *Staff*

When President Reagan asked the business community to take the initiative providing help and assistance to the disadvantaged, he must have envisioned programs like BIPED. BIPED is an acronym for Business Information Processing Education for the Disabled. The BIPED program may become the prototype for the private sector's new responsibility—realizing the potential of the physically handicapped and actively training them to function as taxpayers rather than tax expenses.

BIPED receives no government financial assistance. Every aspect, from acquiring office furniture (both special and normal) to choosing the curriculum and printing brochures, is funded with corporate dollars.

The connection between this innovative program and its 20 *Fortune 500* corporate sponsors is obvious in BIPED's rooms at the Easter Seal Rehabilitation Center in Stamford, Connecticut. Two large posters in the main instruction room boast of the affiliations by displaying the familiar logos of the involved corporations. A refrigerator in the second of the two large rooms had its non-sponsoring corporate nameplate pried off and replaced with a Texaco logo. Texaco, of course, is one of BIPED's sponsors.

The two rooms, an administrative office and a conference room, use approximately 1500 square feet of a new wing in the Easter Seals Rehab Center. BIPED, however, is neither a branch nor a service of Easter Seals; the space is rented.

Walking through the Easter Seals building, past therapists in white uniforms, and patients being wheeled about, eating in the cafeteria or pounding out products at long assembly tables, produces a significant contrast to what the visitor will encounter in BIPED's corner of the building.

There are blackboards, bulletin boards, computer terminals, open books, phones ringing, styrofoam coffee cups, name plates on each desk—not long school-like work-tables, but real desks—drawers, pencil holders, file holders, blotters and the like. The basic difference between BIPED and regular corporate offices is the mode of transportation. There are no quiet shuffling sounds across shag carpeting, seldom the click of heels against linoleum, and squeaky-springed office desk chairs are almost non-existent. Most students bring their own chairs. The soft shuffling and sharp clicking have been replaced by the whirr of electrically driven wheelchairs. It should not be misunderstood that the use of wheelchairs constricts the businesslike atmosphere. To the contrary, the wheelchair jockeys are all dressed in business attire: dress shirts, trousers and neckties. These well-dressed people scurry from room to room, in and out of tight corners with the speed of an office go-fer and the accuracy of a professional needle-threader.

Twelve students were chosen for the program: five quadraplegics, one with no use of the left arm, one with flaccid paralysis of the right arm, one with renal failure, two with muscular sclerosis, one with chronic gastrointestinal disorder, the last with cerebral palsy. Rounding out the roster is one course instructor and one general all-around volunteer helper. This unusual group of people refer to themselves as a family.

Photo 1. BIPED Classroom Instruction.

BIPED as an Idea

IBM, realizing in 1972 that computer programming is an occupation requiring intelligence rather than dexterity, trained a quadraplegic to do the job. The experiment was successful and resulted in the establishment of an ongoing nine-month training program at the Woodrow Wilson Institute in Virginia. IBM's success prompted other experiments; one was started in California, another in Alabama and two more, in Philadelphia and New Haven.

New Haven's program began in 1976 at the city's Easter Seals Rehabilitation Center. Easter Seals' efforts were assisted by Yale University and several leading Connecticut based corporations. Joseph P. LaMaine was with Yale at the time, and supported the program. Later he joined Easter Seals and directed the New Haven program through four sessions. during that time LaMaine taught and graduated 35 students who now work for various Connecticut corporations.

New Haven became one of 12 programs which banded together as an information sharing network to form the Association of Rehabilitative Programs and Data Processing (ARPDP). Some ARPDP programs were

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" 'It takes time to work with the handicapped; to find out how can this person become more feasible to society.' "

run in a university environment and others came out of rehab centers. All the programs received government support; either federal, state or both. Some received private donations as well.

This partial support through private sector business donations spawned an idea in Joseph LaMaine's head. "One of the reasons BIPED has evolved is because two years ago I thought that if we could run a program that was totally the private sector's contribution, it would release federal monies for other projects, while at the same time enhancing the future in rehabilitation and bringing more of the private sector into helping the disabled community." With that thought in mind, LaMaine got to work.

The Corporate Role

In 1979 LaMaine presented his ideas to John W. Stanger, president of the General Electric Credit Corporation and Kenneth G. Reside, also of GE Credit Corp. Stanger and Reside were intrigued with the New Haven project and LaMaine's plan to expand the program to one of total private industry support. "Mr. Stanger and his staff thought it appropriate if I could join General Electric Credit Corporation, to give me the ability to help disabled people, we could be the catalyst to get it going. But we only had one corporation and wanted others to participate equally in the project."

Photo 2. Joe LaMaine and four students in conference.

Getting to see and talk with corporate presidents is not easy, unless another corporate president is making the contacts. During the next several months LaMaine and Stanger contacted company presidents and gave demonstrations, seeking the participation of those corporations now with BIPED (see Table 1). They were well received. "The companies were delighted to see a program like this get started, especially when it is going to be managed and directed by them."

Eventually a program was established by the private sector creating a non-profit, non-stock corporation which serves as a private occupational school. Corporate participation is offered through the donation of funds and executives' time and expertise on an advisory committee. "We established that committee over 1980 and '81. The advisory committee is made up of members from the corporate community, data processing executives, public relations personnel and some engineers. Primarily, about 75 percent are data processing executives from corporations and their staffs."

The advisory committee's role is to support the program in the capacities of managing and directing BIPED's functions, the creation of a board of directors and monitoring the financial aspects of the corporation.

The Corporate Atmosphere

As established, BIPED is made up of its corporate officers, board of directors, corporate sponsors, committees and subcommittees. If this all sounds very corporate to you, you're catching on. The reason everything is so businesslike is that it is *supposed* to be businesslike. The 60 individuals involved are corporate people; it is quite natural for them to divide everything into boards, officers, committees and the like. These kinds of corporate people probably organize family picnics into committees: hot dog committee and relish subcommittee, right on down through potato salad officers and dessert managers. One of the reasons these people are successful is their functional organization.

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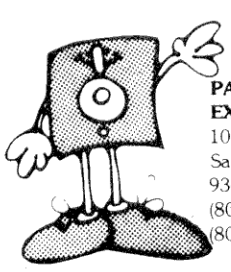

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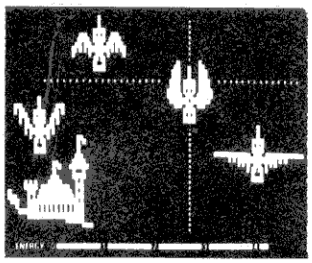

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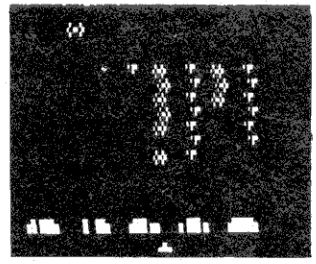

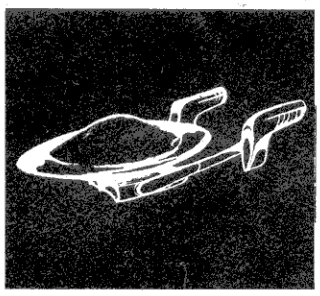

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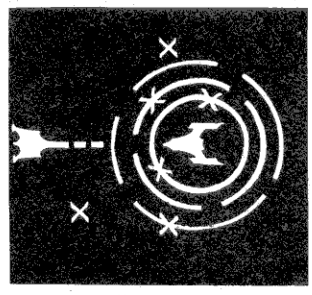

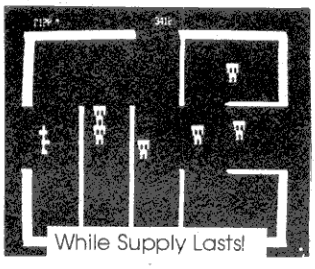

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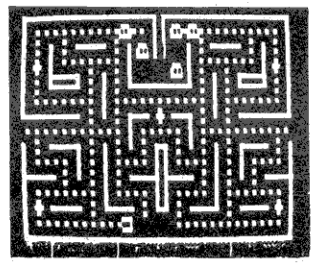

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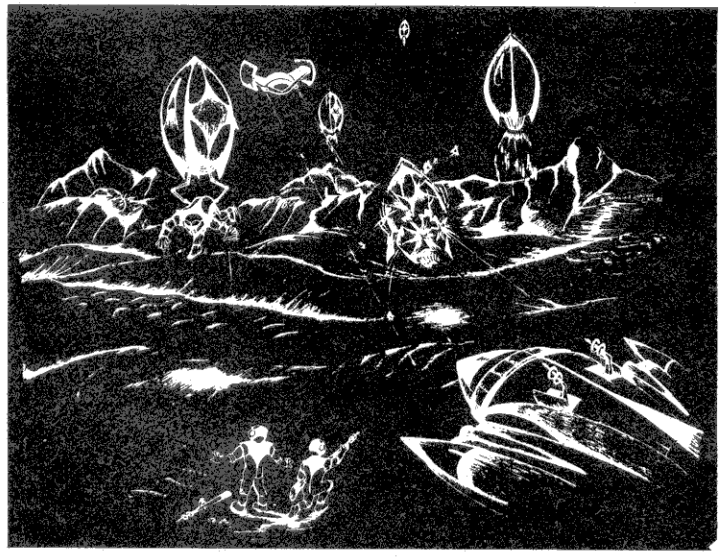

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"Eventually a program was established by the private sector creating a non-profit, non-stock corporation. . ."

is the students. One aspect where BIPED is very different from other computer programmer courses is that BIPED simulates business and industry. Students have meetings scheduled every morning from 9:00 to 9:30. They divide into individual committees, such as the public relations committee and technical investigations committee. As the course progresses the students will be writing status reports and using calendars to schedule their time.

"They will be learning all the items necessary in business," said LaMaine, "That includes how to dress appropriately, how to participate in a team environment doing systems analysis work. This gives the student the opportunity to be in the proper business environment and to perform. This is why BIPED uses desks and not just handicapped tables. We feel if the person is going into the business environment he should experience the real environment."

BIPED Sub-Committees

It is a little difficult to discover BIPED from touring its facilities. It seems BIPED is more what you do not see than what is obvious. What you see has been described earlier: rooms, special equipment, office furniture, and people in wheelchairs whipping about. Even though the program's success depends on how well the students fare in the real non-simulation world, the program's existence depends on the time, money and good will of some of the world's largest corporations.

Part of that unseen creating force is a group of six sub-committees established to implement the policies of the corporation. These sub-committees are admissions, curriculum, equipment, placement, public relations and accreditations and licensing.

The admissions committee is headed by Walter Johnson of the American Can Company. Johnson is also chairman of BIPED's board of directors. Besides the obvious, this committee also takes into account such special needs as transportation and housing.

The curriculum committee is the charge of Inge Cseh of Reader's Digest. Just as computer hardware and software is constantly changing, so then must a good computer programming curriculum. Approximately 25 percent of BIPED's curriculum is taught by guest lecturers. These lecturers, as well as curriculum supplies and contributions, state-of-the-art course updates and on-site visits are all arranged by the curriculum committee.

Wallace Fletcher, Director of Information Systems for Pitney Bowes, is chairman of the equipment committee. It is the responsibility of this committee to procure all furniture, special equipment, computer equipment and computer time for the students. Assisted by Jonathan Brown of GTE, the committee arranged for 13 computer terminals to be donated from General Telephone and Electronics. GTE has also promised all the necessary related hardware and a dedicated phone line to Union Carbide's computer in Tarrytown, New York. David Wainwright, Fletcher's Union Carbide counterpart, agreed to provide free computer time for each student for the duration of the program.

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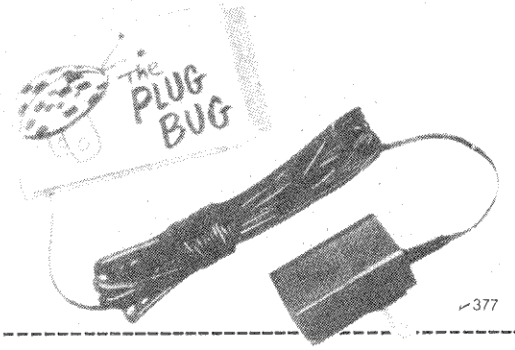

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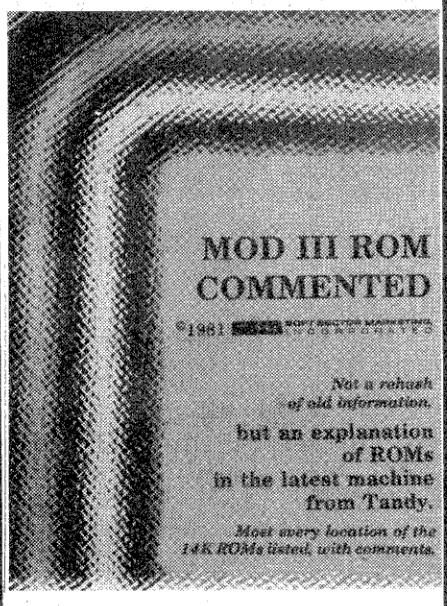

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MOD III ROM COMMENTED

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Not just a rehash of old information, but detailed comments on the ROMS in the latest machine from Tandy.

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NEW

ZAPSIT

©1981 by Soft Sector Marketing, Inc. – Written for TRS-DOS & DOSPLUS by Larry Ashmun
Requires 32K Disk – Mod III

Zapsit is a stand alone machine language program that lets you examine, modify, copy disk sectors and much more. It does not use any of the resident DOS routines so that you are not limited to the restrictions of the particular DOS that you normally use. You do not have to have a system disk in DRIVE 0 once Zapsit is running.

Currently there are two versions of Zapsit – one for use with TRSDOS* and one for use with DOSPLUS**. They are the same except in the way that they format a disk and the way that they write DATA ADDRESS MARKS. Because of the differences, they are not interchangable. Writing to a TRSDOS diskette with the DOSPLUS version (or vice-versa) could make the diskette written too unuseable.

For all disk operations you will be asked a series of questions. Each question can be answered by pressing the ENTER Key or by entering a specific value. Pressing the ENTER Key will cause the DEFAULT value to be used. All default values are indicated on the screen at the time the question is asked.

When entering a specific numeric value it is assumed to be DECIMAL unless an H is appended to the number. When an H is appended, the number is assumed to be hexadecimal (base 16).

CAPABILITIES

Display/Modify Disk Sectors/Memory. Print to screen. Print sector to printer. Modify in Hex. Modify in ASCII.
Change Track & Sector Limits. Single density read and write. Double density read and write for 1-80 track, from 0-18 sectors. Single and dual sided drives.
Format a Disk. S = Standard Format. W = Format without Erase. If you press ENTER or S you will be asked which drive, what density. After answering these questions Zapsit will format the disk using the parameters specified. As each track is formatted all of the sectors are checked for readability before the next track is formatted. Any unreadable sectors are reported but the operation will not be aborted.

If you type W you will be asked which drive, what density to use and if you want any bad sectors reported to the printer. Before each track is formatted each readable sector on the track is read into a holding area. Unreadable sectors are reported and their holding area is zeroed. After all of the sectors for a track are stored, the track is reformatted and the data in the holding areas written to the appropriate sectors.
Verify a Disk. Verify a disk does just that. It verifies that every sector is readable. Any unreadable sectors are reported. You will be asked if you want the unreadable sectors reported to the printer.

Now you can verify that the format of your diskette is in good shape before you copy your important files to a diskette. This prevents loosing your data that you are trying to back up.
Copy Disk Sectors. Copy disk sectors allows you to: Copy sectors (Single or Double Density) from a disk to different sectors on the same disk. Copy sectors from a Double Density disk to a different Double Density disk. Copy sectors from a Single Density disk to a different Single Density disk. Copy sectors from a Single Density disk to a Double Density disk. Copy sectors from a Double Density disk to a Single Density disk. All copying to a Different disk must be done on a Two Drive System.
Zero Disk Sectors. Zero disk sectors allow you to write a value of your choice to the sectors specified.
Read a Track. Reading a track allows you to read an entire track into memory, with all of the address marks and information that you don't normally see with a sector read. The output can be to either the screen or printer.

List $24.95

Introductory Special $19.95

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"Part of that unseen creating force is a group of six sub-committees established to implement corporate policies."

The task is just beginning for the placement committee. James Sutter, of Xerox, has taken on the responsibility of teaching interviewing skills and resume writing, as well as teaching the skills necessary for keeping a job after getting one.

BIPED president George Hefferon's public relations committee operates as an outreach promoting general public knowledge of BIPED. Hefferon, who comes to BIPED from Perkin-Elmer Corporation, not only gears BIPED's publicity efforts to the general public, but also attempts to make other handicapped people aware of BIPED's existence.

Accreditations and licensing is an ongoing process. Charles Packer, of the Aetna Corporation, works to keep BIPED licensed as a private occupational school in the state of Connecticut.

Results

From a rehabilitation standpoint, there are many differences between BIPED and other programs. Jim Shearin, director of the Stamford rehabilitation center and a member of BIPED's board of directors, said, "BIPED focuses on training at a high skill level, while many other programs are clinical and restorative by nature. The severely handicapped are sometimes the most difficult to work with from the standpoint of vocational success and employment."

From a business standpoint, David Kerns, president of Xerox and the U.S. Council of the International Year of the Disabled, explains the business practicality of BIPED. He says business expects the demand for computer programmers to double during the 1980's, "If we don't put disabled people to work, we just aren't going to get the work done."

Kerns is not alone in his opinion. When reached by phone Walter Johnson said, "You can look at it very simply. The timing is absolutely perfect with Reagan's current philosophy on private sector money. This was something that, going into the private sector, couldn't have been done at a better time. Secondly, it's probably the cheapest and most rewarding way you could come up with excellent programmers, who are in short supply. You take people off the tax roles and put them on the payroll."

Joan Gilbert, of Texaco, said, "When you do something as a social service it's one thing, but when you get an employee who is skilled, and at the same time do something for someone who is disadvantaged, that is satisfying."

"I think one of the key aspects of the BIPED program was best crystallized in a note of thanks we received from a relative of one of the students," said George Hefferon. "It said, '. . . has a healthy creative mind captured in an imperfectly functioning body.' In the computer programming business, our focus is on that creative mind. The BIPED bottom line is to provide the handicapped person with a means of exploiting that talent in a professional application."

Joe LaMaine also is quick to point out that business can, should and does expect a return from BIPED. "The corporations get qualified people, they don't have to pay agency fees, they get good programmers with the equivalent of two years professional experience. The turnover rate in programming may be quite high in some corporations. The known turnover rate, around the country, for the ARPDP has been approximately seven to eight percent.

"So in the long run, what is in it for the student? We have people who have been institutionalized or have been injured for so long that placement was far off in the future and has been for a long time—for severe quadraplegics maybe forever. I've had students with no outlook toward employment. Computer programming finally offers them the ability, like anyone else, because

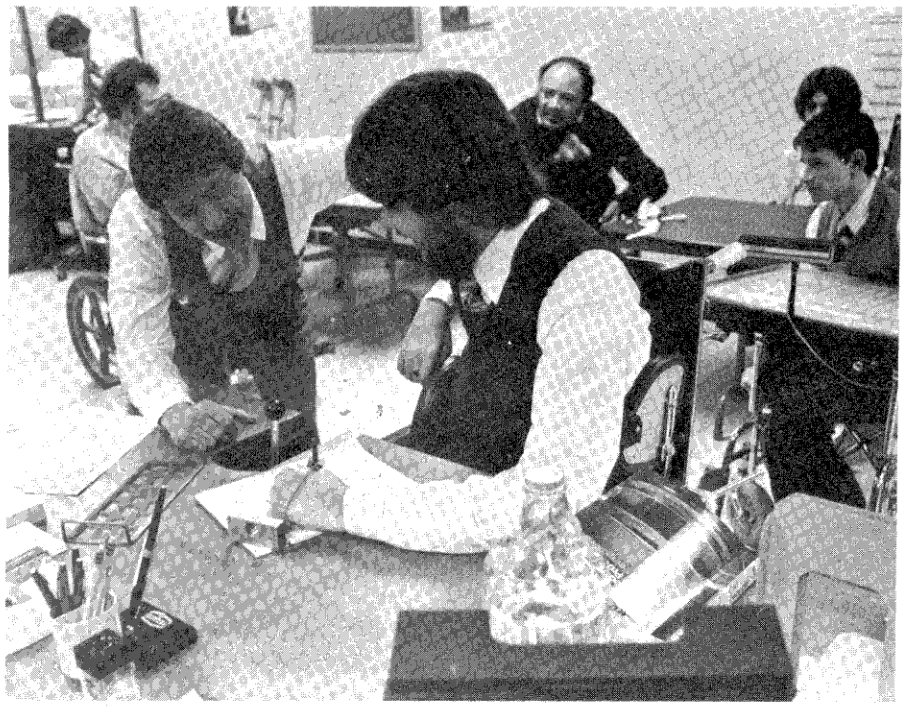

Photo 3. One-on-one instruction. Notice regular desk furnishings alongside special adaptive equipment, such as pen holder attached to Mike's hand, paperweight to hold paper still while writing and, above Joe's right hand, a tool to assist drawing the circles, squares, triangles and other shapes necessary to making a flowchart.

Photo 4. Joe LaMaine holding the special paperweight and flowchart tracing tool.

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" 'You can look at it simply: The timing is absolutely perfect with Reagan's current philosophy.' "

you use your mind and tie your hands behind you.

"It offers them a challenge to gain self-respect, dignity and pride to go back and compete in the business world. We may use BIPED as a fictitious corporation, but it functions like any other corporation. BIPED is for business, it is by business and it is of business." But the nice thing is what it is doing for the handicapped.

Fred Wright, Student

Fred Wright is a 32 year old quadraplegic from Yonkers, New York. His entry into the program, like most of BIPED's New York contingent, was racked by the kind of frustration that can only be brought about by red tape and bureaucrats. Fifteen months passed between the time Fred first heard of BIPED until he learned of his acceptance into the program.

The hold-up was not with Fred, or any of the other New York students' qualifications, but politics. Originally the program was being co-produced by the states of New York and Connecticut. The problems probably began when BIPED's offices became housed not only in Connecticut, but at a rehab center in Connecticut. Apparently there is some restriction against New York sanctioning this type of program if it is located in another state—even if New York residents will benefit from their participation.

Hassles aside, Fred is happy in and with BIPED. He says it is, "One of the best programs to come along." Fred graduated from Western College of New York in 1979 with a degree in accounting. "To this day," says Fred, "it hasn't done me one bit of good." Maybe not, but all that classroom experience must have. One day LaMaine was late and Fred ran the class until he got there. From that day on Fred has been called "The President" by his fellow students.

Fred took only one computer course while at Western New York. It was an introductory level course, meant only to explain what computers are about. "I've learned more in the first nine days of BIPED than I did in the complete college course."

Aside from the obvious career opportunities that lie ahead, much of the excitement in the air at BIPED focuses on the participants' present situation, not the future. At BIPED they are not only learning a career that will make them self-sufficient, but they are treated like business people. The atmosphere is one of learning and collaboration. Fred: "Everyone has their own opinions and expresses their own opinions. . . You do your work here, you can take it home when you want to. Everyone gets their input in. If someone has a question, there's no putting it off; together we take care of it right away."

With BIPED's emphasis on self-sufficiency the students have to arrange for their own transportation to and from the Stamford offices—just like a regular job. For Fred and the other New York participants that means putting up with the morning and afternoon rush hour traffic on the highways. Most commuters grumble about the twice daily traffic hassle, but not Fred. It may be a lot harder for a quadraplegic to negotiate stop-and-go traffic, pay tolls and switch radio stations but you won't catch Fred complaining. "I travel over 50 miles a day just to get back and forth. I receive no financial assistance from the state whatsoever. My only means of support is SSI. I'm scratching dirt to get here. But that's how much I believe in the program. I could give accolades forever about BIPED. I feel like a kid in a candy store."

George Fitzpatrick, Student

George Fitzpatrick is a 36 year old quadraplegic from Stamford, Connecticut. Being from Stamford, George doesn't have to fight the traffic as does Fred. As a matter of fact, George lives just over a mile away from the Easter Seals Rehabilitation Center. Being so close to the program's location is not George's only advantage. Being from Connecticut, George is able to enjoy his state's generous active participation in the BIPED program.

George has been a quadraplegic since the spring of 1965. At the time he was a college freshman in North Carolina. He was out walking when a friend pulled alongside and offered George a lift. George accepted and rode with his friend. Two blocks later the truck flipped over, breaking George's neck.

Since that time George has held various menial jobs; working for a city department of recreation and as a salesman for firms

Photo 5. Fred Wright

BIPED Officers

George J. Hefferon of Perkin-Elmer Corporation
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Joseph P. LaMaine
Vice President and Director of Instruction
Wallace P. Fletcher of Pitney Bowes
Vice President
Michael P. McLaughlin of Peat, Marwick, Mitchell & Co.
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James F. Sutter-Xerox Corporation
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Table 2. BIPED officers and Board of Directors

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Standard Version Works On:

Single density (we recommend double density)
Mod I TRS DOS
Mod III TRS DOS
Mod I and III Newdos-80 version 2.0
Mod I and III Dosplus 3.4

Hardware Requirements:

TRS-80 Mod I or III, 48K
2 or more disk drives

IDEAL SYSTEM

Mod III 48K 1 40 Track Drive
2 80 Track Dual Headed Drives
Dosplus or Newdos-80 Operating Systems
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sorts all 11,000 names in less than 4 minutes
*Special version to work on Dosplus 4.0 Harddisk operating system

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Data Guard® is a special feature only offered by Soft Sector Markting, Inc. If by chance your machine resets while writing information to the disk, you only lose the information that you were writing. Your files are always protected from the danger of losing all the work that you have put in that day. NO OTHER PROGRAM ON THE MARKET OFFERS THIS PROTECTION. If you reset with ANYBODY'S MAILING PACKAGE DURING WRITING you would destroy your ENTIRE data disk. We can't stop your machine from failing but we can protect your data.

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"His entry into the program was wracked by the kind of frustration that can only be caused by red tape and bureaucrats."

such as Amway Distributors. Before BIPED he had some computer training at a private school. He learned Assembly, RPG and Cobol languages but not much else. "The teachers were good, but the atmosphere was not centered around the handicapped. Class turnover was six months so the teachers didn't have the time to give extra help."

George did fairly well, but to keep up he had to work from early in the morning to late at night. It took away from his family life and left him no time for relaxation. "I'd come home from school, eat and get right back to the books and work on problems until 11:30 at night—time to go to bed. I'd get up in the morning to the same routine. It got monotonous to the point where everything was such a rush-rush-rush rat race I'd had enough and decided I didn't need that."

The atmosphere at BIPED is different than that of the computer programmer's school turnstile-like philosophy. "BIPED is a school oriented toward the handicapped." "It understands the problems of the handicapped. It takes time to work with the handicapped; to find out how can this person become more feasible to society, or how can he be more helpful to himself and what way can his learning process be tapped so he might learn more.

"Each one of our problems are different. Our levels are about the same, but we have different needs. Some have a little bit more mobility. It ranges from a wide scope, but the thing about it that's so impressive is, with the community of these corporations involved, that they take the time to understand that."

Michael Molgano, Student

Twenty-two year old Michael Molgano, also from Stamford, was not overly enthused about BIPED when he first heard of it more than two years ago. Back then the program was slated to be held in New Haven. Michael was about to enter college and, frankly, was not thrilled about the prospect of a daily commute between Stamford and New Haven.

Things changed for Michael when he had to abandon his college plans due to an illness. Later when he heard BIPED (still on the drawing board) was planning to locate in Stamford, Michael called his counselor and then Joe Lamaine. Then came the testing, the talking and the waiting, until finally two years later the program was started. "I'm happy, I'm excited that I was accepted. I know there's nothing out there that will give me the experience and the knowledge that I'll get from this course."

Michael, a quadraplegic as a result of a swimming pool diving accident, had no computer experience prior to BIPED. "There's so much to be offered in this course. In 11 months Joe is going to give us a lot. He has a lot of knowledge. Not only Joe, but all the corporations sponsoring this. Some of the professionals and executives are coming in and giving us some of their knowledge."

The class works together, all the time. "We're a family. We help each other out. We all have different kinds of disabilities. What one can't do, another can, and maybe something he can't do—you know, back and forth."

No consideration is given to those with previous computer experience. They all start together, at the same place—the beginning. *80 Microcomputing* visited BIPED when it was just nine days old. "Right now we're learning the history of data processing," Michael said, "We're learning what data processing is, how it is related in the business world, how it is used.

"He's teaching us the corporate structure. We learned who the corporations involved are and how they got involved. It's nice to know they're concerned; just to come in and give their time. Executives' schedules are very, very tight. Their calendars are set five and six months in advance. So when they're coming for an hour you know somebody's being hung up somewhere. That means a lot.

"In the beginning we needed to get situated. We all needed special equipment. We've only been here nine days and we've covered a lot of things. We're right on schedule. We went over the curriculum this morning and we're right on schedule. That's good corporate training. Everything is right where it should be."

Looking Ahead

There is a feeling of purposefulness at BIPED. You can sense it by the glimmer you see in the eyes of the students when you talk to them, or maybe by the bustle you wouldn't normally associate with a room filled with physically handicapped people, or it could possibly be in the quickness of everyone's response to the question: What do you see in your future?

George: "I look forward to finishing this course and getting into the business world. My goal is to be self-sufficient. I'm married and I want to help pay the bills. It can be done."

Fred: "The corporations are doing their job; they're putting their support behind us. We have to carry it forward. It's a two-way street: they help finance the program, we do the work. We benefit, they benefit. I think even the communities around will benefit."

Michael: "I'd like to be a programmer and maybe someday get into systems analysis. There are no pressures. We just want to get in here and do our thing. I don't think being the pioneer class will really hit us until after we've graduated and are out in the world. Then we'll say, 'Wow.' "■

Photo 6. George Fitzpatrick.

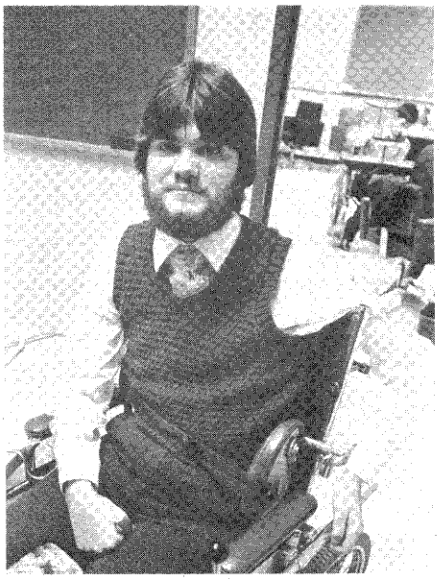

Photo 7. Michael Molgano.

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Written by E.R.I.

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Tape 1		
Keys	4k	NE
Bagels	4k	NE
Find	16k	NE
Darts	4k	NE
Motor	4k	NE
Bomber	4k	NE
Football	16k	EXT
Kapow	4k	NE
Dodge	4k	NE
Tape 2		
Bounce	16k	EXT
Tank	32k	EXT
One Arm	4k	NE
Chute	16k	EXT
Where is it	16k	EXT
Lunar Lander	16k	EXT
Stock Market	4k	NE
Tape 3		
Multiply	16k	EXT
Divide	16k	EXT
Add Sub	16k	EXT
Simple Simon	4k	NE
Hangman	16k	NE
Beast	16k	NE
Count Down	4k	NE
Acey	16k	NE
Genie	16k	NE
Protect	16k	EXT
Tape 4		
Graphics	16k	EXT
Songs	16k	EXT
Joy	16k	EXT
Mortgage	16k	EXT
Checkbook	16k	EXT
Draw 1	16k	EXT
Morris	16k	EXT
Sound	16k	EXT
Tape 5		
Ram	16k	MA
Trace	16k	MA
MMaster	16k	MA
Demo	16k	NE
Disassembler	16k	NE
Basbug	16k	NE
Ohmlaw	4k	NE
Convert	4k	NE
Drawer 2	32k	EXT
Degrees	4k	NE
Tape 6		
Hurdler	32k	EXT
Entrap	16k	EXT
Search	16k	NE
Flip Flop*	16k	EXT
Lost Atom	16k	EXT
Attack	16k	EXT
Cartel*	32k	EXT

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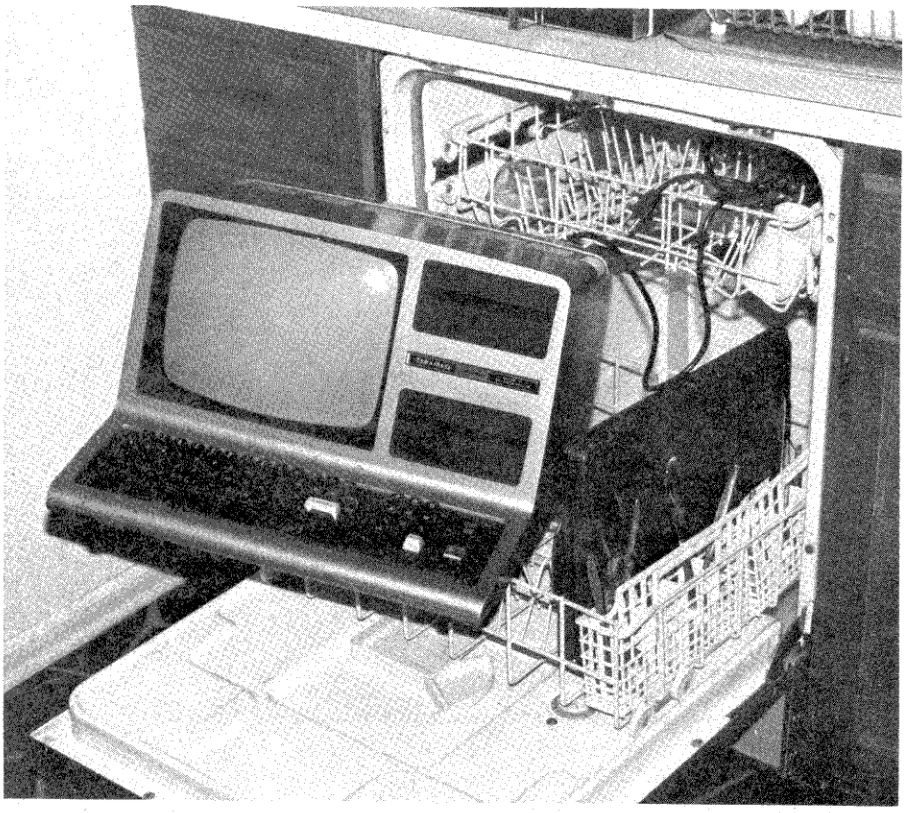

Photo 1. Too cramped

By David Gunn
photos by B. "Snapshot" Hanselman

Your computer is more than just a hunk of electronia. . . it is your friend! But have you been treating it like one? Well? Uh-huh, I thought so.

When was the last time you took it out to a movie, or even down to the local lunch counter for an egg salad sandwich and coffee—last month? Last year? *Never*?

And what about simple conversation? Are programs the only tete-a-tete communications you have with your electro-brain? Hmm?

I'd say that it is time to give your precious microcomputer a little something in return for all the worldly data it has given you.

Let's focus on two long-overdue basic courtesies:

- Taking your computer out.
- Cleaning and minor maintenance of your computer.

Courtesy #1

Where do you take a computer? Deep sea fishing trips and roller skating can get pretty complicated. Let's start easy: dinner and a movie.

Microcomputers enjoy Chinese food. I

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What Do You Use Your TRS-80® For?

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"Nothing embarrasses a computer more than trying to scoop up food with a pair of chopsticks."

suppose it relates back to their abacus ancestry. The restaurant I took mine to is nicely decorated in a traditional Chinese checker pattern.

Don't bother trying to impress your computer by attempting to pronounce the Chinese words on the menu. Start with some soup. Won Ton or Egg Drop will be okay, but some microcomputers are finickier than others. If you order egg rolls try to keep the filling away from the keyboard area. The same goes for Chinese tea. The caffeine plays all sorts of havoc with those ICs.

When it comes time for the main course, request some good ol' American silverware. Nothing embarrasses a computer more than trying to scoop up food with a pair of chopsticks.

Finally, there is dessert. No problem? Think again. How do you reasonably explain to a paragon of logic like your TRS-80 that a data printout curled up in a hunk of baked dough can tell its future? Just settle for a dish of litchi fruits.

After dinner I took my computer to the movies. This particular theatre had no reduced children's rates, but if the one you take your computer to does, do not forget to bring your bill of sale—in case you have to prove your computer is under 12 years old.

After the show we window shopped and discussed the sociological implications of the film. Then we went home.

Courtesy #2

Have you ever noticed how much better you feel, how much more efficiently you work, after an invigorating cleansing? The same goes for your microcomputer. The screen is easier to read and the memory seems positively refreshed. So, don't hold out on your little whizbox just because you do not know which shampoo to use. You should not, in fact, use *any* shampoo.

How do you wash it? Sponge baths are okay, but are normally over too quickly. A bathtub bath does not provide nearly enough room for your microcomputer to splash around in and what's worse, the soap is forever disappearing. The dishwasher is too cramped. Like the bathtub, there never seems to be enough room, even if you stack all the glasses on the top rack (Photo 1).

"Where do you take a computer? Deep sea fishing?"

You need to go where there is sufficient space available. I recommend taking it to the car wash. There is plenty of room there and you can get a nice wax if you so desire (Photo 2).

When washing, always use up and down motions over the front and back panels, and side to side strokes on the sides. The brush bristles should be soft and pliant, so as not to irritate the delicate electronic skin.

Always rinse thoroughly. There is nothing as annoying as running a highfalutin' program in front of friends and having telltale suds bubble up out of the console during printout.

There comes a time when simple washing and waxing is not enough—when internal maintenance is necessary. Yes, I am talking about soldering!

Wait! Come back! Soldering is not something to be feared. Heart surgeons perform this simple operation all the time. Of course, many have had umpteen years of cardiovascular training in expensive hospitals, but the point is, if *they* can do it, and if *I* can do it then you can do it, too.

Before we get started, you got any whiskey in the house?

Just kidding. . . .

Soldering: What is it? Why do I have to do it?

Suppose you have two wires; Fred and Ethel. Normally, they are a couple of terrific wires who get along beautifully together. Today, though, they have had a little spat and will not speak to each other. Well, that is when you take your solder, Lucy, and get them all together for a nice intimate dinner party. Then, when everyone is relaxed and mellowed out with some wine and cheese. . . Presto! You melt Lucy all over Fred and Ethel before they have a chance to object. And once again you have a perfectly harmonious metallic union.

Let's just hope that Fred and Ethel don't get too tired of Lucy, because she means to hang around for quite a spell.

Finally, a few words you should be familiar with to facilitate your soldering: *welding, riveting* and *flux*.

Welding is soldering that has gotten out of hand (Photo 3).

Riveting is holding someone's attention by means of metal pins or a good story.

Flux is a common expression used when soldering has turned into welding (Photo 3).

Actually, if you can avoid soldering, do so. You will be spared a heck of a lot of grief.

Follow this advice and see if your microcomputer doesn't respond to commands more quickly and compute more accurately. In a future issue, we'll discuss *Selecting A Pet For Your Microcomputer.* Stay tuned. ■

Writer David Gunn and photographer Hanselman run a computer dating service in Vermont. Says Gunn, "Computers are good dancers and, basically, are a cheap date."

Photo 2. Plenty of room

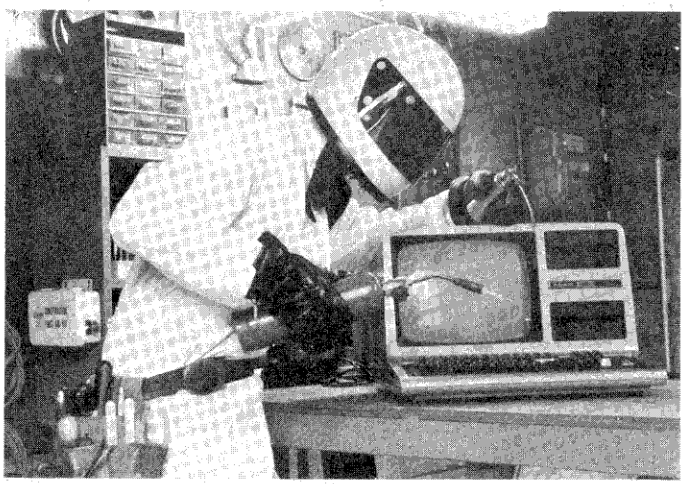

Photo 3. Welding or Flux

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(Actual QWERTY text above)

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QWERTY 3.0 Manual (specify printer)	$10.00

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✓83

Dateline: Sri Lanka

by John P. Mello Jr.
80 Microcomputing *staff*

If you see a man driving a yellow Pinto station wagon bristling with electronic gadgets, while dictating into a microcassette recorder, there's no need for a double take. It's only David Busch, ever-vigilant watchdog of Kitchen Table Inc., speeding to another significant press event held by the fictitious Sri Lankan-based manufacturer of computer wares.

Busch stands out among computer writers because he is a humorist in a field where sobriety is king. However, the Ravenna, OH, native quickly rapped widespread notions that computers are inherently humorless: "What do they mean computers aren't inherently funny? Haven't they ever used a TRS-80 Model I?"

"Tandy has done many, many good things," he observed. "Yet, they introduced a computer that gave you two letters for every one pressed, left out lowercase in order to save 14 cents and sold a $300 expansion interface with free disk controller circuitry, but no memory."

The public relations specialist admitted Tandy inspired his creation of KTI: "I was most familiar with Radio Shack. If I had been more familiar with Commodore, I might have thought Commodore."

He added: "I thought, what if there was a company with the imagination of a Scott Adams, Nolan Bushnell or Bill Gates, but had Tandy's management structure? That was Kitchen Table. Now I can scarcely look at a new product without thinking how KTI would mishandle it."

Busch began his journalistic career in 1960 at the age of 13 as a newsboy for the six-day-a-week *Record-Courier*. Within five years, the whimsical buckeye had risen to reporter, writing mostly sports stories.

Not only did his newsboy job serve as an entree into journalism, but as an introduction to his future wife. "It was on my 16th birthday," he remembered. "One of her girlfriends stopped by and introduced her while I was getting ready to deliver my newspapers.

"She was 13, a little young at the time. I didn't have a driver's license and she wasn't allowed to date, so we just walked around together."

In 1964, her parents moved to California, but the pair corresponded for three years—until Busch saved enough money to fly to California and spend the summer with her. After she graduated from high school in 1968, she moved back to Ohio and the pair tied the knot in 1969.

Meanwhile, Busch began attending Kent State University, where his experience with the Kent and Ravenna county paper made life easier in his college major, journalism:

"When we got assignments to write things, I'd just take a clipping from something I'd already published, hand it in and get an A. We'd learn layout, and I'd bring in a page I'd laid out at the newspaper and get an A. I didn't learn a lot of journalism."

The son of a police officer began to question his newshound instincts—especially after the Kent State killings in May of 1970. "My class let out 15 minutes before the shootings took place," he recalled. "I came out and saw the National Guard and protestors down on a hill. I decided nothing interesting was going to happen so I left. It occurred to me later that I shouldn't go into news journalism because my nose for news was apparently not very highly developed."

At the time of the shootings, Busch managed a camera store on the Kent State campus. "One of the kids that used to come into the camera store and ask me questions about photography won the Pulitzer Prize that year," he said. That student, John Filo, snapped the photo of a woman, her face screaming with grief, crouched beside a slain student. "Maybe his technical skills weren't as good as mine—or maybe they were better, I don't know—but his news sense was a lot more highly developed."

Busch became drawn toward a career in public relations: "There seemed to be more money in it. I had already decided I wasn't the world's greatest reporter. I had already done it. I liked it, but public relations seemed like more fun."

After graduating from Kent State in 1970, he started working in a public relations firm in Rochester, New York. Eighty percent of his work was on Eastman Kodak's account with the firm. Meanwhile, he began collecting jobs. By 1974, he had eight moonlight jobs including photography instructor at the local Barbizon school of modeling; sports information director for St. John Fisher College; and freelance gag writer. "At the time, I was making more money from my part-time things than my main job," he noted.

Despite his exhausting work schedule, Busch still found himself in a money crunch. And he was tiring of icy city life. "They only have two seasons up there," he observed, "cold and colder. My house was burglarized five times, my car broken into a couple of times." So when he had a chance

David Busch

Busch with two of his favorite things: computers and Charlie Chaplin.

"What do they mean computers aren't inherently funny? Haven't they ever used a TRS-80 Model I?"

to work in the Ravenna office of Creative Communications Services, a public relations firm with locations in several U.S. cities, he gobbled up the opportunity. "In Ravenna, we haven't had a murder in a couple of years," he said. "And nobody locks their doors."

The public relations agency had Busch writing about computers and he became interested in them. "But until they invented microcomputers," he said, "you didn't have one of your own to play with."

"When the first kits came out," he recalled, "I started reading all the magazine articles, but I'm not a hardware person. I never thought I could build one."

John Filo photo for Valley News Dispatch, Tarentum, PA. Reprinted with permission.

Busch began to question his instincts for news following the Kent State killings in 1970.

Before buying a Model I Level I, he learned Basic programming from a magazine article and a book he'd bought from Radio Shack. Since then, he's experimented with Pascal and Assembly, but feels he has a way to go with Basic: "I don't think I've exhausted nearly a tenth of what Basic can do. I'm still surprised at the things you can make Basic do."

"When I got my Model I," he said, "I didn't know what to do with it. It just sounded like a good idea at the time. Then I got into it and I started coming up with ideas."

Within 48 hours of buying his Model I, he wrote a travel expense report program exceeding the 4K of memory that came with the machine. So he installed some 16K chips—incorrectly—and had to return them to where he'd bought them. Then he tried to reinstall the 4K chips and bent two of the pins. Singlehandedly, he had reduced his Model I to a 1K computer.

When his 16K chips returned, he plugged them in, but still no results. "Finally," he said, "out of a sense of daring, I plugged in a set of jumpers meant for Level II and they worked. I still don't know why."

Busch does a lot of traveling in his trade and he takes computers wherever he goes: "I always take the Pocket Computer. I take the Model I, usually with one or two disk drives. I used to take a Sinclair ZX-81 because it fit in the pocket of my camera bag. Now I've got a VIC 20 because it's got

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". . . KTI plans to maintain its reputation as an innovative leader with products like no-name software and checkers with sound."

an RF modulator and you can plug it into the television in the motel."

80's observer of KTI travels in a Ford Pinto built for comfort. It can receive up to seven electromagnetic bands including CB, radio, AM, FM and television. "I listen to television while I'm driving," Busch explained. "I have a little thing that flips over the screen so you can't see it. I think it's illegal to watch it while you're driving . . . also dangerous."

The car also contains a fuzz buster, gadgets for eating and drinking, and "the usual audio equipment"—power amplifiers, Jensen speakers and from 80 to 100 tapes of recorded music. "The electrical system wasn't built for all that," he added. "I usually go through a battery every couple of years."

Traveling as much as he does—eight days a month—can lead to some hairy experiences. "Generally," Busch observed, "everywhere I go, tragedy follows. I was at Kent State the day of the shootings. I was in New York the day of the big blizzard. I was in Detroit the day Jimmy Hoffa disappeared. I was at Washington National Airport the day before the plane crashed into the bridge."

"Last year," he added, "driving up to Rochester, New York, I drove sideways for about 200 yards on the New York State Thruway on the ice. It's interesting to look out the side window to see where you're going.

"I frightened all the other drivers. It was a three-lane highway and they all pulled over to the shoulder and watched me drive down the street sideways."

When Busch goes on long trips, he dictates his Kitchen Table columns into his Norelco microcassette recorder. "I actually get more work done driving than I do some types of work sitting in my office," he noted.

"My office is a spacious eight by ten feet," he added. "Most of it is taken up by counter space and bookcases, and the actual floor space is closer to four by six feet. There are no windows to distract me, and the tight confines keep me from collapsing with fatigue since there's no place to fall down.

"One major problem is that when I want to move a computer or something, there is such a tangle of wires and extension cords that I usually just snip them with scissors to free the necessary peripherals, and start all over again.

Another problem is I am seldom more than three feet away from two or three monitors—including one color receiver—so I find that I sometimes glow in the dark."

The clutter in the silicon comic's office reflects his incurable bent for collecting things. He has all his photography magazines dating back to 1960 and every paperback book he's ever bought. However, while he visited his wife-to-be in 1967, his mother—who had to quit her job of many years as a beautician because she became allergic to hair dye—dumped his comic books and Playboys. "I've always collected everything," he said. "I don't think I've thrown anything away in my life. It's all out in my garage."

Busch collects travel guides to Spain published before 1900 and "Seat Occupied" signs from airlines. "I like to do things nobody else does," he commented.

He's played in a number of jazz, dance, rock and blues bands, including a punk rock garage band called "The Babylonian Disaster Squad." Currently he's negotiating to play bass with a local New Wave band, BAK Two Square One, "I loaned the band's lead guitarist my bass," he explained, "and he allowed it to be stolen. Now I'm saving up to buy a new one."

He likes all kinds of music. His favorite composers are Beethoven, John Lennon and Hank Williams, Jr. He has every Beatles album including bootlegs not officially released by the group. "I listen to Beatles music at least an hour or two a day," he added.

He also likes films. "I've made humorous home movies," he noted, "with anyone sitting around with nothing to do." Charlie Chaplin holds Busch's interest and he has most of the silent era comedian's films on Super 8 and videotape. His favorite movie is "City Lights."

Other Busch favorites include *The Moon Is a Harsh Mistress* by Robert Heinlein, the video game Galaxians, video pinball, and a pair of utility programs called IRV (a key-

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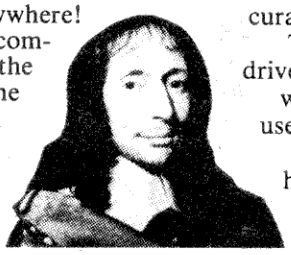

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(PASCAL 80 does not implement variant records, pointer and window variables, or functions and procedures used as parameters.)

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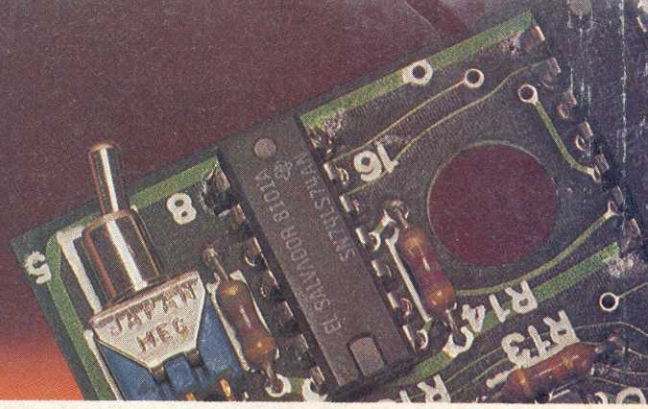
Reader Service for facing page 31→

THE SWITCH



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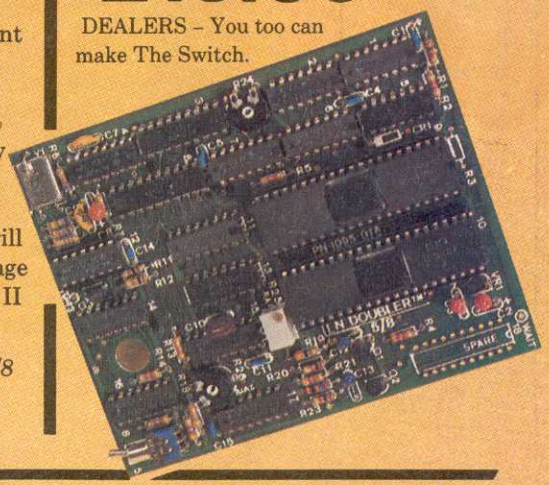

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". . . when I want to move a computer there is such a tangle of wires and extension cords that I usually just snip them with scissors. . ."

stroke multiplier) and PACKER (which packs and unpacks program statements).

The Busch household also has its complement of pets: goldfish, parakeets and his in-laws' cat, vacationing with the family while its owners reside in warmer climes during the winter. "It feels right at home," he observed. "It comes in and throws up any time it wants."

Busch's cat came to a recent untimely end: "It was one that we found. We thought it was a kitten, but it turned out it was a year and a half old and its growth had been stunted because it had been starving for a year and a half. Then, while walking on some rafters in someone's garage, it slipped and fell between them and hung itself."

Busch has two sons, ages 11 and 12, both interested in computers. His oldest boy, following his father's footsteps, is saving his paper route money to buy an Atari 800.

"My wife can't understand why the computers cost so much money," Busch said. "So I try to explain to her they're free. Like when I bought the Pocket Computer. She said, 'You paid $200 for that thing?!!' Well, I've already written three articles about it and have gotten twice as much money for the articles as I paid for the computer."

Sometimes Busch tries out his Kitchen Table jokes on his children, but never on his wife. However, he said, "Mostly, I try them on my users' group."

The KTI observer maintained he had no doubts about a humor column being accepted by computerists. "When I first started writing Kitchen Table," he commented, "I said, gee, this is good stuff. I thought people would like it. I tried out the jokes on my user's group and they thought they were hilarious."

Kitchen Table is Busch's handle on the Micronet CB network. "Every time I get on there," he said, "people recognize it and comment." He also gets funny tongue-in-cheek letters asking questions about KTI wares: "One guy said he had a scratch on TLS-8E's CRT and he wanted to know if the company made a special tape to repair it."

In fact, the demand for KTI products has been so great, Busch is developing some of them: "I'm working on DROSSDOS and the Basic Misinterpreter. DROSSDOS looks like you're actually running a DOS but when you type BASIC, and go into the Basic Misinterpreter, it does funny things. When you type PRINT 1 + 2, it will print one plus two instead of three. If you give it a command it doesn't recognize, it goes: Huh?"

Meanwhile, Busch said, in the coming year, KTI plans to maintain its reputation as an innovative leader with products like no-name software—software with no frills like menus and documentation—and checkers with sound. ■

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NOTE: *Printer Parallel accommodates the following printers:
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**All Serial Interface cables are universal kits complete with all parts having 7 wires staked to pins. Pins must be inserted into plugs and sockets and then strain relief (included) added.

CMP INDUSTRIES CABLES

Cable - Computer Type	Peripheral	List Price
11 Altos	Printer Parallel*	$65.00
12 Apple	Printer Parallel*	35.00
13 Atari	Printer Parallel*	52.00
14 AVL Eagle	Printer Parallel*	45.00
15 IBM	Printer Parallel*	41.00
16 NEC	Printer Parallel*	35.00
17 Radio Shack TRS-80,*** Mod I or Mod III	Printer Parallel*	35.00
18 Radio Shack TRS-80,*** Mod II	Printer Parallel*	35.00
19 Vector Graphics (Serial)	Okidata Microline (Serial Input)	28.00
20 Vector Graphics (Serial)	NEC Spinwriter (Serial)	35.00
21 Vector Graphics (Serial)	Modem DCE	23.00
22 Vector Graphics (Serial)	Modem DTE	46.00
23 IBM	Houston Plotter	35.00
24 Serial (M) DB 25P	Serial (M) DB 25P**	35.00
25 Serial (F) DB 25S	Serial (F) DB 25S**	37.00
26 Serial (M) DB 25P	Serial (F) DB 25S**	37.00
27 Serial (M) DB 25P	Serial (M) DB 25P**	35.00
28 Serial (M) DB 25P	Serial (M) DB 25P**	35.00
29 Serial (F) DB 25S	Serial (M) DB 25P**	35.00
30 Edge Card Connector, FEN 767-J034-AU/1	Serial (F) DB 25S**	35.00
31 Vector	Parallel Receptacle (Jumper)	35.00
32 Commodore IEEE	Houston Plotter	37.00
	Printer Parallel*	

***TRS-80 is a Trademark of the Tandy Radio Shack Corporation

All cables are 5 Ft. except #28 and #29 which are 3 In. jumpers and cables #11, #14, #24, #25 and #26 which are 10 Ft. in length.

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ECHO Speech Synthesizers use LPC synthesis pioneered by Texas Instruments, combined with a phoneme-based operating system to provide any vocabulary you desire while using a minimum of your computer's memory.

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Simple commands allow you to select from:

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- Words spoken monotonically or with intonation
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- Entire words pronounced or spelled letter by letter
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For more information see your dealer or contact:

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Anaheim, CA 92806 Telephone: 714/632-9950

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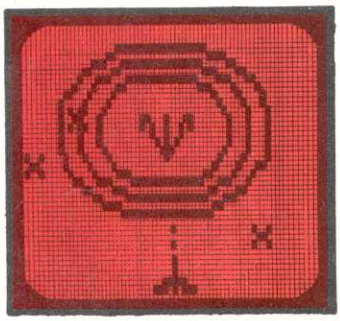
The Cornsoft Group PRESENTS:

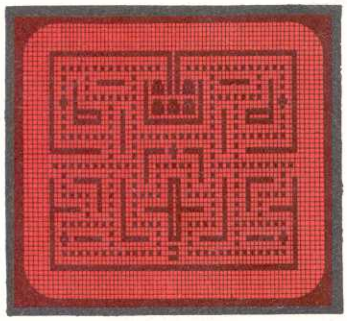
New! SPACE CASTLE
FOR TRS-80 MODELS I & III



Will you save the Andromeda Galaxy by destroying the Space Castle or will the evil warlord Yugdab continue to rule, uncontested? Locked in battle with Yugdab, your main defense is your ability to skillfully handle your ship and it's projectiles. If you are not careful, Yugdab's intelligent mines will hunt you down and blow you into space dust. Written in machine language, Cornsoft's New Arcade Game, Space Castle, has fast action and exciting sound. Yes, Joystick owner's, the Alpha Joystick really puts you in the cockpit!!

16K Model I & III Tape: 15.95 + 1.50 Shipping
32K Model I & III Disk: 19.95 + 1.50 Shipping
Indiana Residents Add 4% Sales Tax

New! SCARFMAN
FOR THE TRS-80 COLOR COMPUTER



It's eat or be eaten. That's right!!! Now color computer owners can enjoy the same thrills that lots of Model I & III owners are raving about, like Mrs. David Cullen, Germantown, Maryland, who writes:

"My highest (score) to date is 271,090. I have achieved this on our TRS-80 Model III, without Joysticks. I honestly don't play all day — my three children wouldn't allow it — but I think it's great fun!!

Congratulations on the Third Highest Score to date: (Highest: 289,565 by David Leventhal)

Written in machine language, Scarfman has the Excitement, Graphics, Sound and Real Time Action that have become a trademark of the Cornsoft Group. Scarfman is also Alpha Joystick compatible.

TRS-80 Color Computer Tape: 19.95 + 1.50 Shipping
16K Model I & III Tape: 15.95 + 1.50 Shipping
32K Model I & III Disk: 19.95 + 1.50 Shipping
Indiana Residents Add 4% Sales Tax

The Cornsoft Group

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- multiple linear regression
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- analysis of variance
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Minneapolis, MN 55419

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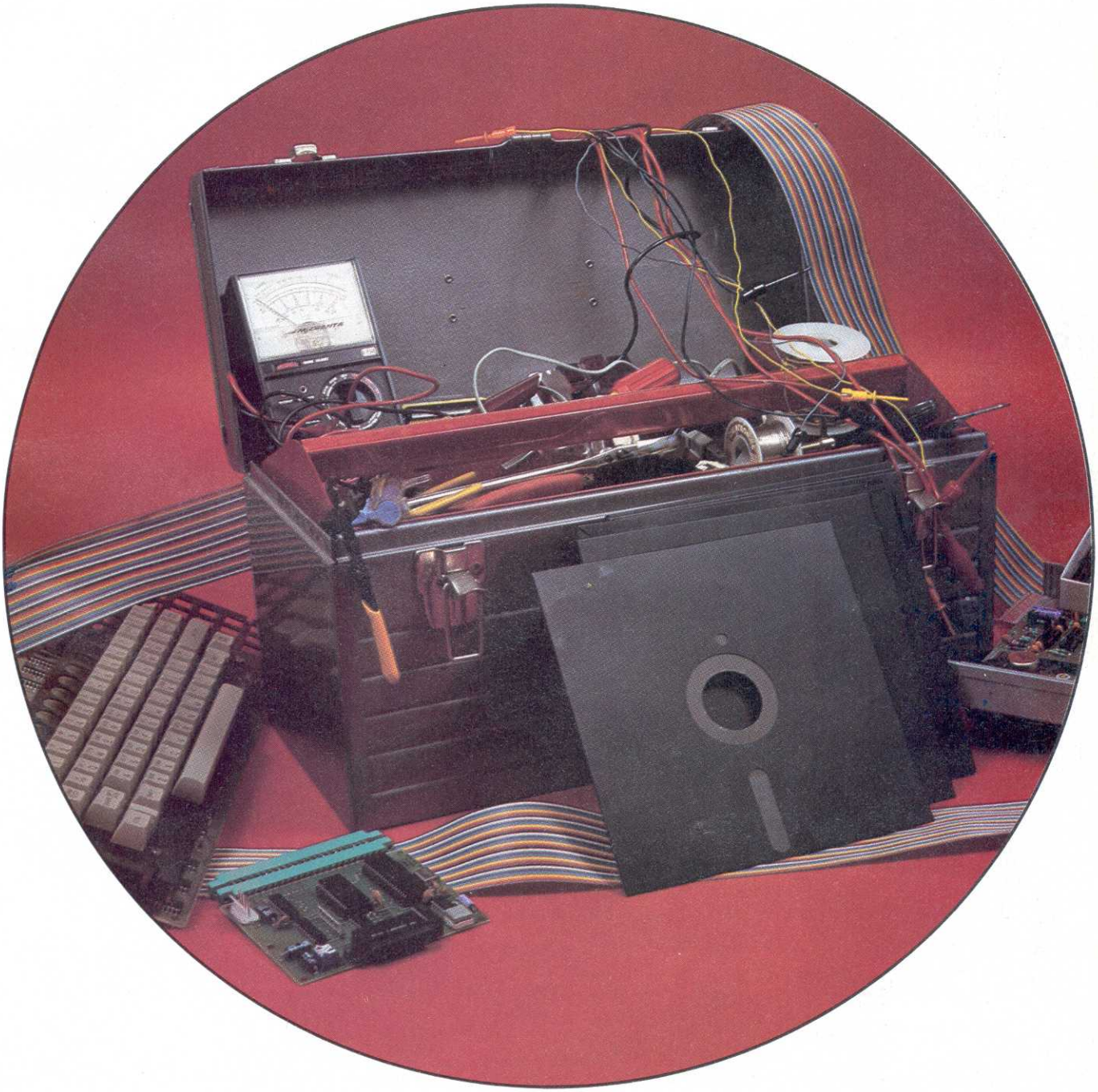
*Trademark Tandy Corp. **Trademark Corvus Systems, Inc.

80 microcomputing™

the magazine for TRS-80 users*

1982 Utilities Buyer's Guide



1982 BUYER'S GUIDE

Assemblers

	Product	Model	Minimum RAM	Tape or Disk System	DOS	Price
Computer Applications	T-ZAL	III	16K	T	NA	$49.95
Program Innovations	Macro Assembler	II	64K	D	V	$74.95
InfoSoft	I/SAL	II	32K	D	R	$225

Editor/ Assemblers

Mumford Micro Systems	Instant Assembler	I,III	16K	T	NA	$29.95
MISOSYS	EDAS	I,III	32K	D	K,L,V	$79
MICRO WORKS	SDS80C	Color Comp.	4K	T	NA	$89.95
RACET Computes, Ltd.	Development Package	II	64K	D	F	$125
Computer Applications	M-ZAL	I,III	32K	2D	I,K,V	$149
Spectral Associates	Editor/Assembler	Color Comp.	16K	T	NA	$34.95

C = inquire
X = unavailable
NA = not applicable

D = disk
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B = NEWDOS 2.1
E = NEWDOS PLUS
F = TRSDOS 2.0

G = NEWDOS
H = NEWDOS40
I = NEWDOS80

UTILITIES

Separate documentation	Supports Macros	Conditional Assembly	Other features
X	N	N	Symbol table cross-ref facility Supports 1500 baud Can upgrade to disk system
C	Y	Y	Requires EDTASM
$15	Y	Y	Linker and debugger alone $150

	Editor	Suports Macros	Conditional Assembly	Sets Breakpoints	
$3	Y	N	N	N	Relocatable code modules Uses compressed format
X	Y	N	Y	N	Assemble from multiple disk source files
$10	Y	N	Y	Y	Assigns labels ROMPACK Source listing available
$12.50	Y	Y	Y	N	Superzap and disassembler included
NA	Y	Y	Y	N	Symbol table cross-ref facility Nested source file Relocatable object code
C	Y	Y	Y	N	

J = NEWDOS80 2.0
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L = LDOS
M = VTOS
P = MicroDOS
R = CP/M
V = TRSDOS
W = any non-CP/M DOS

So you have a blown disk, or a tape you would like to duplicate, or a machine language program ready for assembling. What next?

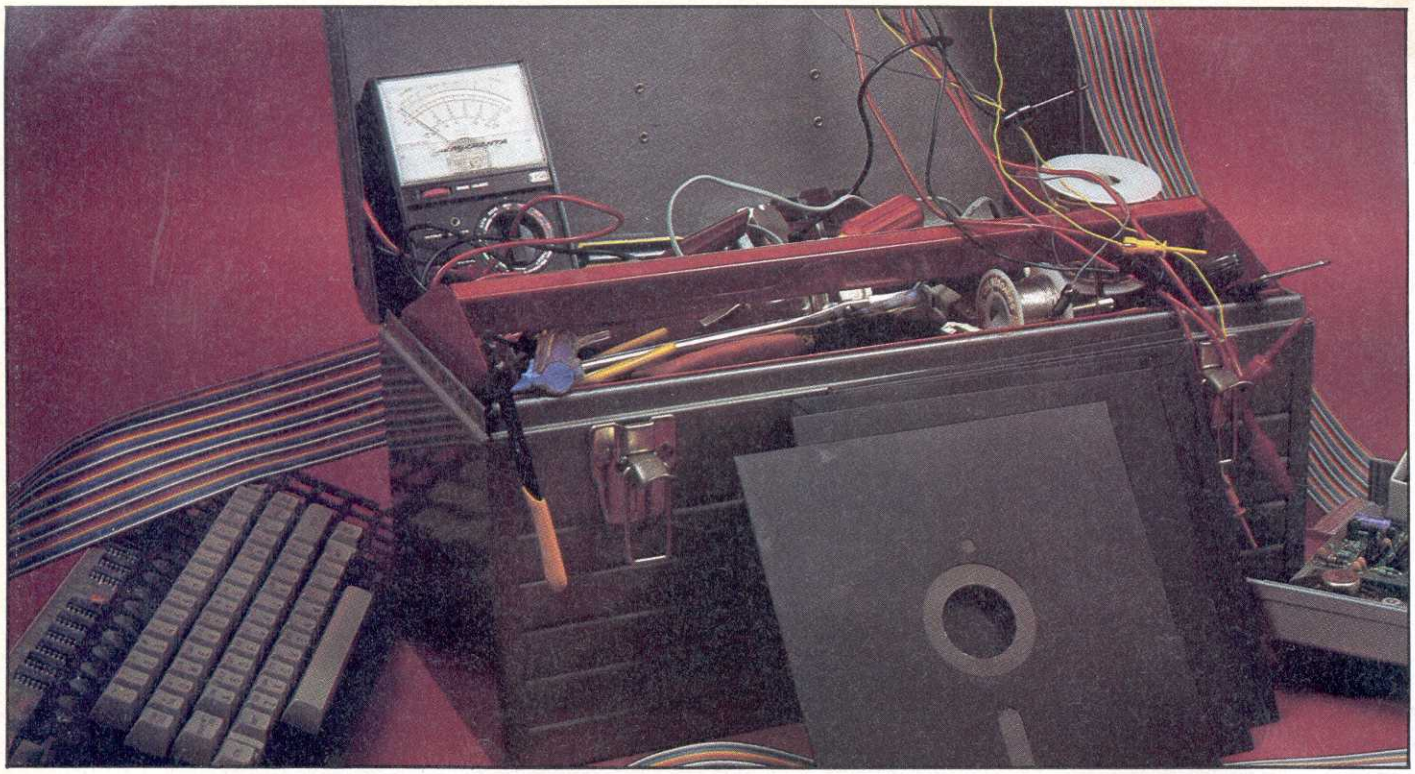
Start by reading Jake Commander's tutorial article about utilities in this issue. He describes each general category of utilities useful to the personal computer owner, and includes tips on what to look for when you purchase a program.

After you decide which utility you need, flip through the pages of the Buyer's Guide. The 20 companies (and approximately 75 products) listed are included because they responded to *80 Micro's* letters of inquiry. (If you don't see your favorite utility here, don't panic. The product is probably still on the market, but the manufacturers did not meet our publication deadlines.)

One notable omission from this Guide is Radio Shack—they chose not to be included. If you're considering Radio Shack software, dust off your catalog and compare their offerings with what is listed here.

Keep in mind that the purpose of this Guide is not to tell you which product to buy. Rather, it should narrow your field of choices to three or four programs. Eliminate the software which is out of your budget or too simplistic or not written for your system. Then, contact the companies remaining for more specific info about their products.

Obviously, there is no space to comprehensively list the features of each piece of software included. A $20 product may have virtually the same standard features as a $120 item. It is up to you to find out about the "extras." ■



Disassemblers

Product	Model	Minimum RAM	Tape or Disk System	DOS	Price
Instant Software	The Disassembler	I,III	16K	T	NA	$9.95
Instant Software	TLDIS	I,III	16K	T	NA	$14.95
MISOSYS	DISI	I,III	16K	T	NA	$15
Instant Software	DLDIS	I,III	16K	D	W	$19.95
MISOSYS	DISII	I,III	16K	D	W	$20
Program Innovations	Disassembler	II	64K	D	V	$73.95
The Micro Works	80C	Color Comp.	16K	T	NA	$49.95

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G = NEWDOS
H = NEWDOS40
I = NEWDOS80

Companies in Buyer's Guide

Advanced Operating Systems
450 St. John Road
Michigan City, IN 46360
800-348-8558
219-879-4693

ALGORIX/Allen Gelder Software
Box 11721
San Francisco, CA 94101
415-387-3131

The Alternate Source
704 N. Pennsylvania
Lansing, MI 48906
517-482-TAS0
517-482-TAS1

Computer Applications Unlimited
P.O. Box 214
Rye, NY 10580
914-937-6286

Cottage Software
614 N. Harding
Wichita, KS 67208
316-683-4811

Datasoft Inc.
19519 Business Center Drive
Northridge, CA 91324
213-701-5161

Howe Software
14 Lexington Road
New City, NY 10956
914-634-1821

InfoSoft Systems Inc.
25 Sylvan Road South
Westport, CT 06880
203-226-8937

Instant Software
Peterborough, NH 03458
800-258-5473
603-924-9471

INTERPRO
P.O. Box 4211
Manchester, NH 03108
603-669-0477

Galactic Software/ Logical Systems Inc.
Mequon, WI 53092
414-241-8030

The Micro Works
P.O. Box 1110
DelMar, CA 92014
714-942-2400

MISOSYS
5904 Edgehill Dr.
Alexandria, VA 22303
703-960-2998

Mumford Micro Systems
Box 400-E
Summerland, CA 93067
805-969-4557

PowerSoft
11500 Stemmons Exp., Suite 125
Dallas, TX 75229
214-484-2976

Program Innovations
Box 1368—400 N. Walnut St.
Lumberton, NC 28358
919-739-3216 ext. 15

PROSOFT
Box 839
North Hollywood, CA 91603
213-764-3131

RACET Computes, Ltd.
1330 N. Glassell Suite M
Orange, CA 92667
714-997-4950

Small Systems Software
P.O. Box 366
Newbury Park, CA 91320
805-497-6657

Spectral Associates
145 Harvard Avenue
Tacoma, WA 98466
206-565-8483

Separate documentation	Relocatable	Labels	Output to Screen, Printer, Tape or Disk	Other features
X	Y	N	P,T	
X	Y	Y	P,T	
X	N	Y	S,P,T	
X	Y	Y	P,D	
X	N	Y	S,P,T	Other programs relocated
C	N	N	D	DO file
X	Y	Y	S,T	Variable output formats

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K = DOSPLUS
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M = VTOS
P = MicroDOS
R = CP/M
V = TRSDOS
W = any non-CP/M DOS

"If you don't see your favorite utility here, don't panic."

Editors

Product	Model	Minimum RAM	Tape or Disk System	DOS	Price
Instant Software	IRV	I	16K	2D	V	T $24.95 D $29.95
Computer Applications	XBE (XEDIT)	I,III	16K	T,D	I,K,L,V	T Model I $24.95 Model III $29.95
The Alternate Source	KBE	I,III	32K	D	W	$39.95
ALGORIX	Edit	I,III	16K	D	W	$40
Datasoft	S.E.C.S	Color Comp.	16K	T	NA	$29.95
INTERPRO	ABE	I	32K	D	I,V	$19.95

Monitors

MISOSYS	DUTIL	I	16K	D	L	$20
INTERPRO	ULTRA-MON	I,III	16K	T	NA	$24.95
MISOSYS	TUTIL	I,III	16K	T	NA	$15
Mumford Micro Systems	STEP80	I,III	16K	T	NA	$16.95
Computer Applications	X-BUG	I,III	16K	T,D	W	$19.95

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I = NEWDOS80

Separate documentation	Full cursor control	Block functions	Global commands	Macro keys	Other features
X	Y	Y	N	Y	
X	Y	Y	Y	Y	
$2	Y	NA	NA	Y	Editor for Basic, DOS, EDTASM, EDIT-80
X	Y	Y	Y	N	
X	Y	N	N	N	High resolution graphics Character generator Audible error warning
C	Y	Y	Y	Y	

	Disassembler	RAM Editor	Single Step	Set Breakpoints	
X	N	Y	N	Y	Read sectors or tracks
X	Y	Y	N	Y	Relocates memory Trace
X	N	Y	N	Y	
X	Y	Y	Y	Y	Trace
$9.95	N	Y	Y	Y	Relocatable monitor

Continued

J = NEWDOS80 2.0
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R = CP/M
V = TRSDOS
W = any non-CP/M DOS

Assemblers Editor/Assemblers Disassemblers Editors Monitors Disk Zappers Renumberers/Compressors Tape Utilities File Utilities General Utilities Assemblers Editor/Assemblers Disassemblers Editors Monitors

Screen editors are utilities offering distinct advantages over the line-editing process known to TRS-80 users. They allow cursor movement across the video screen without destroying any of the text the cursor passes over.

Text editors are used to enter and manipulate text files from a keyboard. Basically, they are stripped-down word processors, and in fact, most word processors will do a better job than a text-editing utility.

All monitors allow memory to be displayed or printed in various formats, such as hexadecimal, octal, decimal, ASCII or symbolic. Symbolic means symbols are displayed instead of values; these symbols are simply the mnemonics discussed under the heading of disassemblers. Some monitors therefore contain a disassembler as an option. The memory under scrutiny can be altered from the monitor and can influence the results of any resumed execution of the main course.

Monitors
Continued

Product	Model	Minimum RAM	Tape or Disk System	DOS	Price
The Alternate Source	TASMON	I,III	8K 16K with no DOS	D	I,K,L,V	$29.95
Howe	MON-3	I,III	16K	T	NA	$39.95
ALGORIX	STRETCH SUPERSTEP	I,III	32K	D	W	$39.95
Howe	MON-4	I,III	16K	D	Model I W Model III V,J,K	T $49.95 D $53.95
Datasoft	SIGMON	Color Comp.	16K	T	NA	$29.95
The Micro Works	CBUG	Color Comp.	4K	T	NA	$29.95 ROM $39.95 ROMLESS PAK 1 $64.90
ALGORIX	COCOBUG	Color Comp.	4K	T	NA	$19.95
PowerSoft	Super Utility	I	32K	D	G,V	$49.95
PowerSoft	Super Utility Plus	I,III	48K	D	W	I,III $74.95 I/III $124.95
PowerSoft	Quick-Fix	I	32K	T	B,V	$34.95
Spectral Associates	BUGOUT	Color Comp.	4K	T	NA	$19.95
Advanced Operating Systems	MACRO-MON	I,III	16K	T,D	W	Model I T $54.95 D $59.95 Model III D $69.95
Small Systems Software	RSM-2	I	16K	T,D	V	T $26.95 D $29.95
Small Systems Software	RSMII	II	64K	D	V	$39.95

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I = NEWDOS80

Price	Disassembler	RAM Editor	Single Step	Set Breakpoints	Other features
$2	Y	Y	Y	Y	Trace Relocatable monitor
$2	Y	Y	N	N	Relocate object programs
$5	Y	Y	Y	N	Trace View code in 8 formats
$5	Y	Y	N	N	RS-232-C port
X	Y	Y	Y	Y	Mini-assembler Debugger
X	N	Y	N	Y	RS-232 port
X	N	Y	N	Y	Induces screen modes Shows chip and architecture before and after instruction
$10	N	Y	Y	N	Format disks, configure system Disk or tape copy
$10	N	Y	Y	N	Format disks, configure system Disk or tape copy
$10	N	Y	N	N	All features of Super Utility except Special Copy and Tape Copy
C	N	N	Y	Y	
X	Y	Y	Y	Y	Trace Relocate object programs Self-relocatable
X	Y	Y	Y	Y	
X	Y	Y	Y	Y	Modify in hex or ASCII

J = NEWDOS80 2.0
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L = LDOS
M = VTOS
P = MicroDOS
R = CP/M
V = TRSDOS
W = any non-CP/M DOS

Disk Zappers Renumberers/Compressors Tape Utilities File Utilities General Utilities Assemblers Editor/Assemblers Disassemblers Ed

Assemblers come with a wide variety of features and are priced accordingly. The beginner should stay with a simple assembler until the more sophisticated options, such as conditional or macro assembly, are needed. A simple assembler is still worth its weight in gold compared to the time and effort involved in hand assembly.

itors Monitors Disk Zappers Renumberers/Compressors Tape Utilities File Utilities General Utilities Assemblers

As their names suggests, disassemblers do a job exactly opposite of assemblers. Where an assembler takes mnemonic opcodes and assembles them into hexadecimal object code, a disassembler takes the object code and produces mnemonic text.

Editor/Assemblers Disassemblers Editors Monitors Disk Zappers Renumberers/Compressors Tape Utilities File Utilities General Utili

"The purpose of this Guide is not to tell you which product to buy. Rather, it should narrow your field of choices to three or four programs."

Disk Zappers	Product	Model	Minimum RAM	Tape or Disk System	DOS	Price
The Alternate Source	TRAKCESS	I	48K	D	G,V	$24.95
Instant Software	Disk Editor	I	16K	D	G,L,M,P,V	$39.95
Galactic Software	FED	I,III	32K	D	L	$40
Renumberers/ Compressors						
Instant Software	RENUM/COMPRESS	I	16K	T	NA	$14.95
Instant Software	Compression Utility Pack	I	16K	T	NA	$19.95
PROSOFT	QUICK COMPRESS	I,III	16K	T,D	G,I,K,L,V	T or D $19.95
Cottage Software	PACKER	I,III	16K	T,D	G,L,M,V	$29.95
PROSOFT	FASTER	I,III	16K	T,D	G,I,K,L,V	T or D $29.95
RACET Computes, Ltd.	REMODEL/PROLOAD	I,III	16K	T,D	G,I,J,K,L,V	T $35 D $40

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H = NEWDOS40
I = NEWDOS80

Separate documentation	Resident editor	Modify by track	Modify by sector	Modify by file	Other features
X	Y	Y	N	N	
X	Y	N	Y	Y	Transfer command to Debug
$5	Y	N	N	Y	Edit files on disk

	Renumberer	Remove blanks and Remarks	Produce multi-statement lines	Unpack	
X	Y	Y	N	N	
X	Y	Y	Y	N	
X	N	Y	N	N	FASTER & QUICK $39.95
$6	Y	Y	Y	Y	Move lines
X	N	N	N	N	Allocates variables to cut running time FASTER & QUICK $39.95
X	Y	N	N	N	Move or delete lines

J = NEWDOS80 2.0
K = DOSPLUS
L = LDOS
M = VTOS
P = MicroDOS
R = CP/M
V = TRSDOS
W = any non-CP/M DOS

ties Assemblers Editor/Assemblers Disassemblers Ed itors Monitors Disk Zappers Re numberers/Com pressors Tape Utilities File Utili ties General Utili ties Assemblers Editor/Assemblers

A disk can be blown in numerous ways, and the more ghastly ways will preempt any attempt at data recovery. Many situations exist, however, where a file is intact on a disk but can't be accessed for some reason; this is where a disk zapper can be used to recover hours of work otherwise lost.

Disassemblers Ed itors Monitors Disk Zappers Re numberers/Com

The utility may have functions other than debugging; it may tidy up the final product, or list the program in a more readable fashion than usual.

pressors Tape Utilities File Utili ties General Utili ties Assemblers Editor/Assemblers Disassemblers Ed itors Monitors Disk Zappers Re numberers Com pressors Tape Utilities File Utili

Tape Utilities

Product	Model	Minimum RAM	Tape or Disk System	DOS	Price
ALGORIX	TSAVE	I,III (500 baud only)	16K	T	NA	$9.95
Cottage Software	System Tape Duplicator	I,III	16K	T	NA	$15.95
Mumford Micro Systems	CLONE	I,III	16K	T	NA	T $16.95 D $21.95
Small System Design	Duplicator	I	16K	T	NA	$8
Instant Software	Cassette Scope	I	16K	T	NA	$14.95

File Utilities

RACET Computes, Ltd.	Cross Reference	II	64K	D	F	$50
MISOSYS	PDS (Partition Data Set)	I,III	16K	D	L	$50
MISOSYS	CMDFILE	I,III	16K	D	W	$20
RACET Computes, Ltd.	BLINK (Basic Linker)	I,III II	32K 64K	D D	G,I,J,K,L,V F	Model I $25 Model III $30 Model II $40
MISOSYS	CONVCP/M	I,III	16K	D	L and R	$30
Galactic Software	I/O Monitor	I,III	32K	D	L	$25
Instant Software	DISK SCOPE	I	16K	D	V	$19.95

C = inquire
X = unavailable
NA = not applicable

D = disk
T = tape
S = screen

B = NEWDOS 2.1
E = NEWDOS PLUS
F = TRSDOS 2.0

G = NEWDOS
H = NEWDOS40
I = NEWDOS80

J = NEWDOS80 2.0
K = DOSPLUS
L = LDOS

Separate documentation	Duplicate tapes	Other features
X	N	Write non-contiguous RAM to System tape
$3.20	Y	Verify Routines 1500 baud—Model III
X	Y	1500 baud—Model III Screen display of copied material
X	Y	Verify Routines
X	N	Dump tape to screen in binary format Display load addresses of system tapes

Separate documentation	Description
$5	Listing by variable, string, numeric data, alphanumeric data
X	Generate library files
X	Append, concatenate, offset, copy, create files
$5	Intercept disk I/O error
Model I $2.50 Model III $3 Model II $4	Program chaining Merge files
X	Transfer file from CP/M to LDOS medium
X	Prints number of file tracks and sectors, amount of memory View tracks or sectors

continues

M = VTOS
P = MicroDOS
R = CP/M
V = TRSDOS
W = any non-CP/M DOS

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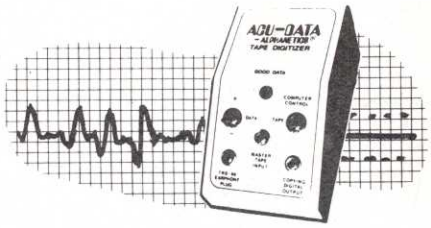

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RACET Computes, Ltd.	Utility Package	II	64K	D	F	$150

General Utilities

PROSOFT	XTEND40	I	16K	D	H,I,K,L	$19.95
Instant Software	Dynamic Device Drivers	I	16K	T,D	W	T $19.95 D $24.95
RACET Computes, Ltd.	LPSPOOL	I	32K	D	G,I,J,K,L,V	$75
Cottage Software	Print to LPrint	I,III	16K	T	NA	$12.95
RACET Computes, Ltd.	COMPROC	I,III	32K	D	G,I,J,K,L,V	T Model I $20 T Model III $30 D Model I $25 D Model III $35
PROSOFT	DISK RPM	I,III	32K	D	W	$24.95
Logical Systems Inc.	Filter Package	I,III	32K	D	L	$60
PowerSoft	Make-80	I,III	16K	D	W	Model I $14.95 Model III $24.95
Spectral Associates	Magic Box	Color Comp.	16K	T	NA	$24.95
PowerSoft	Utility Disk #2	I,III	32K	D	L	$69.95

C = inquire
X = unavailable
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D = disk
T = tape
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B = NEWDOS 2.1
E = NEWDOS PLUS
F = TRSDOS 2.0

G = NEWDOS
H = NEWDOS40
I = NEWDOS80

J = NEWDOS80 2.0
K = DOSPLUS
L = LDOS

Separate documentation	Description
$5	Reads and sorts directories
$15	Ten utilities for rebuilding crashed data files
X	Convert 35-track disks into 40-track disks
X	Debounce, repeat keys, lowercase mod support, graphics, printer/screen auto switch
$7.50	Spool data to disk, despool to printer
$2.60	Change Print to LPrint (except Print@ and Print #)
Model I $2 Model III $3	Bring a program to a main menu Command processor
X	Measure and adjust drive rotational speed
$5	Modify I/O to printer, video, keyboard Enhancements to LDOS
X	Convert 35- or 40- track disks into 80-track disks
C	Load Model I or III tapes into Color Computer
$10	Twelve programs to expand LDOS

M = VTOS
P = MicroDOS
R = CP/M
V = TRSDOS
W = any non-CP/M DOS

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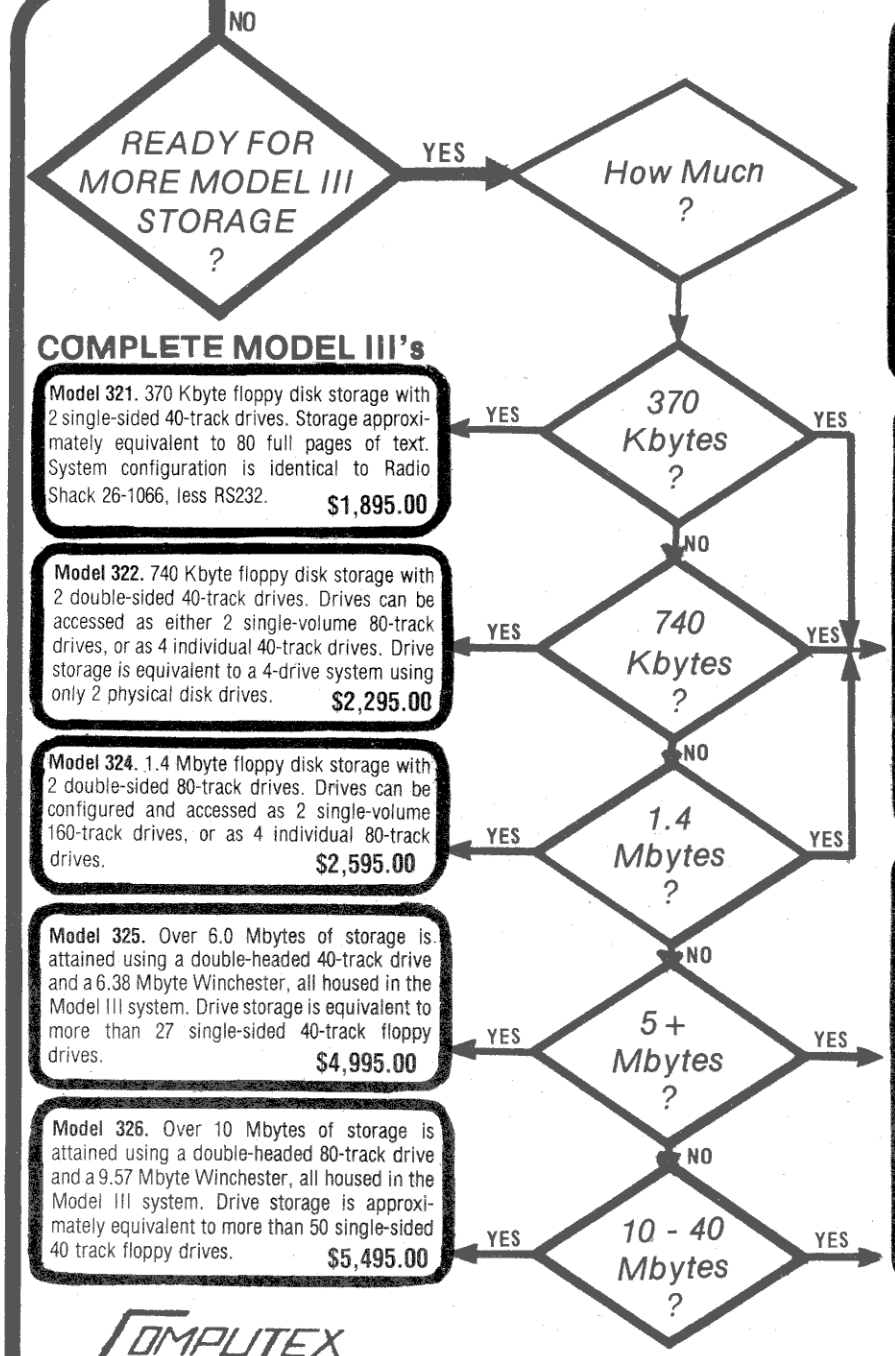

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M3WDC-1 **DRIVE CONTROLLER.** Western Digital WD1000 Winchester Drive Controller *$595.00*

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27

Develop your utility ability.

Make Butterflies—Not Bugs

Utilities: what are they, and how can they help you, the struggling programmer? In this article I'll look at various types of utilities and discuss their use at the hardware and software levels.

According to my dictionary, utilities are "useful things"— a classical dictionary definition if ever I saw one. Although I'd prefer to avoid it, I'm going to have to resort to the overworked term "software tool." That's exactly what utilities are; as tools, they create or alter other programs, but there are other uses for them, as we shall see.

Utilities are broadly divided into two categories—those that help debug software, and those that help debug hardware. Programmers use software utilities in the development stages of a piece of software, when that software is most likely to be going wrong in unpredictable and exasperating ways. Here we're referring to such things as Basic single-step utilities, which allow Basic program execution one instruction at a time. Another example is a variable-dump utility which automatically prints the values of certain variables at predetermined points during the main program flow. These are the tools that allow a programmer a high degree of control over the program under development.

The utility itself is a program which helps create another program, and the utility itself may have been written with the help of other utilities. This is analogous to mechanical tools used to create other tools. The programmer doesn't have to be a Basic programmer to need a utility; he may be writing at a lower level, such as machine code, where similar types of utilities would give important control over the creation and debugging of the final product. The utility may have functions other than debugging; it may tidy up the final product (as a Basic renumberer would do), or list the program in a more readable fashion than usual. The uses of utilities are many and varied.

Utility programs at the hardware level are more likely to be used in an engineering than a programming situation. For instance, though you may not consider yourself an engineer, you perform an engineering function when you use something like a memory test program. This program wouldn't help write another program, but would diagnose a possible fault in a memory chip or associated hardware. These programs are sometimes called diagnostics because they diagnose and analyze symptoms of hardware problems in the same way a doctor would diagnose a human patient. In common with the experience you would demand from a doctor, the writer of a good diagnostic program must have considerable expertise at the hardware level and familiarity with the specific piece of hardware involved. Many utilities fall into this category, but as a programmer, you won't encounter them as often as the software utilities.

One of the high costs involved in the price of mainframe hardware is the necessary development or diagnostic software that comes with a particular machine. This software takes man-months or years to perfect but ensures that maintenance engineers can keep the equipment functioning at peak efficiency, systems programmers can easily maintain the operating system environment and finally, applications programmers can quickly write and debug the programs which are the *raison d'etre* for the computer's existence. In the world of TRS-80 microcomputers we're not as well provided for—we may have to perform any or all these functions ourselves, and we'll need to shop for the correct utilities to help us. With that task in mind, here is a breakdown, including ten of the various types of utilities and what you can expect them to do.

Assemblers

Assemblers are definitely made for machine code programmers. Though you may think of an assembler as a language program, it's really a utility allowing you to enter a machine code program without having to refer to specific numbers representing required opcodes. Simply reference each opcode by a shortened name (mnemonic), and the assembler will assemble that mnemonic into memory as the appropriate number or numbers. The mnemonics lines fed into the assembler are called the source program, and the resulting pure machine code is the object program. Source code can be typed directly into the assembler from the keyboard or fed in from a tape or disk file. The object code can be directly generated in memory or output to a file on disk or tape to be loaded and executed later.

As an example of an assembler's operation, let's say you decide to start a machine code program by loading the stack pointer register with the number 7000 hex. The Z80 machine code for this procedure consists of the hexadecimal operation code (opcode) 31. The opcode is followed by the address—in this case 7000 hex. To make matters more complicated, some microprocessors (like the Z80) prefer their addresses back to front. The final machine code would appear as: 31 00 70. Imagine doing this process for more than 1000 bytes; you're likely to make a lot of mistakes and cause yourself a severe headache. Using an assembler, just specify a mnemonic followed by an address such as LD SP,7000H, which means "load the stack pointer with 7000 hex." Much simpler than hand assembling

"A simple assembler is still worth its weight in gold compared to the time and effort involved in hand assembly."

the same code.

Assemblers can also keep track of any relative jumps in the machine code. For example, a hand-assembled program may contain a jump forward of ten bytes. If any code is inserted between the jump instruction and the opcode jumped to, the jump has to be adjusted to skip over the inserted bytes. The assembler deals with this by using labels; tell the assembler you want to jump to a label and ascertain the opcode you want to jump to has been labeled. The assembler than inserts the correct number of bytes to jump into your code.

Some assemblers, called conditional assemblers, let you skip over parts of your source code under certain conditions. This feature lets you write portions of code which are assembled only if you specify that code in your final object program. This is normally achieved by setting a label to a value somewhere in the source code, then telling the assembler to test that label and produce code or ignore lines from the source code. This facility allows you to produce two or more versions of the same machine code program with features left in or out according to the way it was assembled, saving you the effort of creating two versions of source code which differ by only a few lines of code.

Finally, macro-assemblers are enhanced versions of the type of assembler we've been discussing. Macro-assemblers let you use macro instructions, which are whole sets of machine code instructions defined within the body of the source program. You define a set of instructions as having a certain name; every time you want to use that sequence of instructions, refer to it by that name. This differs from a subroutine in that the whole routine is spelled out in full within the source code every time you call it by its macro name. Coupled with conditional assembly, macro code allows powerful manipulation of your source code according to preset options.

Assemblers come with a wide variety of features and are priced accordingly. The beginner should stay with a simple assembler until the more sophisticated options, such as conditional or macro assembly, are needed. A simple assembler is still worth its weight in gold compared to the time and effort involved in hand assembly.

Basic Utilities

For our purpose, this heading includes any utility written to help the Basic programmer, and includes all kinds of programming aids. Basic is such a popular language it's no wonder so many utilities are available to help create and debug a Basic program.

At the simple end are utilities such as single-steppers (previously mentioned). Single-steppers allow execution of a Basic program one statement at a time, in order to stop a program from running past the point a bug occurs. The program can be stopped with the Break key the moment the bug occurs when a single step causes incorrect operation of the program. It is then easy to list, analyze and correct the bad line; the alternative is to gradually narrow down the portion of code containing the bug until it is found.

Line renumberers are the utility most common to Basic programmers. Renumberers renumber a Basic program (or a portion of it) more logically. Often a line needs to be inserted between two lines with consecutive line numbers while a program is being developed. This small eventuality is the single largest reason to renumber a Basic program. Once a program is renumbered using sensible increments other lines can easily be inserted. Programs can also be renumbered to tidy up the final listing or to logically separate routines from each other.

To improve the appearance of the finished program, a class of utility exists which allows changes in the format of a Basic program. A program which contains so many multi-statement lines it becomes difficult to follow needs its lines unpacked into single statement lines and a new version of the program created with new line numbers. It's possible to bypass such drastic action using a "pretty printer utility," which lists the program in a format structured to make the code flow easy to follow.

The problem may also exist in reverse: The Basic code may be too well laid out, using generous spaces and REM statements, too quickly using up memory. Before long no more room will exist for further code. A compression utility removes spaces, compacts program statements into multi-statement lines, removes REM statements, and even spots and removes unused portions of code within the program text.

Finally there are enhancements to the Basic language itself. These utilities add new features to the dialect of Basic in use by defining new commands or keywords. The commands may provide graphic functions, such as line drawing or shape displays, which may be called by name from the Basic program. A sorting routine might be called to sort a variable array into ascending or descending order. New mathematical functions could be defined, such as matrix manipulation or new transcendental functions. The list goes on; there are as many different variations as there are demands for those variations. Available utilities range from simply utilitarian to outright luxury.

Diagnostics

Diagnostic utilities exist specifically to check the performance of a piece of hardware by subjecting it to a sequence of tests. The hardware involved may be anything from random access memory (RAM) to a disk controller chip to a hard disk unit. These and other devices interface to the microprocessor in some way, and when functioning correctly, will display predictable results. A diagnostic utility works by anticipating these results and comparing them to acceptable parameters. If a piece of hardware can't perform because of a malfunction, it's the diagnostic's job to recognize that malfunction and report the error. A good diagnostic will pinpoint the problem as accurately as possible, suggest possible causes, and even recommend alternate courses of action to fix it.

As an example, a memory test diagnostic may not only find the faulty chip, but describe the condition under which the error occurs and the chip's part number for replacement. Memory diagnostics, however, should be used with caution: Certain types of memory fault can be missed during even a thorough workout, and then crash the first program that runs in it. I've witnessed a memory chip pass every combination of bits thrown at it but refuse to accept data written to it from a machine code Push instruction.

Disk diagnostics can be particularly useful because they subject the hardware to physical extremes not encountered in daily use. For instance, the disk can be asked to step from track to track at a faster rate than normal. If this test is passed it's reasonable to expect the disk to behave well at its normal speed. With these techniques, it's even possible to forsee a failure before it actually occurs.

Disassemblers

As their name suggests, disassemblers do a job exactly opposite of assemblers. Where an assembler takes mnemonic opcodes and assembles them into hexadecimal object code, a disassembler takes the object code and produces mnemonic text. The output text can even contain labels automatically generated by the disassembler,

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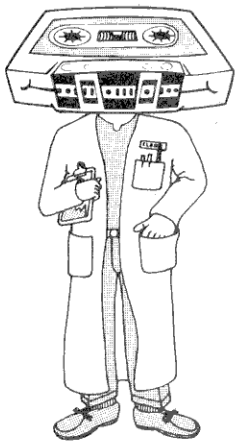

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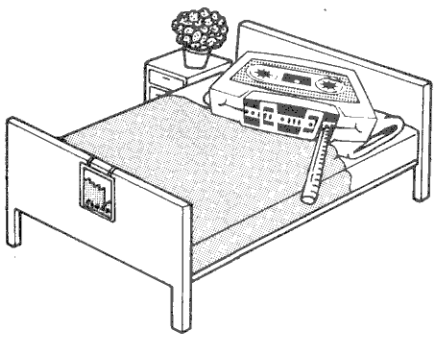

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". . . a disk zap program can take a blown disk and make it usable."

enabling reassembly at a later date.

A disassembler makes a machine code easier to follow and understand. The mnemonics produced by a disassembler are easier for a human to read and analyze than the raw opcode bytes used by the microprocessor. It's possible to disassemble a machine code routine and alter it according to your specific needs, a useful capability when changing printer driver routines to enable them to drive off-brand printers, for instance. A less frivolous example is changing tape input/output (I/O) routines to disk, facilitating customized software upgrades to disk operation.

Disk Zappers

These are a must for disk users. Depending on the sophistication of the particular utility, a disk zap program can take a blown disk and make it usable. A disk can be blown in numerous ways, and the more ghastly ways will preempt any attempt at data recovery. Many situations exist, however, where a file is intact on a disk but can't be accessed for some reason; this is where a disk zapper can be used to recover hours of work otherwise lost.

The subject of disk data recovery can take a whole book—ask Harv Pennington, author of the best-known work on the subject, *TRS-80 Disk and Other Mysteries*. That book gives a fair insight into the problems that may be encountered with disk files. For our purposes, we'll stick to the more typical problems and how a disk zap utility can help.

Imagine this: You save a large program to disk, smoking while you work. You shouldn't be! Smoke particles enter the disk unit and are attracted by static to the disk surface. On the spot your file is to be saved, the particles land under the write head of the disk and cause what's known as a soft error. The next revolution of the disk removes the particles and subsequent writes will be correct, but one sector wasn't written correctly. Unless you're running with automatic write-verification, you won't know your first sector is in trouble until you try to read in the program. When you do try to load it, you'll get a read error. A disk zap utility can find the bad sector and allow a rewrite with some dummy information so the program will load, although it will contain garbage from the dummy sector. Rather than retype the entire program, only a small section has to be reentered.

Another example: you save a large program to disk (yes, I know, we just did that, but that's the point, it's much more likely to

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"Monitors. . . are second only in usefulness to assemblers, and some people would dispute that."

happen during a prolonged disk save). This time there's a glitch on the power lines while your program is being saved. In the short time the power surges, the disk head converts the extra voltage to extra magnetism. We now have a partially erased track on the disk—another scene from the chamber of horrors. The sector no longer exists so it can't be repaired; to use the disk in the future, it would have to be reformatted, but this would erase every track and sector on it. Fortunately, utilities exist that can reformat a disk without erasing recoverable data. Again, the blown file may be incomplete when salvaged, but many valuable records may be accessible.

The final example is the most common scenario: Accidental file killing. This mishap occurs so often there are utilities that do nothing but find the dead file directory entry and resurrect it. By altering a single bit on the disk with a zap utility and then restoring its entry in the directory hash index table (HIT) this can be done. On many operating systems, the file itself remains intact after being killed, only the directory entry is amended. Some disk zapper utilities can provide the option of restoring killed flies.

Editors

Contrary to common belief, these are not people but utilities. Editors come in two main forms: text editors and screen editors.

Text editors are used to enter and manipulate text files from a keyboard. Basically, they are stripped-down word processors, and in fact, most word processors will do a better job than a text-editing utility. The best reason for using a text editor at all is that many computer languages process their source input (the actual program to be compiled or assembled) from a file which has to be typed in initially. Text editors are an integral part of many language development systems and the chief method of preparing input files. In common with word processors, a good editor will move, change, delete, substitute text and so on, and then save it to a file for subsequent input to another program.

Screen editors are utilities offering distinct advantages over the line-editing process known to TRS-80 users. They allow cursor movement across the video screen without destroying any of the text the cursor passes over. Characters may be inserted or deleted or otherwise moved and the line may be entered as if it were typed at the input prompt. Thus, if you type a Run command with a misspelled disk file name, you would move the cursor to the error, correct the typo using the screen editor, and hit the Enter key—much simpler than retyping the whole line and risking a new error. Screen editors can also provide options such as direct entry of graphics characters or other characters not normally available from the keyboard.

Monitors

A monitor is the best debugging tool a machine code programmer has at his disposal. Monitors can be as simple or sophisticated as the pocketbook will allow. They are second only in usefulness to assemblers, and some people would dispute that. They provide an interface between a

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"No expert craftsman would be without a fine set of tools, and no programmer should be without a good set of utilities."

machine code program and the programmer. Unlike a Basic program (or any other interpreted language, for that matter), a machine code program executes directly on the microprocessor chip at an almost incomprehensible speed. Some method has to be found to prevent a program still in the evolution stages from crashing the system without leaving a trace as to why. This is where the monitor program is a life saver.

As its name suggests, this utility oversees the execution of a program by allowing the machine code programmer a degree of interaction with his code. Probably the most important function of a monitor is to enable the insertion of breakpoints in the body of the code. Whenever such a breakpoint is encountered, the monitor regains control from the program being debugged. At this point the programmer can check the status of registers in the microprocessor or bytes in RAM to ascertain his program is functioning as it should. The monitor will allow subsequent resumption of the target progam, ensuring all registers are in the state they held at the time of the breakpoint.

All monitors allow memory to be displayed or printed in various formats, such as hexadecimal, octal, decimal, ASCII or symbolic. Symbolic means symbols are displayed instead of values; these symbols are simply the mnemonics discussed under the heading of disassemblers. Some monitors therefore contain a disassembler as an option. The memory under scrutiny can be altered from the monitor and can influence the results of any resumed execution of the main program.

Other options may include abilities such as single-stepping code, which allows one opcode to be executed at a time. On many computers this is a hardware option, but is not available on micros due to chip architecture. A printer may be used to obtain a trace disassembly similar to the TRON function in Basic. This would show the path taken by a machine code program with registers dumped at strategic points.

Sorts are invaluable utilities which can save you the effort of rewriting your own sort routine every time you need to rearrange data in a program. Many different sorting methods exist, each with their own selling point. Tradeoffs are usually involved; one method may be quicker but take more space, another may run in a small amount of RAM but take longer to sort.

Sorts can operate on data already resident in RAM or be called on to sort data in a disk file. Generally, if a file can fit into memory, it's quicker to sort it there, losing no time transferring data back and forth between disks. If a file is too large for memory a disk sort has to be performed, an occasion when a well-written, efficient sort routine is required to minimize the input/output overhead.

Depending on the design of the program, a good sort utility will allow you to specify how your records are broken into fields. Once this is done, designate which field is to be used to sort by; this field will be known as the key field and would be a zip code field within a mail-file address record, for instance. Some sorts allow you to specify one or more key fields, allowing sorting within sorting. In this case, you would end up with a file in zip code order, and in name order within each zip code.

It's sometimes necessary to join two files and ascertain that the resultant file is in some kind of order. This calls for a specialize utility called a sort-merge. There is a conspicuous absence of this in the TRS-80.

Tape Utilities

Tape utilities fall into two types: those that copy tapes one to another, and those that dump tapes in a readable format so the user may view their contents.

Utilities that copy program tapes on the Models I and III must do so by reading the entire tape into memory and then writing a new tape. On many computers this isn't necessary; tape files are structured in blocks which can be read in one at a time and output the same way. Although this is true of data files on the Models I and III, it's not true of Basic or machine code programs, necessitating specialized utilities to copy system tapes. The block format found in other computers allows single blocks to be read and the tape stopped between each to allow that block to be copied to another tape. This isn't possible with TRS-80 program tapes; information would be lost as there are no inter-block gaps. Basic data tapes are saved a block at a time, however.

Some tape utilities let you view the stored data so its layout can be seen as it is encoded. This is especially useful when debugging a piece of software that outputs a tape file, since a bug can intervene and cause output to be different than anticipated. A few of the copy utilities also allow the tape data to be viewed; this allows portions of the data to be changed before dumping a new version.

Terminal Packages

These utilities help with inter-computer communications. There should be no communication problem since we have what's known as the RS-232 standard. The theory is that an agreed standard should allow anybody and his computer to talk to anybody else's computer by using the same set of interface signals. A computer will know when another computer is ready to talk or ready to listen. That's the theory; in reality, various signals are used in various ways and sometimes one computer may not be giving another the expected signal. The more clever terminal packages can help avoid this problem.

The less clever packages, however, play their part by turning your computer into an appropriately-named "dumb terminal." These packages work by emulating the operation of a dumb terminal without a puff of smoke and quick-change act. Your computer is allowed to simply send and receive data signals. Sending is done from the keyboard only, while receiving involves displaying (sometimes called echoing) the received characters on the video screen. Using such a package permits you to communicate with anyone else if his computer is able to read your signals and you can read his.

At the opposite end of the scale we have smart terminal packages. These packages will be smart in proportion to the amount paid for them. There's no real dividing line between smart and dumb; a smart terminal utility may have only a few features which places it just above a dumb one, or it may have many, many features. The attraction of these packages is that they allow such feats as saving incoming messages or data to disk or tape files, or transmission of data from a stored file instead of from the keyboard. It's also possible to simultaneously produce printouts while characters are being received at the terminal. Other goodies offered can include changing the speed of communication (baud rate) without resetting the program and setting specific statuses of RS-232 signals to accomodate a particular dumb terminal.

Each utility described here could have a whole article devoted to it and I've only scratched the surface by taking a quick glance at so many types. In many cases, having the correct utility available saves reinventing the wheel, something that already occurs too often. Without them, programming would become a drudge instead of the enjoyable experience it should be. No expert craftsman would be without a fine set of tools, and no programmer should be without a good set of utilities. ■

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2	ANNU1	Annuity computation program
3	DATE	Time between dates
4	DAYYEAR	Day of year a particular date falls on
5	LEASEINT	Interest rate on lease
6	BREAKEVN	Breakeven analysis
7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
98	SALELEAS	Sale-leaseback analysis
99	RRCONVBD	Investor's rate of return on convertable bond
100	PORTVAL9	Stock market portfolio storage-valuation program

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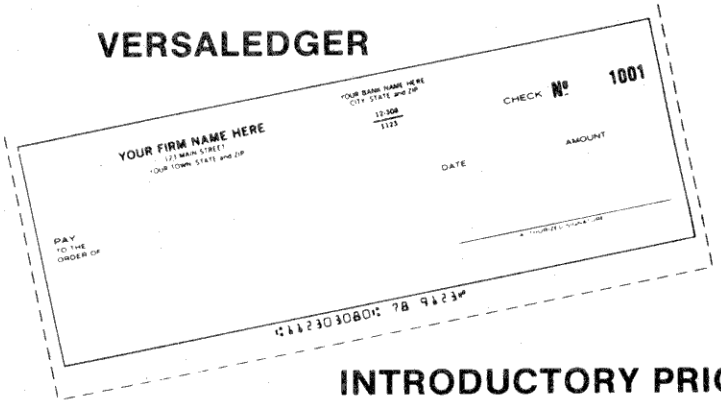

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GENERAL LEDGER

Processes

- ★ Flexible design allows system to be easily adapted to both small businesses and also to firms performing client writeup services.
- ★ Add, change or delete records within the Chart of Accounts (Master) File.
- ★ List the Chart of Accounts File.
- ★ Key in transactions into the Transactions (Journal Entries) File.
- ★ List the Transactions File.
- ★ If other Peachtree Software packages are present, pass summary transactions from these packages to the General Ledger at the end of the accounting period.
- ★ At the end of an accounting period, print out the major reports:
  - (1) Trial Balance (Detail Report)
  - (2) Transaction Registers
  - (3) Balance Sheet
  - (4) Prior Year Comparative Balance Sheet
  - (5) Income Statement
  - (6) Prior Year Comparative Income Statement
  - (7) Department Income Statements

File Information

There are two main computer files maintained within the General Ledger System.

(1) The of Accounts File
- Account Number
- Description
- Account Type
- Balance Sheet Column Code
- Current Amount
- Year-To-Date Amount
- Budget Amount
- Prior Year Monthly Amounts

(2) The Transactions File
- Account Number
- Description
- Source Code
- Reference
- Date
- Amount

ACCOUNTS RECEIVABLE

Processes

- ★ Add, change or delete records within the Customer File.
- ★ List the entire Customer File, or any Customer within the File.
- ★ Enter invoices, payments, credits and adjustments.
- ★ Prepare invoices and statements.
- ★ Produce the following reports:
  - (1) Aged Accounts Receivable
  - (2) Invoice Register
  - (3) Payment, Credit and Adjustment Register
  - (4) Customer Account Status Report
- ★ At the end of a month, post the following items to the General Ledger:
  - (1) Invoiced Sales
  - (2) Freight Charges
  - (3) Sales Tax
  - (4) Service Charge Income
  - (5) Cash Payments
  - (6) Discounts Allowed
  - (7) Returns/Credits
  - (8) Income Adjustments
  - (9) Accounts Receivable

File Information

There are three main computer files maintained within the Accounts Receivable System, the Customer File, the Invoice File, and the Transaction File.

CUSTOMER FILE
- Customer Account Number
- Customer Name
- Address
- Phone
- Type of Account
- Credit Terms
- Credit Limit
- Tax Rate
- Discount Rate
- Date of Last Credit
- Date of Last Debit
- Amount of Last Credit
- Amount of Last Debit
- Current Balance
- High Balance
- Year-To-Date Sales
- Year-To-Date Payments
- Automatic Billing Amount

INVOICE FILE
- Invoice Number
- Invoice Date
- Invoice Amount
- Credit Terms

TRANSACTION FILE
- Transaction Type
- Transaction Date
- Transaction Amount

See List of Advertisers on page 338

ACCOUNTS PAYABLE

Processes

★ Add, change or delete records within the Vendor File.
★ List the Vendor File.
★ Enter vouchers.
★ Automatically determine which vouchers to pay.
★ Print checks and a Check Register.
★ Produce the following reports:
  (1) Open Voucher Report.
  (2) Accounts Payable Ageing Report.
  (3) Cash Requirements.
★ At the end of a month, prepare the General Ledger Transfer File, passing the following information for each debit or credit transaction:
  (1) Account Number
  (2) Description
  (3) Source Code
  (4) Date
  (5) Amount

File Information

There are two main computer files maintained within the Accounts Payable System, the Vendor File and the Voucher File.

VENDOR FILE
- Vendor Code
- Vendor Name
- Address
- Phone
- Year-To-Date Purchases
- Year-To-Date Payments
- Current Balance
- Last Payment
- Date of Last Payment
- Monthly Entry Flag
- Due Date of Month
- Debit Account Number
- Amount (Debit)
- Month Last Paid

This file may also contain information to enable generation of automatic vouchers for those items such as rent or bank payments that are paid every month.

VOUCHER FILE
- Voucher Code
- Voucher Date
- Amount Due
- Date Due
- Discount Percent
- Discount Amount
- Discount Date
- Invoice Number
- Invoice Date
- Status

Plus up to six account number-amount fields for General Ledger account numbers to which the amount due is to be distributed.

PAYROLL

Processes

★ Add, change or delete records within the Employee File.
★ List the Employee File.
★ Modify the Tax Information Files.
★ At the end of a pay period -
  (1) Calculate Pay
  (2) Print Checks
  (3) Print Payroll Register
★ At the end of a month -
  (1) Print the monthly summary
  (2) Print the Unemployment Tax Report
  (3) Prepare the General Ledger Transfer File, passing the following information:
    Net Pay (Cash)
    Employee FICA Withheld
    Federal Tax Withheld
    Insurance Deductions
    Miscellaneous Dedutions
    State Tax Withheld
    Local Tax Withheld
  The gross pay for up to twenty payroll departments may also be passed to the General Ledger.
★ At the end of a quarter, print the 941A report information.
★ At the end of a year, print the W-2 forms.

File Information

There are two main computer files maintained within the Payroll System, the Employee Master File and the Tax File.

EMPLOYEE MASTER FILE
- Name
- Address
- Local Code
- State Code
- Marital Status
- Exemptions, Federal
- Exemptions, State
- Social Security Number
- Pay Period
- Pay Type
- Pay Rate
- Insurance Deduction
- Miscellaneous Deduction
- Date Employed
- Date Terminated
- Last Check Information

Payroll (con't)

And current, month-to-date, quarter-to-date and year-to-date totals for:
- Regular Earnings
- Overtime Hours/Earnings
- Other Hours Rate/Earnings
- Commission Earnings
- Miscellaneous Income
- FICA Deductions
- Federal Deductions
- State Deductions
- Local Deductions
- Insurance Deductions
- Miscellaneous Deductions

TAX FILE
- (for single and married persons)
- Federal Tax Information Tables
- State Tax Information Tables
- Local Withholding Tax Information Tables

An Overview of the Inventory System

Inventory is probably the most speculative of all of a company's assets. A true measure of the effectiveness of management is the ability with which it supervises the inventory control function.

The Peachtree Software™ Inventory Management System is designed to (1) give you better merchandise control, (2) allow you to lower your dollar investment in inventory, and (3) improve customer service and response.

The System maintains detailed information on each inventory item including the part number, description, unit of measure, vendor and reorder data, item activity, and complete information on current item costs, pricing, and sales. Transactions effecting inventory (sales, receipts, adjustments) may be applied at any time to insure the inventory data is always up to date and accurate.

As with all Peachtree products, the system is interactive, simple to operate, and provides reports that are up to date and comprehensive.

Particular features of the Peachtree Software™ Inventory Management System include:

- Interactive, menu-driven programs
- Self-instructing user documentation
- Long item number - up to 15 characters
- Departmentalizing of items
- Multiple pricing levels
- Processes items on reserve (committed but still in stock)
- Online item query at any time
- Comprehensive management reporting
- Automatic month end file backup
- Recovery routines for hardware failures
- Sample data for demonstration and training

How the System is Designed

The Inventory Management System operates with an **Inventory Master File** which allows for the creation of each inventory item and for the recording of transactions (sales, receipts, returns, reserves, and adjustments) to each inventory item.

The Inventory Master File contains the item number, description and various other data on item costs, prices, reorder levels, vendor refereence, and activity. The items within the Master File are entered, changed, deleted, and queried through the **Inventory Master File Maintenance** program. All data on all items may be listed by using the **Detail Inventory Report** program.

Transactions may be applied at any time to the Master File through the **Enter Inventory Transactions** program. An **Update Report** automatically prints during this entry process to provide an audit trail of all inventory acitivity.

Several reports are available for the maintaining of stock, analysis, and forecasting. These reports include the **Physical Inventory Worksheet, Inventory Price List, Departmental Summary Report, Inventory Status Report,** the **Reorder Report** and the **Period-to-Date** and **Year-to-Date** reports.

At the end of an accounting period (usually a month), and then again at the end of a year, the **End of Period Processing** program is run to update current balances and clear previous balances.

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RAM:	four separate tests including every address and data value.
VIDEO DISPLAY:	character generator, video RAM, and video signal.
KEYBOARD:	every key contact tested.
LINE PRINTER:	character test.
CASSETTE RECORDER:	read/write/verify data.
RS-232-C INTERFACE:	connector fault, data transmission, framing, data loop, baud rate generator.
DISK DRIVES:	disk controller, drive select and restore, track seek and verify data, read/write/verify all tracks and sectors with or without erasing, sector formatting, disk drive timer, disk head cleaner.

— Individual tests of each device with operator monitoring and intervention.
— Continuous sysem tests run continually for hours testing each component, with diagnostic reports optionally written on line printer.
— One program adapts to any system configuration and hardware.
— Complete instructions and documentation.

MON-3 and MON-4

The TRS-80 Monitor Programs #3 and #4 are powerful utility programs enabling you to interact directly with the TRS-80 in Machine Language. They are as useful for beginners as for advanced programmers.

- BEGINNERS can learn to interact directly with the computer in Machine Language.
- 40-PAGE MANUAL provided with each program.
- SIMPLE commands, easy to use.

The Features Of The Monitor Programs Enable You To The Following.....

- DISPLAY memory in different ways.
- DISASSEMBLE memory to see Machine Language commands.
- MOVE and COMPARE memory areas.
- SEARCH through memory to find specific values.
- MODIFY memory in various ways.
- RELOCATE object programs.
- PRINT output on video display or line printer.
- READ and WRITE object tapes in SYSTEM Format.
- UNLOAD programs using low RAM on disk.
- SAVE and READ disk files (MON-4 Only).
- INPUT and OUTPUT of disk sectors (MON-4 Only).
- SEND and RECEIVE data over RS-232-C Interface (MON-4 Only).
- Create SYMBOLIC Tapes (MON-3) or Files (MON-4) of Disassembled output for Editor/Assembler program.

MON-3 (For Cassette Systems) $39.95
MON-4 (For Disk Systems) $49.95

SMART TERMINAL

Enables your TRS-80 to be used as a remote terminal to a time sharing computer system. Supports upper/lower case and full range of control keys, including control key mapping into any ASCII character. Automatic transmission of files between TRS-80 and host computer. Files can be read from or written to cassette tape or disk. Incoming data can be printed on line printer or stored in memory for subsequent save to cassette or disk. Disk and tape files are fully compatible with the ELECTRIC PENCIL program. Baud rate and RS-232-C sense switches can be reset without opening Expansion Interface. Requires RS-232-C interface and modem.

Cassette or Disk Version $69.95

FASTSORT

A series of machine-language subroutines (for 16K, 32K and 48K Systems) to sort data from BASIC programs. Data may be alphabetic (string) or numeric (integer only). Works equally well with Level II or Disk Basic. Complete instructions and examples provided for interfacing with your BASIC programs.

Cassette or Disk Version $9.95

MAILING LIST

Maintains mailing lists of over 1000 names. Commands allow adding, changing, deleting, and finding names. Sorting is done by machine language according to the information in any field (i.e., name, address, zip code). Labels printed in 1, 2, or 3 columns, in master list on one line, or on video display.

Disk Version Only $69.95

HOME BUDGET

Combines the maintenance of your checkbook with analysis of your income, expenses, and monthly bills. Handles data including bills, including bills, income, deposits, checks and debits to your checking account, and cash expenses. Computes checkbook balance, list of unpaid bills, monthly and year-to-date summaries of income and expenses showing income tax deductions. All output printed on video display or line printer at user's option. Complete instructions for customizing to suit your own budget.

Disk Version Only $49.95

SMALL BUSINESS ACCOUNTING

Based on Dome Bookkeeping Record #612, this program keeps track of income, expenditures, and payroll for a small business of up to 16 employees. Income and expenditures can be entered on a daily, weekly, or monthly basis, and the program computes monthly, through last month, and year-to-date summaries. Payroll section keeps record of individual employees and their paychecks with up to six categories of payroll deductions. Employee payroll record and year-to-date payroll totals can be computed. Manual contains complete instructions for customizing to suit your business.

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Cassette Version $29.95
(Cassette Version does not contain payroll)

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DOS RANDOM ACCESS & BASIC FILE HANDLING

Written For TRS—80 and All Computers Using MICROSOFT basic

FINALLY IT IS HERE. At last someone wrote a book on disk random access and file handling. A book written for the non-programmer. Written for the businesman and professional who need to solve and write special programs for in house business problems.

Written for the hobbyist who wants to go beyond the cassette recorder and into disk storage and file manipulation.

This book handles a subject of reasonable complexity, so simple and down to earth, that anyone with some Level II experience can cope with the material.

This book is written using a simple program as a starting point. The programs grow in ability and complexity as the book progresses into the various aspects of file handling and record manipulation. Extensive effort has been made to keep the material coherent and every program line is explained in detail.

The programming material presented in this 150 page self-instruction tutorial will provide any non-programmer with the ability to write special programs for inventories, mailing list, work scheduling, record keeping, research project data manipulation, etc. The subjects covered in this edition are as follows . . . . .

(A) The writing of a Menu to summarize program functions.
(B) The writing of a screen format to accept record data.
(C) The creation of the basic record.
(D) The Fielding and LSET routines for buffer preparation.
(E) The writing of the record to disk in a Random Access mode.
(F) The retrieval of a record from disk in a Random Access mode.
(G) The ability to change or edit a record.
(H) The LPRINT capability from disk using three different formats.
(I) Deleting a record from a Random file.
(J) Sorting the Random file.
(K) Searching the Random file by name or other keyfield.
(L) The ability to search in a "NEXT or PRIOR" fashion.
(M) The ability to purge a disk file from deleted records.
(N) The ability to calculate with data from a disk file.
(O) The provision for future expansion of the data fields.
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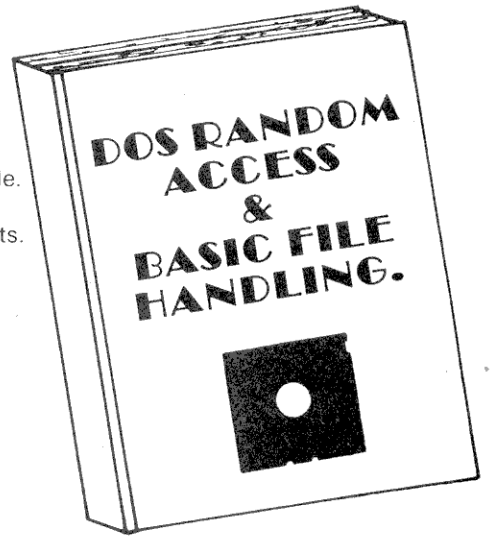

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The Key Box

Basic Level II
Model I
4K RAM

Be a beginner and advanced at the same time!

BAM!

Jeff Byrkit
13862 Kimberly Drive
Largo, FL 33540
Age: 14

It's 8:30 at night and there is nothing on television worth watching. So you decide to go back to—yes, the *computer room.*

What? You want to try T-BUG again? You haven't used that artifact for a while. Sure, suit yourself. All right, it's loaded. Now a slash. What do you do now? Let's put in a program. Let me see. What command do we use to change memory? Oh well, guess we had better dust off the manual and look it up. Ah! There it is, M. Well, we've put it all in now. How do you get out of the M command? Back to the manual...

So, you just got your new Level II system back from the store. Good! Let's see how much memory there is on a Level II. Type in P.M. Hmmm . . . SN ERROR?

All right, Captain Joe. Fry the last Klingon and we'll accomplish our mission. Impulse, down, four. God! Now look what we did! We messed up the whole game! Those commands aren't in this game! . . . .

Ever have one of the above diseases? They are very serious. The first disease, forgetfulness, afflicts most of us at one time or another. The second, change-osis, can catch you by surprise. The last disease is a killer. It's called end-of-the-game errosis. It is a complex form of both change-osis and forgetfulness.

Relieve Those Symptoms!

As a victim of all three of these diseases one night, I decided to become my own doctor and make a serum that could relieve the symptoms for a while. I call it BAM. This serum, taken in gradual doses, can help you learn machine code without having to look up one-letter commands. It can help make the change from Basic to machine code like learning a few words, rather than learning a whole new language, by highlighting the resemblance of machine code commands to Basic commands.

Yes, you have the right magazine. Go ahead and check the cover. I'm doing what you all ask for, you know, the plain English bit. Well, this is plain English from a 14 year old. I'm here to bring you all down to earth and show you what a child can do.

I wrote this program to help those of you who have to look up the one-letter commands for the RSM—1,2,2D, T-BUG, or any other monitor on the market. In BAM, each command is a full *word*, not a single letter, so you can remember what it is supposed to do more easily. In addition, I wrote BAM so that you professors can change it, expand it, and add to it, thus impressing your boss when he comes over for dinner and wants to know about machine code. (You can hide the fact that a kid in ninth grade wrote it by himself.) For example, you could use it to key in a program to tell you how much water it would take to wash a half load of clothes.

Take a Shotgun to that Monitor

Before you begin your quest, I'd like to warn you about something. When the program was still in its design stages, I decided to add a mess of new commands to it. I'd stuffed it so full of junk that the editor/assembler told me, in capital letters, SYMBOL TABLE OVERFLOW. I was so outraged that I wanted to take a shotgun to my screen. But I was in luck. The tape commands and a few others had not been put (or written, for that matter) in yet, so I deleted all the tape subroutines and a few others.

Table 1. Listing of the Subroutines in BAM.

LW This subroutine is not executed by the monitor, but patched into BASIC. If you don't have a lowercase mod installed, you do not need to put it in. But if you ever plan to have lowercase, you should leave it in anyway.
PR This subroutine is an alternative to calling 28A7H. I made this so that I wouldn't have to use up extra lines in the source program. For example:

```
DEFB    'B'         ;This produces an uppercase B when you print
                    ;it using the 28A7H subroutine.
DEFB    'B'+32      ;This produces a lowercase B when printed
                    ;with the 28A7H sub.
DEFB    'L'         ;This prints a lowercase L when printed
                    ;with the PR sub.
DEFB    'L'+32      ;Prints an uppercase L when printed by
                    ;the PR sub.

So....
DEFB    'C'+32
DEFM    'OMMAND? '
```

Table continues

"The first disease, forgetfulness, afflicts most of us at one time or another."

To put the monitor from paper to tape or disk, use the dreaded editor/assembler to type in the source program. If you don't have the editor/assembler, or only have 4K of memory, use your monitor to key it in by hand. You should change the ORG statement as follows: from 79A7 to 49A7 for 4K, B9A7 for 32K, or F9A7 for 48K systems.

The procedure for loading BAM (Beginners Advanced Monitor) is very simple. First, answer the Memory Size? question with 31142 for 16K, 18854 for 4K, 47526 for 32K, or 63910 for 48K. To get to the Memory Size? question, either turn off the computer or type System (Enter) and /0 (Enter). Then type System (Enter) and the name of the monitor (I use BAM). When the monitor has successfully loaded into memory, hit the slash key and Enter. The screen should clear, and BAM Operating System REV 4.1 and Command? should be on the screen. (The Command? will be on the screen if you have a lowercase mod installed.)

With the monitor running, you can now test how well you read and try any of the following commands:

Restart: restarts the monitor. It isn't really necessary, but if you change it, it may come in handy. As written, it clears the screen, enables KBFIX and lowercase, and displays what you see when you type in the slash. The format for entering this command so that the monitor will accept it is Restart (and Enter, because the computer never knows when you are through).

ASCII executes an ASCII dump of memory. If the character to be printed is non-ASCII, a period is printed instead. To temporarily stop execution of the dump, hit the shift @ keys just as you would to stop a Basic listing. To continue, hit any other key. If you want to get back to the monitor, while execution is stopped, hit the Break key. From now on, when the computer is waiting for you to hit Enter or Break, if you hit Break, you are instantly returned to the monitor. Trust me.

Dump executes a hexadecimal dump of memory. The current address is displayed, along with the 16 bytes in memory. After printing a line, the computer waits for you to hit Enter or Break. If you hit Enter, the next address is printed along with the next 16 bytes in memory. The format is: Dump xxxx (Start) xxxx (End).

Modify is similar to T-BUG, and, in fact, the only difference is that you type Modify instead of M. It modifies memory one byte at a time. To display the next byte, hit Enter. To return to the monitor, hit Break. To change the byte, type in the hexadecimal number. Hitting any non-hex number will cause an error message to be displayed. The format is: Modify xxxx (Start).

Search goes through the entire memory

Table continued

will produce 'Command? ' if it is printed with the PR sub. But:

```
DEFB    'C'
DEFB    'O' + 32
DEFB    'M' + 32
DEFB    'M' + 32
DEFB    'A' + 32
DEFB    'N' + 32
DEFB    'D' + 32
DEFM    '? '
```

will produce 'Command? ' if it is printed with the 28A7 subroutine. You can plainly see that it is easier to type in the first example rather than the second, and it conserves valuable buffer space.

KB This is our keyboard debounce routine. It is very crude, but it serves our purpose.

KEY1 This subroutine scans the keyboard. If shift @ is pressed, execution is stopped until you hit another key. If the Break key is pressed, you are returned to the monitor.

KEY Gets a key from the keyboard.

CON This subroutine converts all text in the buffer to uppercase. This is used in case you hit lowercase letters, since the commands are in uppercase.

UN This subroutine moves the HL register to the first non-blank character in the buffer. This is used in case you accidentally type in a space or two before the command.

NEXT This searches through the command table and returns when a 00 hex is found.

INPUT Inputs a line of 65 characters into the buffer. See Wes Thielke's article (ROM routines, #2, p. 106) for the requirements to call the subroutine.

DECIPH This subroutine is the heart of the program. It deciphers the command at the buffer against the commands at the command table. If an exact match is made, the number of the command is returned in the accumulator and at (CO). If no command is found, a zero is returned at (CO).

BLANK This subroutine searches for the first blank (20 hex) in the HL register.

HTOASC This subroutine displays the accumulator on the screen as two ASCII characters. For example, if the A register contained 3C hex, the codes 33 hex and 43 hex would be displayed on the screen.

ASCTOH This subroutine forms a hexadecimal number from two ASCII characters starting at the address pointed to by HL.

ZERO1 This subroutine loads the three workspace words with 0000. Used mainly as a precaution.

EVAL1 This subroutine calls ZERO1, and loads the HL register with the address of the first character (non-blank) of the buffer.

EVAL This subroutine forms a 16 bit integer from the buffer. The number is returned in the DE register.

GET3 Forms three 16 bit numbers from the buffer. (DR),(EN), and (ST) contain the first, second, and third numbers, respectively.

GET2 Forms two 16 bit numbers from the buffer. (EN) and (ST) contain the first and second numbers, respectively.

GET1 Forms one 16 bit number from the buffer. (ST) contains the number.

GETKEY Waits for the user to hit Enter or Break. If the user hits Break, a 01 hex is returned.

CASC Checks to see if the A register contains a valid ASCII code. If it doesn't, the A register is loaded with a period.

DEHL Compares the HL and DE registers. The Z flag is set if they are equal.

DISPHL Displays the HL register on the screen with a colon. Example: If the HL register contains 5610H, if you call DISPHL,

```
5610 :
```

will be displayed.

NUM Checks to see if the accumulator contains a valid hex number in ASCII. If it does not, an error message is displayed and you are returned to the monitor.

ERROR Prints 'Error at ' along with the HL register. The C register is incremented.

RESTART [Enter]	Restarts monitor.
ASCII xxxx xxxx	Executes an ASCII dump from start to finish.
DUMP xxxx xxxx	Executes a hexadecimal dump from start to finish.
Modify xxxx	Modifies memory one byte at a time.
SEARCH xxxx xx or /xx	Searches memory for two characters or two bytes.
MOVE xxxx xxxx yyyy	Moves memory from start to start1 for yyyy number of bytes.
CHECKSUM xxxx xxxx	Computes and displays checksum from start to finish.
TEST xxxx xxxx	Tests memory from start to finish. Bad addresses are displayed.
ZERO xxxx xxxx	Zeroes memory from start to finish.
GOTO xxxx	Jumps to address given.
BASICM	Jumps to 0000H
BASIC1	Jumps to 1A19H
BASIC	Jumps to 0072H
#	Does same command again. User must type in information again. Also, the # must be the first character of the input.
ADD xxxx xxxx	Adds two numbers. Result is displayed along with the carry.
SUB xxxx xxxx	Subtracts two hexadecimal numbers. Displayed like ADD.
INP xx	Inputs from a port. Value received is displayed.
OUT xx yy	Outputs port xx with value yy.
ENTER xxxx	Enters a string of 255 characters at xxxx. Can be stopped at any time with Enter or Break.

Table 2. Summary of commands.

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Aging Report 01/31/82 Page 1

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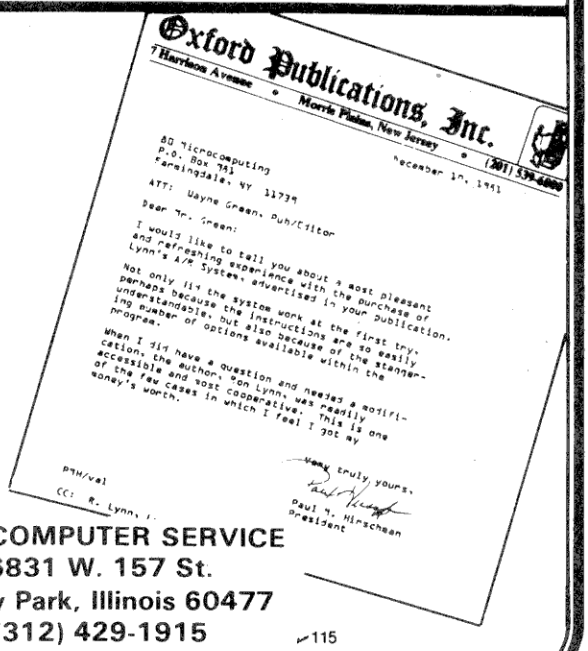
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". . . I decided to become my own doctor and make a serum."

looking for either two hex bytes or two ASCII characters. When they are found in succession, they are displayed like this:

```
MATCH MADE AT 2CA0 : F8 [CD][96] 02__
```

The address displayed (2CA0) contains the hex byte between the first pair of signs (CD). The monitor then waits for you to hit Enter or Break. If you hit Enter, the computer searches for the next pair of bytes, and returns you to the monitor when it has searched through the entire memory. The format is: Search xxxx (Start) xxxx (Hex bytes) or /xx (Two ASCII chrs). Here are two examples:

```
SEARCH 0000 CD96    (ENTER)    -or-
SEARCH 0000 /ME     (ENTER)
```

Move relocates memory from the start to the new address for the number of bytes specified. The formats: Move xxxx [Start] xxxx [New address] xxxx [Number of bytes].

Checksum computes and displays a checksum of memory. The format is: Checksum xxxx [Start] xxxx [End].

Test does what it indicates: tests memory. No locations are changed. The address with the suspected error is displayed. After the last address has been tested, a total number of errors is printed. If you make a typing error, such as testing the entire ROM, hit the Break key. The format is: Test xxxx [Start] xxxx [End].

Zero is a command that zeroes memory. The format is: zero xxxx [Start] xxxx [End].

GOTO executes a jump to the location given. The format is: GOTO xxxx [Address].

BASICM jumps to 0000H (power-up). The format is: BASICM

BASIC1 jumps to 1A19H (re-entry). The format is: BASIC1

BASIC jumps to 72H (better than 1A19). The format is: BASIC

repeats a command. The user must retype any additional information.

Add is something you learned how to do in first grade. It adds two hexadecimal numbers and displays the result, along with the carry. The format is: Add xxxx [first number] xxxx [second number].

Sub is something you learned in the second grade. It subtracts two hexadecimal numbers and displays the result and the carry. The format is: Sub xxxx [first no.] xxxx [second no.].

INP inputs a value from a port. The received value is displayed. The format is: INP xx [port #].

Out outputs the specified port with the specified value. The format is: out xx [port #] xx [value].

Enter enters a string of ASCII characters. Control characters are accepted also. The format is: Enter xxxx [Address].

When entering any command, any extra information such as addresses, values, and so forth, should have a space included between each item:

```
Dump [space] 44A7 [space] 4500
Search [space] 0000 [space] /ME
Out [space] FF [space] 08
```

When I wrote the monitor, I made it as easy as possible to take out the subroutines and use them in other programs. You can change the name of any command by changing its name at CM, change the error messages E1–E4, and so forth. See Table 1 for the list of subroutines and their functions.

The program, in its present state, occupies only 88 bytes more than T-Bug. Which would you rather have? Think about it. ■

Jeff is a 14 year old. This is his first published article.

Program Listing

```
                 00100 ;
                 00110 ; BAM
                 00120 ; BY JEFF BYRKIT
                 00130 ; FOR TRS-80 LEVEL II
                 00140 ;
79A7             00150          ORG     79A7H
79A7 0000        00160 ST       DEFW    0
79A9 0000        00170 EN       DEFW    0
79AB 0000        00180 DR       DEFW    0
0041             00190 BU       DEFS    65
79EE 00          00200 CO       DEFB    0
79EF 0D          00210 M2       DEFB    13
79F0 63          00220          DEFB    'C'+32
79F1 4F          00230          DEFM    'OMMAND?'
79F8 20          00240          DEFB    32
79F9 0E          00250          DEFB    14
79FA 00          00260          DEFB    0
79FB 6D          00270 M4       DEFB    'M'+32
79FC 41          00280          DEFM    'ATCH MADE AT '
7A09 00          00290          DEFB    0
7A0A 63          00300 M5       DEFB    'C'+32
7A0B 48          00310          DEFM    'HECKSUM IS '
7A16 00          00320          DEFB    0
7A17 65          00330 M6       DEFB    'E'+32
7A18 52          00340          DEFM    'RROR AT '
7A20 00          00350          DEFB    0
7A21 20          00360 M7       DEFB    32
7A22 74          00370          DEFB    'T'+32
7A23 4F          00380          DEFM    'OTAL ERRORS.'
7A2F 00          00390          DEFB    0
7A30 42          00400 M8       DEFM    'B.A.M. OPERATING SYSTEM REV 4.1
7A4F 0D          00410          DEFB    13
7A50 00          00420          DEFB    0
7A51 52          00430 MC       DEFM    'R'+32
7A52 45          00440          DEFM    'ESULT IS '
7A5B 00          00450          DEFB    0
7A5C 20          00460 MD       DEFB    32
7A5D 63          00470          DEFB    'C'+32
7A5E 41          00480          DEFM    'ARRY IS '
7A66 00          00490          DEFB    0
7A67 6E          00500 E3       DEFB    'N'+32
7A68 4F          00510          DEFM    'OT ENOUGH INFORMATION.'
7A7E 00          00520          DEFB    0
7A7F 73          00530 E5       DEFB    'S'+32
7A80 59          00540          DEFM    'YNTAX ERROR.'
7A8C 00          00550          DEFB    0
7A8D 6E          00560 E6       DEFB    'N'+32
7A8E 4F          00570          DEFM    'ON-HEX NUMBER.'
7A9C 00          00580 CM       DEFB    0
7A9D 52          00590          DEFM    'RESTART'
7AA4 0D          00600          DEFB    13
7AA5 00          00610          DEFB    0
7AA6 41          00620          DEFM    'ASCII'
7AAB 00          00630          DEFB    0
7AAC 44          00640          DEFM    'DUMP'
7AB0 00          00650          DEFB    0
7AB1 4D          00660          DEFM    'MODIFY'
7AB7 00          00670          DEFB    0
7AB8 53          00680          DEFM    'SEARCH'
7ABE 00          00690          DEFB    0
7ABF 4D          00700          DEFM    'MOVE'
7AC3 00          00710          DEFB    0
7AC4 43          00720          DEFM    'CHECKSUM'
7ACC 00          00730          DEFB    0
7ACD 54          00740          DEFM    'TEST'
7AD1 00          00750          DEFB    0
7AD2 5A          00760          DEFM    'ZERO'
7AD6 00          00770          DEFB    0
7AD7 47          00780          DEFM    'GOTO'
7ADB 00          00790          DEFB    0
7ADC 42          00800          DEFM    'BASICM'
7AE2 0D          00810          DEFB    13
7AE3 00          00820          DEFB    0
7AE4 42          00830          DEFM    'BASIC1'
7AEA 0D          00840          DEFB    13
7AEB 00          00850          DEFB    0
7AEC 42          00860          DEFM    'BASIC'
7AF1 0D          00870          DEFB    13
7AF2 00          00880          DEFB    0
7AF3 49          00890          DEFM    'INP'
```

Program continues

"The program. . . occupies only 88 bytes more than T-Bug."

Program continued

```
7AF6 00        00900          DEFB   0
7AF7 4F        00910          DEFM   'OUT'
7AFA 00        00920          DEFB   0
7AFB 45        00930          DEFM   'ENTER'
7B00 00        00940          DEFB   0
7B01 41        00950          DEFM   'ADD'
7B04 00        00960          DEFB   0
7B05 53        00970          DEFM   'SUB'
7B08 0000      00980          DEFW   0
7B0A DD6E03    00990 LW       LD     L,(IX+3)
7B0D DD6604    01000          LD     H,(IX+4)
7B10 DA9A04    01010          JP     C,49AH
7B13 AF        01020          XOR    A
7B14 B1        01030          OR     C
7B15 FAA604    01040          JP     M,4A6H
7B18 FE20      01050          CP     32
7B1A D27D04    01060          JP     NC,47DH
7B1D C36004    01070          JP     460H
7B20 7E        01080 PR       LD     A,(HL)
7B21 B7        01090          OR     A
7B22 C8        01100          RET    Z
7B23 23        01110          INC    HL
7B24 FE41      01120          CP     'A'
7B26 2808      01130          JR     Z,PB
7B28 F2307B    01140          JP     P,PB
7B2B CD3A03    01150 PA       CALL   33AH
7B2E 18F0      01160          JR     PR
7B30 FE5A      01170 PB       CP     'Z'
7B32 2807      01180          JR     Z,PC
7B34 FA3B7B    01190          JP     M,PC
7B37 D620      01200          SUB    32
7B39 18F0      01210          JR     PA
7B3B C620      01220 PC       ADD    A,32
7B3D 18EC      01230          JR     PA
7B3F C5        01240 KB       PUSH   BC
7B40 018001    01250          LD     BC,180H
7B43 CD6000    01260          CALL   60H
7B46 C1        01270          POP    BC
7B47 C3E303    01280          JP     3E3H
7B4A D5        01290 KEY1     PUSH   DE
7B4B FDE5      01300          PUSH   IY
7B4D CD2B00    01310          CALL   2BH
7B50 FE01      01320          CP     1
7B52 2004      01330          JR     NZ,KK
7B54 F1        01340          POP    AF
7B55 C3777F    01350          JP     ENTRY
7B58 FE60      01360 KK       CP     '@'+32
7B5A 2003      01370          JR     NZ,$+5
7B5C CD4900    01380          CALL   49H
7B5F FDE1      01390          POP    IY
7B61 D1        01400          POP    DE
7B62 C9        01410          RET
7B63 D5        01420 KEY      PUSH   DE
7B64 FDE5      01430          PUSH   IY
7B66 CD4900    01440          CALL   49H
7B69 FDE1      01450          POP    IY
7B6B D1        01460          POP    DE
7B6C C9        01470          RET
7B6D 7E        01480 CON      LD     A,(HL)
7B6E FE0D      01490          CP     13
7B70 C8        01500          RET    Z
7B71 FE60      01510          CP     'A'+31
7B73 2806      01520          JR     Z,LL1
7B75 FA7B7B    01530          JP     M,LL1
7B78 D620      01540          SUB    32
7B7A 77        01550          LD     (HL),A
7B7B 23        01560 LL1      INC    HL
7B7C 18EF      01570          JR     CON
7B7E 21AD79    01580 UN       LD     HL,BU
7B81 7E        01590 LL2      LD     A,(HL)
7B82 FE0D      01600          CP     13
7B84 2007      01610          JR     NZ,LA1
7B86 F1        01620          POP    AF
7B87 21F079    01630          LD     HL,M2+1
7B8A C37A7F    01640          JP     ENTRY+3
7B8D FE20      01650 LA1      CP     32
7B8F C0        01660          RET    NZ
7B90 23        01670          INC    HL
7B91 18EE      01680          JR     LL2
7B93 1A        01690 NEXT     LD     A,(DE)
7B94 B7        01700          OR     A
7B95 13        01710          INC    DE
7B96 20FB      01720          JR     NZ,NEXT
7B98 C9        01730          RET
7B99 3E41      01740 INPUT    LD     A,65
7B9B 47        01750          LD     B,A
7B9C 21AD79    01760          LD     HL,BU
7B9F C3D905    01770          JP     5D9H
7BA2 3E00      01780 DECIPH   LD     A,0
7BA4 32EE79    01790          LD     (CO),A
7BA7 0E01      01800          LD     C,1
7BA9 21AD79    01810          LD     HL,BU
7BAC CD6D7B    01820          CALL   CON
7BAF CD7E7B    01830          CALL   UN
7BB2 119C7A    01840          LD     DE,CM
7BB5 CD937B    01850 G2       CALL   NEXT
7BB8 1A        01860 G3       LD     A,(DE)
7BB9 B7        01870          OR     A
7BBA C8        01880          RET    Z
7BBB BE        01890          CP     (HL)
7BBC 2806      01900          JR     Z,$+8
7BBE CD7E7B    01910          CALL   UN
7BC1 0C        01920          INC    C
7BC2 18F1      01930          JR     G2
7BC4 23        01940          INC    HL
7BC5 13        01950          INC    DE
7BC6 1A        01960          LD     A,(DE)
7BC7 B7        01970          OR     A
7BC8 20EE      01980          JR     NZ,G3
7BCA 79        01990          LD     A,C
7BCB 32EE79    02000          LD     (CO),A
7BCE C9        02010          RET
7BCF 0641      02020 BLANK    LD     B,65
7BD1 7E        02030          LD     A,(HL)
7BD2 FE20      02040          CP     32
7BD4 23        02050          INC    HL
7BD5 C8        02060          RET    Z
7BD6 FE0D      02070          CP     13
7BD8 2B        02080          DEC    HL
7BD9 C8        02090          RET    Z
7BDA 23        02100          INC    HL
7BDB 10F2      02110          DJNZ   BLANK
7BDD C9        02120          RET
7BDE F5        02130 HTOASC   PUSH   AF
7BDF E6F0      02140          AND    0F0H
7BE1 0F        02150          RRCA
7BE2 0F        02160          RRCA
7BE3 0F        02170          RRCA
7BE4 0F        02180          RRCA
7BE5 FE0A      02190          CP     10
7BE7 FAEC7B    02200          JP     M,$+5
7BEA C607      02210          ADD    A,7
7BEC C630      02220          ADD    A,30H
7BEE CD3A03    02230          CALL   33AH
7BF1 F1        02240          POP    AF
7BF2 E60F      02250          AND    0FH
7BF4 FE0A      02260          CP     10
7BF6 FAFB7B    02270          JP     M,$+5
7BF9 C607      02280          ADD    A,7
7BFB C630      02290          ADD    A,30H
7BFD C33A03    02300          JP     33AH
7C00 23        02310 ASCTOH   INC    HL
7C01 C5        02320          PUSH   BC
7C02 CDA47C    02330          CALL   NUM
7C05 7E        02340          LD     A,(HL)
7C06 2B        02350          DEC    HL
7C07 F5        02360          PUSH   AF
7C08 CDA47C    02370          CALL   NUM
7C0B 7E        02380          LD     A,(HL)
7C0C 23        02390          INC    HL
7C0D D630      02400          SUB    30H
7C0F FE0A      02410          CP     10
7C11 FA167C    02420          JP     M,I1
7C14 D607      02430          SUB    7
7C16 CB27      02440 I1       SLA    A
7C18 CB27      02450          SLA    A
7C1A CB27      02460          SLA    A
7C1C CB27      02470          SLA    A
7C1E 4F        02480          LD     C,A
7C1F F1        02490          POP    AF
7C20 D630      02500          SUB    30H
7C22 FE0A      02510          CP     10
7C24 FA297C    02520          JP     M,I2
7C27 D607      02530          SUB    7
7C29 F5        02540 I2       PUSH   AF
7C2A 79        02550          LD     A,C
7C2B 47        02560          LD     B,A
7C2C F1        02570          POP    AF
7C2D B0        02580          OR     B
7C2E C1        02590          POP    BC
7C2F C9        02600          RET
7C30 210000    02610 ZERO1    LD     HL,0
7C33 22A779    02620          LD     (ST),HL
7C36 22A979    02630          LD     (EN),HL
7C39 22AB79    02640          LD     (DR),HL
7C3C C9        02650          RET
7C3D CD307C    02660 EVAL1    CALL   ZERO1
7C40 21AD79    02670          LD     HL,BU
7C43 C37E7B    02680          JP     UN
7C46 CDCF7B    02690 EVAL     CALL   BLANK
7C49 CDA47C    02700          CALL   NUM
7C4C CD007C    02710          CALL   ASCTOH
7C4F 57        02720          LD     D,A
7C50 23        02730          INC    HL
7C51 CDA47C    02740          CALL   NUM
7C54 CD007C    02750          CALL   ASCTOH
7C57 5F        02760          LD     E,A
7C58 C9        02770          RET
7C59 CD467C    02780 GET3     CALL   EVAL
7C5C ED53AB79  02790          LD     (DR),DE
7C60 CD467C    02800 GET2     CALL   EVAL
7C63 ED53A979  02810          LD     (EN),DE
7C67 CD467C    02820 GET1     CALL   EVAL
7C6A ED53A779  02830          LD     (ST),DE
7C6E C9        02840          RET
7C6F 0600      02850 GETKEY   LD     B,0
7C71 210000    02860          LD     HL,0
7C74 C3D905    02870          JP     5D9H
7C77 FE20      02880 CASC     CP     32
7C79 2806      02890          JR     Z,J1
7C7B F2817C    02900          JP     P,J1
7C7E 3E2E      02910 J2       LD     A,'.'
7C80 C9        02920          RET
7C81 FE7A      02930 J1       CP     'Z'+32
7C83 C8        02940          RET    Z
7C84 F8        02950          RET    M
7C85 18F7      02960          JR     J2
7C87 7A        02970 DEHL     LD     A,D
7C88 BC        02980          CP     H
7C89 C0        02990          RET    NZ
7C8A 7B        03000          LD     A,E
7C8B BD        03010          CP     L
7C8C C9        03020          RET
7C8D 7C        03030 DISPHL   LD     A,H
7C8E CDDE7B    03040          CALL   HTOASC
7C91 7D        03050          LD     A,L
7C92 CDDE7B    03060          CALL   HTOASC
7C95 3E20      03070          LD     A,32
7C97 CD3A03    03080          CALL   33AH
7C9A 3E3A      03090          LD     A,':'
7C9C CD3A03    03100          CALL   33AH
7C9F 3E20      03110          LD     A,32
```

Program continues

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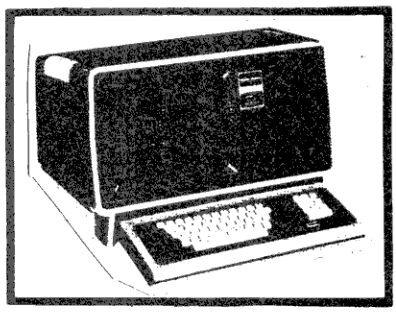
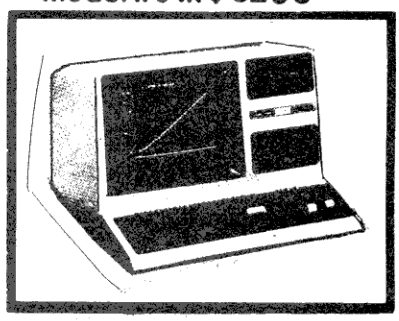


Model II 64K $ 3298



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Program continues

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7CA1 C33A03   03120          JP    33AH
7CA4 7E       03130 NUM      LD    A,(HL)
7CA5 FE0D     03140          CP    13
7CA7 2005     03150          JR    NZ,N32
7CA9 21677A   03160          LD    HL,E3
7CAC 180F     03170          JR    N422+5
7CAE FE30     03180 N32      CP    '0'
7CB0 2812     03190          JR    Z,N11
7CB2 F2C47C   03200          JP    P,N11
7CB5 218D7A   03210 N21      LD    HL,E6
7CB8 3E20     03220 N422     LD    A,32
7CBA CD3A03   03230          CALL  33AH
7CBD CD207B   03240          CALL  PR
7CC0 F1       03250          POP   AF
7CC1 C3777F   03260          JP    ENTRY
7CC4 FE39     03270 N11      CP    '9'
7CC6 C8       03280          RET   Z
7CC7 F8       03290          RET   M
7CC8 FE41     03300          CP    'A'
7CCA 2803     03310          JR    Z,N31
7CCC FAB57C   03320          JP    M,N21
7CCF FE46     03330 N31      CP    'F'
7CD1 C8       03340          RET   Z
7CD2 F8       03350          RET   M
7CD3 18E0     03360          JR    N21
7CD5 E5       03370 ERROR    PUSH  HL
7CD6 D9       03380          EXX
7CD7 21177A   03390          LD    HL,M6
7CDA CD207B   03400          CALL  PR
7CDD E1       03410          POP   HL
7CDE CD8D7C   03420          CALL  DISPHL
7CE1 3E08     03430          LD    A,8
7CE3 CD3A03   03440          CALL  33AH
7CE6 3E08     03450          LD    A,8
7CE8 CD3A03   03460          CALL  33AH
7CEB 3E0D     03470          LD    A,13
7CED CD3A03   03480          CALL  33AH
7CF0 CD5803   03490          CALL  358H
7CF3 FE01     03500          CP    1
7CF5 2004     03510          JR    NZ,R11
7CF7 F1       03520          POP   AF
7CF8 C3777F   03530          JP    ENTRY
7CFB D9       03540 R11      EXX
7CFC 0C       03550          INC   C
7CFD C9       03560          RET
7CFE CD3D7C   03570 INP      CALL  EVAL1
7D01 CDCF7B   03580          CALL  BLANK
7D04 CD007C   03590          CALL  ASCTOH
7D07 4F       03600          LD    C,A
7D08 ED78     03610          IN    A,(C)
7D0A F5       03620          PUSH  AF
7D0B 3EC6     03630          LD    A,198
7D0D CD3A03   03640          CALL  33AH
7D10 3E3C     03650          LD    A,'<'
7D12 CD3A03   03660          CALL  33AH
7D15 F1       03670          POP   AF
7D16 CDDE7B   03680          CALL  HTOASC
7D19 3E3E     03690          LD    A,'>'
7D1B CD3A03   03700          CALL  33AH
7D1E C3777F   03710          JP    ENTRY
7D21 CD3D7C   03720 OUT      CALL  EVAL1
7D24 CDCF7B   03730          CALL  BLANK
7D27 CD007C   03740          CALL  ASCTOH
7D2A 4F       03750          LD    C,A
7D2B C5       03760          PUSH  BC
7D2C CDCF7B   03770          CALL  BLANK
7D2F CD007C   03780          CALL  ASCTOH
7D32 C1       03790          POP   BC
7D33 ED79     03800          OUT   (C),A
7D35 C3777F   03810          JP    ENTRY
7D38 CD3D7C   03820 ASCDUM   CALL  EVAL1
7D3B CD607C   03830          CALL  GET2
7D3E ED5BA779 03840          LD    DE,(ST)
7D42 2AA979   03850          LD    HL,(EN)
7D45 7E       03860 K1       LD    A,(HL)
7D46 E5       03870          PUSH  HL
7D47 CD777C   03880          CALL  CASC
7D4A CD3A03   03890          CALL  33AH
7D4D CD4A7B   03900          CALL  KEY1
7D50 E1       03910          POP   HL
7D51 23       03920          INC   HL
7D52 CD877C   03930          CALL  DEHL
7D55 20EE     03940          JR    NZ,K1
7D57 C3777F   03950          JP    ENTRY
7D5A CD3D7C   03960 HEXDUM   CALL  EVAL1
7D5D CD607C   03970          CALL  GET2
7D60 ED5BA779 03980          LD    DE,(ST)
7D64 2AA979   03990          LD    HL,(EN)
7D67 CD8D7C   04000 L2       CALL  DISPHL
7D6A 0610     04010          LD    B,16
7D6C 7E       04020 L1       LD    A,(HL)
7D6D CDDE7B   04030          CALL  HTOASC
7D70 3E20     04040          LD    A,32
7D72 CD3A03   04050          CALL  33AH
7D75 CD877C   04060          CALL  DEHL
7D78 23       04070          INC   HL
7D79 CA777F   04080          JP    Z,ENTRY
7D7C 10EE     04090          DJNZ  L1
7D7E E5       04100          PUSH  HL
7D7F D5       04110          PUSH  DE
7D80 CD6F7C   04120          CALL  GETKEY
7D83 D1       04130          POP   DE
7D84 E1       04140          POP   HL
7D85 FE0D     04150          CP    13
7D87 28DE     04160          JR    Z,L2
7D89 C3777F   04170          JP    ENTRY
7D8C CD3D7C   04180 ADD      CALL  EVAL1
7D8F CD607C   04190          CALL  GET2
7D92 21517A   04200          LD    HL,MC
7D95 CD207B   04210          CALL  PR
7D98 3E00     04220          LD    A,0
7D9A 2AA779   04230          LD    HL,(ST)
7D9D ED5BA979 04240          LD    DE,(EN)
7DA1 19       04250          ADD   HL,DE
7DA2 F5       04260          PUSH  AF
7DA3 CD8D7C   04270          CALL  DISPHL
7DA6 215C7A   04280          LD    HL,MD
7DA9 CD207B   04290          CALL  PR
7DAC F1       04300          POP   AF
7DAD 17       04310          RLA
7DAE CDDE7B   04320          CALL  HTOASC
7DB1 C3777F   04330          JP    ENTRY
7DB4 CD3D7C   04340 SUBTR    CALL  EVAL1
7DB7 CD607C   04350          CALL  GET2
7DBA 37       04360          SCF
7DBB 3F       04370          CCF
7DBC 21517A   04380          LD    HL,MC
7DBF CD207B   04390          CALL  PR
7DC2 2AA979   04400          LD    HL,(EN)
7DC5 ED5BA779 04410          LD    DE,(ST)
7DC9 ED52     04420          SBC   HL,DE
7DCB 3E00     04430          LD    A,0
7DCD F5       04440          PUSH  AF
7DCE CD8D7C   04450          CALL  DISPHL
7DD1 215C7A   04460          LD    HL,MD
7DD4 CD207B   04470          CALL  PR
7DD7 F1       04480          POP   AF
7DD8 17       04490          RLA
7DD9 CDDE7B   04500          CALL  HTOASC
7DDC C3777F   04510          JP    ENTRY
7DDF CD3D7C   04520 SEARCH   CALL  EVAL1
7DE2 CD677C   04530          CALL  GET1
7DE5 CDCF7B   04540          CALL  BLANK
7DE8 7E       04550          LD    A,(HL)
7DE9 FE2F     04560          CP    '/'
7DEB 200B     04570          JR    NZ,Z1
7DED 23       04580          INC   HL
7DEE 7E       04590          LD    A,(HL)
7DEF 47       04600          LD    B,A
7DF0 23       04610          INC   HL
7DF1 7E       04620          LD    A,(HL)
7DF2 4F       04630          LD    C,A
7DF3 2AA779   04640          LD    HL,(ST)
7DF6 1812     04650          JR    Z2
7DF8 2AA779   04660 Z1       LD    HL,(ST)
7DFB E5       04670          PUSH  HL
7DFC 21AD79   04680          LD    HL,BU
7DFF CDCF7B   04690          CALL  BLANK
7E02 CD677C   04700          CALL  GET1
7E05 ED4BA779 04710          LD    BC,(ST)
7E09 E1       04720          POP   HL
7E0A E5       04730 Z2       PUSH  HL
7E0B D1       04740          POP   DE
7E0C 7E       04750 Z3       LD    A,(HL)
7E0D B8       04760          CP    B
7E0E 23       04770          INC   HL
7E0F 2808     04780          JR    Z,Z4
7E11 CD877C   04790 Z5       CALL  DEHL
7E14 CA777F   04800          JP    Z,ENTRY
7E17 18F3     04810          JR    Z3
7E19 7E       04820 Z4       LD    A,(HL)
7E1A B9       04830          CP    C
7E1B 23       04840          INC   HL
7E1C 20F3     04850          JR    NZ,Z5
7E1E C5       04860          PUSH  BC
7E1F E5       04870          PUSH  HL
7E20 21FB79   04880          LD    HL,M4
7E23 CD207B   04890          CALL  PR
7E26 E1       04900          POP   HL
7E27 2B       04910          DEC   HL
7E28 2B       04920          DEC   HL
7E29 CD8D7C   04930          CALL  DISPHL
7E2C 2B       04940          DEC   HL
7E2D D5       04950          PUSH  DE
7E2E 7E       04960          LD    A,(HL)
7E2F CDDE7B   04970          CALL  HTOASC
7E32 3E20     04980          LD    A,32
7E34 CD3A03   04990          CALL  33AH
7E37 3E3C     05000          LD    A,'<'
7E39 CD3A03   05010          CALL  33AH
7E3C 23       05020          INC   HL
7E3D 7E       05030          LD    A,(HL)
7E3E CDDE7B   05040          CALL  HTOASC
7E41 3E3E     05050          LD    A,'>'
7E43 CD3A03   05060          CALL  33AH
7E46 3E3C     05070          LD    A,'<'
7E48 CD3A03   05080          CALL  33AH
7E4B 23       05090          INC   HL
7E4C 7E       05100          LD    A,(HL)
7E4D CDDE7B   05110          CALL  HTOASC
7E50 3E3E     05120          LD    A,'>'
7E52 CD3A03   05130          CALL  33AH
7E55 23       05140          INC   HL
7E56 3E20     05150          LD    A,32
7E58 CD3A03   05160          CALL  33AH
7E5B 7E       05170          LD    A,(HL)
7E5C CDDE7B   05180          CALL  HTOASC
7E5F E5       05190          PUSH  HL
7E60 CD6F7C   05200          CALL  GETKEY
7E63 E1       05210          POP   HL
7E64 D1       05220          POP   DE
7E65 C1       05230          POP   BC
7E66 FE01     05240          CP    1
7E68 CA777F   05250          JP    Z,ENTRY
7E6B 189F     05260          JR    Z3
7E6D CD3D7C   05270 MODIFY   CALL  EVAL1
7E70 CD677C   05280          CALL  GET1
7E73 2AA779   05290          LD    HL,(ST)
7E76 CD8D7C   05300 M1       CALL  DISPHL
7E79 7E       05310          LD    A,(HL)
7E7A CDDE7B   05320          CALL  HTOASC
7E7D 3E20     05330          LD    A,32
7E7F CD3A03   05340          CALL  33AH
7E82 CD637B   05350          CALL  KEY
7E85 CD3A03   05360          CALL  33AH
7E88 FE0D     05370          CP    13
7E8A 281F     05380          JR    Z,M21
7E8C FE01     05390          CP    1
7E8E CA777F   05400          JP    Z,ENTRY
7E91 32AD79   05410          LD    (BU),A
7E94 CD637B   05420          CALL  KEY
7E97 CD3A03   05430          CALL  33AH
7E9A 32AE79   05440          LD    (BU+1),A
7E9D E5       05450          PUSH  HL
7E9E 21AD79   05460          LD    HL,BU
7EA1 CD007C   05470          CALL  ASCTOH
7EA4 E1       05480          POP   HL
7EA5 77       05490          LD    (HL),A
7EA6 3E0D     05500          LD    A,13
7EA8 CD3A03   05510          CALL  33AH
7EAB 23       05520 M21      INC   HL
7EAC 18C8     05530          JR    M1
7EAE CD3D7C   05540 ENTER    CALL  EVAL1
7EB1 CD677C   05550          CALL  GET1
7EB4 2AA779   05560          LD    HL,(ST)
7EB7 06FF     05570          LD    B,255
7EB9 CDD905   05580          CALL  5D9H
7EBC C3777F   05590          JP    ENTRY
7EBF CD3D7C   05600 MOVE     CALL  EVAL1
7EC2 CD597C   05610          CALL  GET3
7EC5 ED4BA779 05620          LD    BC,(ST)
7EC9 ED5BA979 05630          LD    DE,(EN)
7ECD 2AAB79   05640          LD    HL,(DR)
7ED0 EDB0     05650          LDIR
7ED2 C3777F   05660          JP    ENTRY
7ED5 CD3D7C   05670 CHKSUM   CALL  EVAL1
7ED8 CD607C   05680          CALL  GET2
7EDB 2AA979   05690          LD    HL,(EN)
7EDE ED5BA779 05700          LD    DE,(ST)
7EE2 0E00     05710          LD    C,0
7EE4 7E       05720 P1       LD    A,(HL)
7EE5 81       05730          ADD   A,C
7EE6 4F       05740          LD    C,A
7EE7 CD877C   05750          CALL  DEHL
7EEA 23       05760          INC   HL
7EEB 20F7     05770          JR    NZ,P1
7EED C5       05780          PUSH  BC
7EEE 210A7A   05790          LD    HL,M5
7EF1 CD207B   05800          CALL  PR
7EF4 C1       05810          POP   BC
7EF5 3E3E     05820          LD    A,'>'
7EF7 F5       05830          PUSH  AF
7EF8 3D       05840          DEC   A
7EF9 3D       05850          DEC   A
7EFA CD3A03   05860          CALL  33AH
7EFD 79       05870          LD    A,C
7EFE CDDE7B   05880          CALL  HTOASC
7F01 F1       05890          POP   AF
7F02 CD3A03   05900          CALL  33AH
7F05 C3777F   05910          JP    ENTRY
7F08 CD3D7C   05920 TEST     CALL  EVAL1
7F0B CD607C   05930          CALL  GET2
7F0E 2AA979   05940          LD    HL,(EN)
7F11 ED5BA779 05950          LD    DE,(ST)
7F15 0E00     05960          LD    C,0
7F17 7E       05970 Q1       LD    A,(HL)
7F18 F5       05980          PUSH  AF
7F19 3EAA     05990          LD    A,170
7F1B 77       06000          LD    (HL),A
7F1C CB16     06010          RL    (HL)
7F1E CB1E     06020          RR    (HL)
7F20 7E       06030          LD    A,(HL)
7F21 FEAA     06040          CP    170
7F23 C4D57C   06050          CALL  NZ,ERROR
7F26 F1       06060          POP   AF
7F27 77       06070          LD    (HL),A
7F28 CD877C   06080          CALL  DEHL
7F2B 23       06090          INC   HL
7F2C 20E9     06100          JR    NZ,Q1
7F2E 3E0D     06110          LD    A,13
7F30 CD3A03   06120          CALL  33AH
7F33 79       06130          LD    A,C
7F34 CDDE7B   06140          CALL  HTOASC
7F37 21217A   06150          LD    HL,M7
7F3A CD207B   06160          CALL  PR
7F3D C3777F   06170          JP    ENTRY
7F40 CD3D7C   06180 ZERO     CALL  EVAL1
7F43 CD607C   06190          CALL  GET2
7F46 2AA979   06200          LD    HL,(EN)
7F49 ED5BA779 06210          LD    DE,(ST)
7F4D 3600     06220 R1       LD    (HL),0
7F4F CD877C   06230          CALL  DEHL
7F52 23       06240          INC   HL
7F53 20F8     06250          JR    NZ,R1
7F55 C3777F   06260          JP    ENTRY
7F58 CD3D7C   06270 GOTO     CALL  EVAL1
7F5B CD677C   06280          CALL  GET1
7F5E 2AA779   06290          LD    HL,(ST)
7F61 E9       06300          JP    (HL)
7F62 CDC901   06310 ENTRY1   CALL  1C9H
7F65 21307A   06320          LD    HL,M8
7F68 CDA728   06330          CALL  28A7H
7F6B 213F7B   06340          LD    HL,KB
7F6E 221640   06350          LD    (4016H),HL
7F71 210A7B   06360          LD    HL,LW
7F74 221E40   06370          LD    (401EH),HL
7F77 21EF79   06380 ENTRY    LD    HL,M2
7F7A CD207B   06390          CALL  PR
7F7D CD997B   06400          CALL  INPUT
7F80 FE01     06410          CP    1
7F82 21F079   06420          LD    HL,M2+1
7F85 28F3     06430          JR    Z,ENTRY+3
7F87 3AAD79   06440          LD    A,(BU)
7F8A FE23     06450          CP    '#'
7F8C 3AEE79   06460          LD    A,(CO)
7F8F C4A27B   06470          CALL  NZ,DECIPH
7F92 FE01     06480          CP    1
7F94 CA627F   06490          JP    Z,ENTRY1
7F97 FE02     06500          CP    2
7F99 CA387D   06510          JP    Z,ASCDUM
7F9C FE03     06520          CP    3
7F9E CA5A7D   06530          JP    Z,HEXDUM
7FA1 FE04     06540          CP    4
7FA3 CA6D7E   06550          JP    Z,MODIFY
7FA6 FE05     06560          CP    5
7FA8 CADF7D   06570          JP    Z,SEARCH
7FAB FE06     06580          CP    6
7FAD CABF7E   06590          JP    Z,MOVE
7FB0 FE07     06600          CP    7
7FB2 CAD57E   06610          JP    Z,CHKSUM
7FB5 FE08     06620          CP    8
7FB7 CA087F   06630          JP    Z,TEST
7FBA FE09     06640          CP    9
7FBC CA407F   06650          JP    Z,ZERO
7FBF FE0A     06660          CP    10
7FC1 CA587F   06670          JP    Z,GOTO
7FC4 FE0B     06680          CP    11
7FC6 CA0000   06690          JP    Z,0
7FC9 FE0C     06700          CP    12
7FCB CA191A   06710          JP    Z,1A19H
7FCE FE0D     06720          CP    13
7FD0 CA7200   06730          JP    Z,72H
7FD3 FE0E     06740          CP    14
7FD5 CAFE7C   06750          JP    Z,INP
7FD8 FE0F     06760          CP    15
7FDA CA217D   06770          JP    Z,OUT
7FDD FE10     06780          CP    16
7FDF CAAE7E   06790          JP    Z,ENTER
7FE2 FE11     06800          CP    17
7FE4 CA8C7D   06810          JP    Z,ADD
7FE7 FE12     06820          CP    18
7FE9 CAB47D   06830          JP    Z,SUBTR
7FEC 3AAD79   06840          LD    A,(BU)
7FEF FE0D     06850          CP    13
7FF1 21F079   06860          LD    HL,M2+1
7FF4 CA7A7F   06870          JP    Z,ENTRY+3
7FF7 217F7A   06880          LD    HL,E5
7FFA CD207B   06890          CALL  PR
7FFD C3777F   06900          JP    ENTRY
7F62          06910          END   ENTRY1
00000 TOTAL ERRORS
```

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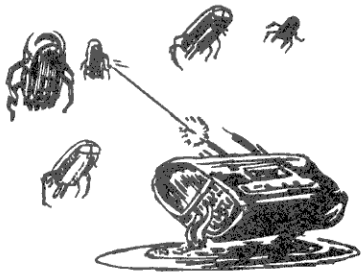

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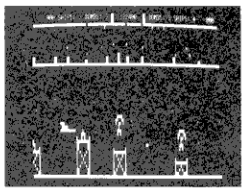

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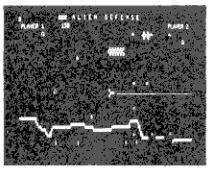

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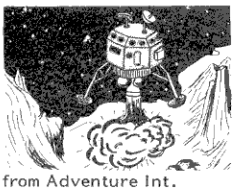

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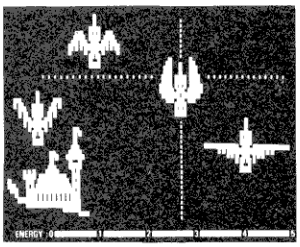

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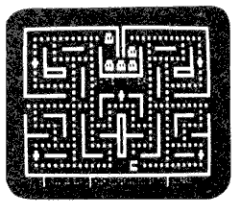

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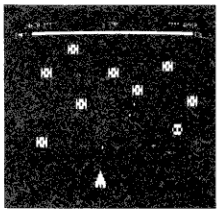

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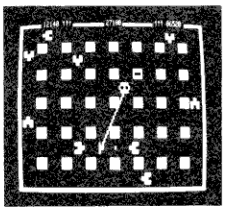

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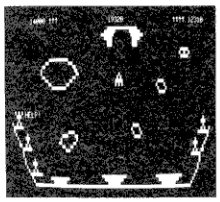

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This article shows users of Lifeboat Associates' implementation of CP/M with Microsoft Cobol-80 on the TRS-80 Model II how to implement a terminal driver using the same keyboard codes as Microsoft's TRSDOS driver. The replacement driver takes advantage of all special features found in the TRSDOS driver, and uses an audible alarm in a somewhat unconventional way.

If you use Lifeboat CP/M, but not Microsoft Cobol-80, you may be interested in the last two paragraphs in the *Method of Attack* section.

Problems to be Solved

When you received Cobol-80, you probably turned quickly to the User's Guide, Appendix A, *Configuring the CRT.* After noticing no special driver for the TRS-80 Model II, you probably figured that since Lifeboat emulates a Lear-Siegler ADM3-A, it was appropriate to use the CDADM3 driver. So, you installed the driver according to Microsoft's instructions, and compiled, linked, and ran the CRTEST program supplied with the distribution disk. Alas, although the program ran, it did not produce the results you would have liked to see. The problems were:

- The cursor on/off feature was not operational;
- There was no highlighting (reverse video);
- The F1 and F2 keys did not perform as expected;
- The screen scrolled when it was not supposed to; and
- The "Audible Alarm" was inaudible.

The first two problems are because the ADM3-A does not support the cursor on/off and highlighting functions. The third happens because there are no function keys on the ADM3-A. The fourth is more complicated, and will be explained below. The fifth probably did not surprise you, because the TRS-80 does not have a bell.

Method of Attack

We can solve all these problems, (even the fifth, if you have the right type of printer) through the design of a special-purpose terminal driver for the TRS-80 Model II. On page 42 of the Cobol-80 User's Guide (Appendix D) you will see that the new driver supplies the same key codes for all input functions (thus enabling the F1, F2, and arrow keys). Of course, we cannot use the same output functions, because these are meaningless in a CP/M environment. We must, therefore, resort to more devious means of solving the other problems.

Program Listing

```
                        ; When linking programs which use this driver, you must
                        ; explicitly specify the REL file in order to ensure that
                        ; this $outch is used instead of the Microsoft version
                        ; (you'll get a "Mult. Def. Global $OUTCH" error which
                        ; you can ignore).  For example:
                        ;
                        ;       A> 180 myprog/n,myprog,cd80m2/e

                                entry   $crlen,$crwid,$setcr,$curon,$curof
                                entry   $curbk,$erase,$alarm
                                entry   $eol,$hilit,$lolit
                                entry   $clist,$tlist,$flist

                                entry   $outch          ;replace $outch in coblib

                                .z80    ;work in Z-80 mode

0005                    bdos    equ     x'0005'         ;bdos entry point
F800                    vidram  equ     x'f800'         ;beginning of video ram
FF80                    vidend  equ     vidram + 24 * 80 ;one past end of video ram

                        ;keyboard code definitions

0000'                   $clist:                         ;editing key definitions
0000'   15                      db      x'15'           ;line delete (ctl-U)
0001'   08                      db      x'08'           ;char delete (backspace)
0002'   1D                      db      x'1d'           ;forward space (right arrow)
0003'   1C                      db      x'1c'           ;back space (left arrow)
0004'   2B                      db      x'2b'           ;plus sign
0005'   2D                      db      x'2d'           ;minus sign
0006'   00                      db      0               ;end of list

0007'                   $tlist:                         ;terminator key definitions
0007'   1E                      db      x'1e'           ;backtab (up arrow)
0008'   1B                      db      x'1b'           ;escape key (ESC)
0009'   09                      db      x'09'           ;forward tab (TAB or ctl-I)
000A'   0D                      db      x'0d'           ;carriage return (ENTER)
000B'   1F                      db      x'1f'           ;line feed (down arrow)
000C'   00                      db      0               ;end of list

000D'                   $flist:                         ;function key definitions
000D'   01                      db      x'01'           ;F1 or ctl-A
000E'   02                      db      x'02'           ;F2 or ctl-B
000F'   00                      db      0               ;end of list
```

Program continues

"The fifth problem probably did not surprise you, because you know the TRS-80 does not have a bell."

The driver implements cursor on/off functions by directly twiddling the appropriate input/output ports of the computer. Refer to the TRS-80 Model II *Technical Reference Handbook* to determine how these functions work; the same information is in a more readable form in the August 1980 issue of *Lifelines*.

Highlighting requires a bit of fancy footwork. The driver maintains an internal flag to indicate whether highlighting is to occur, and supplies a replacement for the Microsoft $OUTCH routine which checks this flag. It also supplies the high order bit which causes non-control characters to be displayed on the screen in reverse video. Since the new $OUTCH routine must completely override the one supplied by Microsoft (one entry point in a COBLIB.REL module), remember to specify the driver name on all L80 commands for Cobol-80 programs.

"And now for the coup de grace: *the audible alarm."*

The scrolling problem was caused by the lack of an "erase to end of screen" function in the ADM3-A. When this function is invoked, the Microsoft driver sends enough spaces to blank out the screen from the current cursor position. However, the Lifeboat ADM3-A emulator scrolls when any character is written to the last screen position. If the driver sends one less blank the last character on the screen will not be erased. The new driver solves the problem in a much better (and faster) way: Blanks are sent directly to the TRS-80 Model II video RAM from the cursor position to the end of the screen. A similar technique is used for the "erase to end of line" function.

And now for the *coup de grace:* the audible alarm. If you have a printer which will beep (or buzz or chime or holler) when it receives a character sequence, send this sequence when the $ALARM function is invoked. This driver is set up to send a control-G, but you can easily change it to send whatever characters are required.

There is a better solution to the bell problem: Implement an escape-to-printer sequence on the CP/M BIOS (Basic Input/Output System) level which would ring the bell

Program continued

```
                        ;terminal screen dimensions

0010'   18              $crlen: db      24d     ;24 lines
0011'   50              $crwid: db      80d     ;80 columns

                        ;terminal output codes

001B                    escape  equ     x'1b'
0008                    bspace  equ     x'08'
0007                    bell    equ     x'07'

0017                    eraeol  equ     x'17'   ;erase to end of line
001A                    clear   equ     x'1a'

                        ;output functions

                        ;set cursor position:  [h] = row, [l] = column

0012'                   $setcr:
0012'   3E 1B                   ld      a,escape
0014'   CD 003F'                call    $outch          ;send esc
0017'   3E 3D                   ld      a,'='
0019'   CD 003F'                call    $outch          ;send =
001C'   7C                      ld      a,h
001D'   C6 1F                   add     a,x'1f'         ;adjust row number
001F'   CD 003F'                call    $outch          ;send row
0022'   7D                      ld      a,l
0023'   C6 1F                   add     a,x'1f'         ;adjust column number
0025'   C3 003F'                jp      $outch          ;send column

                        ;cursor on/off

0028'                   $curon:
0028'   06 68                   ld      b,3*32+8        ;slow blink, start at line 8
002A'   18 02                   jr      curcom          ;use common code

002C'                   $curof:
002C'   06 28                   ld      b,1*32+8        ;cursor off (start at line 8)
002E'                   curcom:
002E'   3E 0A                   ld      a,10            ;tell crt controller that
0030'   D3 FC                   out     (x'fc'),a       ; we're referring to register 10
0032'   78                      ld      a,b             ;pick up cursor characteristics
0033'   D3 FD                   out     (x'fd'),a       ; and send them to the controller
0035'   C9                      ret

                        ;highlight video

0036'                   $hilit:
0036'   3E FF                   ld      a,x'ff'         ;set hilight flag
0038'   18 01                   jr      comlit          ;use common code

003A'                   $lolit:
003A'   AF                      xor     a               ;reset hilight flag
003B'                   comlit:
003B'   32 0059'                ld      (hiflag),a      ;save new hilight flag
003E'   C9                      ret

                        ;modified $outch to implement highlighting

003F'                   $outch:
003F'   D5                      push    de              ;save de & hl
0040'   E5                      push    hl
0041'   E6 7F                   and     01111111b       ;mask off highlight bit
0043'   FE 20                   cp      x'20'           ;control character?
0045'   38 09                   jr      c,outch2        ;don't modify if it is
0047'   21 0059'                ld      hl,hiflag       ;hl => highlight flag
004A'   CB 46                   bit     0,(hl)          ;check flag
004C'   28 02                   jr      z,outch2
004E'   F6 80                   or      10000000b       ;set high bit if it's on
0050'                   outch2:
0050'   5F                      ld      e,a             ;get character in e
0051'   0E 02                   ld      c,2             ;send character to console
0053'   CD 0005                 call    bdos
0056'   E1                      pop     hl              ;restore hl & de
0057'   D1                      pop     de
0058'   C9                      ret

0059'   00              hiflag: db      0               ;highlight flag

                        ;backspace cursor

005A'   3E 08           $curbk: ld      a,bspace        ;send backspace
005C'   C3 003F'                jp      $outch

                        ;erase to end of screen:
                        ;       [hl] = sequential cursor position

005F'                   $erase:
005F'   11 F7FF                 ld      de,vidram-1     ;de => one before video ram
0062'   19                      add     hl,de           ;hl => cursor position
0063'   36 20                   ld      (hl),' '        ;blank out first position
0065'   E5                      push    hl              ;save current position
0066'   23                      inc     hl              ;hl => next position
```

Program continues

"... include the driver name in every Cobol-80 linkage you perform..."

Program continued

```
0067'  11 FF80          ld      de,vidend       ;de => one past end of video ram
006A'  EB               ex      de,hl           ;hl => end, de => next position
006B'  B7               or      a               ;make sure carry is reset
006C'  ED 52            sbc     hl,de           ;hl = # of positions to blank
006E'  44               ld      b,h             ;get count in bc
006F'  4D               ld      c,l
0070'  E1               pop     hl              ;restore ptr to first position
0071'  78               ld      a,b             ;check for zero count
0072'  B1               or      c
0073'  C8               ret     z               ;return if on last position
0074'  ED B0            ldir                    ;otherwise blank out
0076'  C9               ret                     ; rest of buffer

                ;erase to end of line: [h] = current row, [l] = column

0077'           $eol:
0077'  11 F7B0          ld      de,vidram-80    ;de => video ram - one row
007A'  EB               ex      de,hl           ;d = row, hl => vid ram - one row
007B'  1D               dec     e               ;e = column - 1
007C'  01 0050          ld      bc,80           ;bc = length of one row
007F'  09       eol1:   add     hl,bc           ;hl => next row
0080'  15               dec     d               ;decrement row count
0081'  20 FC            jr      nz,eol1         ;loop until it reaches zero
0083'  19               add     hl,de           ;hl => cursor position
0084'  79               ld      a,c             ;a = 80
0085'  93               sub     e               ;a = 80 - col + 1
0086'  36 20    eol2:   ld      (hl),' '        ;blank out column
0088'  23               inc     hl              ;hl => next column
0089'  3D               dec     a               ;decrement column count
008A'  20 FA            jr      nz,eol2         ;loop until line is blanked
008C'  C9               ret

                ;Note:  In the Lifeboat BIOS (at least for CP/M 2.24),
```

Program continues

whenever a control-G is sent to the CP/M video driver. Using this technique, you get a bell without any modifications to other software (such as a terminal program). I have developed a program to turn the bell on or off in my system; contact me if you are interested in obtaining this program.

Installing the Driver

To install the new video driver (see the Program Listing), type the source code into a file called CD80M2.MAC. Do not forget to disable the printer escape (see the in-line comments) if your system will not support this feature. Then assemble the driver with the command A>M80 = CD80M2. You should now have a working copy of the driver in a file called CD80M2.REL.

Using the Driver

Remember to include the driver name in every Cobol-80 linkage you perform to ensure that the driver's $OUTCH function overrides the one supplied by Microsoft. For this reason, I recommend that you avoid having the CRTDRV.REL file on your working disk (I renamed my CRTDRV.REL to CRTDRV.OLD).

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"Alas, though the program ran it did not produce the results you would have liked to see."

That way, L80 will produce an error message if you forget to include the driver name. If you stick with the name CD80M2.REL, the proper form of the L80 command is: A>L80 prog/N,prog,subl, sub2,...,subn,CD80M2/E where "prog" is your main program name and "subl" to "subn" are names of your subroutines. For example, the proper sequence to compile, link and run the supplied CRTEST.COB program is:

```
A>COBOL=CRTEST
No Errors or Warnings
A>L80 CRTEST/N,CRTEST,CD80M2/E
Link-80 3.37 08-May-80 Copyright 1979,80 (C) Microsoft
%Mult. Def. Global $OUTCH
Data 0103 50D7
[0209 50D7 80]
A>CRTEST
```

Note that you should ignore the "Mult. Def. Global $OUTCH" message. In fact, something is seriously wrong if you do not get it! ■

Jim Korenthal is the President of JEKCU, Inc., a software development firm in New York City.

Program continued

```
                                ;       a control-W will perform an erase to end of line
                                ;       function.  This is not documented (and not avail-
                                ;       able on the ADM-3A).  If it works on your system,
                                ;       however, you can subsitute the following two
                                ;       lines for the above code.
                                ;
                                ;       $eol:   ld      a,eraeol  ;send eraeol character
                                ;       jp      $outch

                                ;sound audible tone

                                ;Note:  Since the TRS-80 Model II has no bell (what an
                                ;       oversight!), the normal thing to do here is just
                                ;       return, as follows:
                                ;
                                ;       $alarm: ret
                                ;
                                ;       However, if your printer will respond to a bell,
                                ;       you can do the following:

008D'   0E 05                   $alarm: ld      c,5             ;list output function
008F'   1E 07                           ld      e,bell          ;sound printer alarm
0091'   C3 0005                         jp      bdos            ;let bdos do the return

                                        end

$ALARM  008DI'  $CLIST  0000I'  $CRLEN  0010I'  $CRWID  0011I'
$CURBK  005AI'  $CUROF  002CI'  $CURON  0028I'  $EOL    0077I'
$ERASE  005FI'  $FLIST  000DI'  $HILIT  0036I'  $LOLIT  003AI'
$OUTCH  003FI'  $SETCR  0012I'  $TLIST  0007I'  BDOS    0005
BELL    0007    BSPACE  0008    CLEAR   001A    COMLIT  003B'
CURCOM  002E'   EOL1    007F'   EOL2    0086'   ERAEOL  0017
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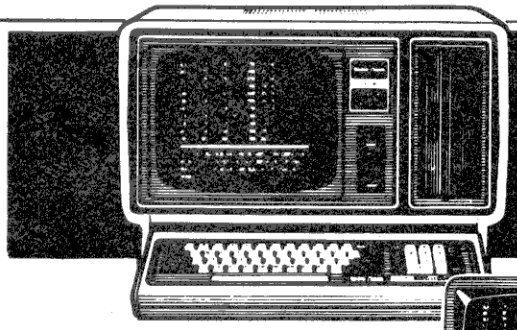

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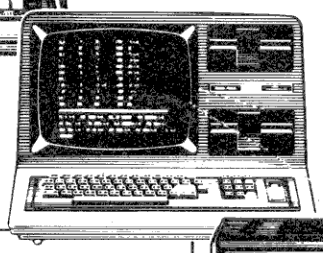

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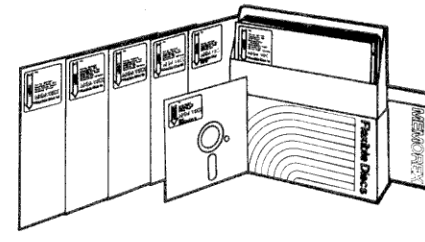

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A tweak here, a pinch there, and . . .

Model II Disassembler

Richard L. Faber
Mathematics Department
Boston College
Chestnut Hill, MA 02167

Carl Wuebker's article "TRS-80 Disassembler" (August 1980, *80 Microcomputing)* was a boon to those curious about what goes on inside TRSDOS or the machine language subroutines called from Radio Shack's Basic software. Unfortunately, PEEKs in the program render it not immediately usable on the Model II.

In the June 1980 issue, Tom Yager's article "Model II Q and A" described machine language subroutines, callable from Basic, which implement PEEK and POKE on the Model II. (Bless you, Mr. Yager!) With a surprisingly small effort, I used the PEEK routine (PEEK/REL in Program Listing 3) to adapt the Disassembler for the Model II.

Mr. Wuebker's original program obtains the absolute address L of the first instruction to be disassembled from a LET statement in line 40. (The user changes this statement each time he runs the program.) The starting address must be in decimal, whereas I would prefer to enter the address in hexadecimal.

TRSDOS 2.0 provides two supervisor calls (BINHEX and BINDEC) to convert between binary and hexadecimal and between binary and decimal. These enable the Disassembler to accept input of a starting address in hexadecimal. These calls translate numeric values into hexadecimal strings, performed in Basic in Mr. Wuebker's original program (lines 5000–5060).

Absolute Binary and Address Storage

The relocatable machine language program CONVERT/REL (Program Listing 1) consists of two subroutines which accomplish the above functions. Before the details, consider absolute binary notation and the representation of memory addresses.

Basic stores integers in two's-complement notation; the leading or most significant bit stores the integer's sign (0 = positive, 1 = negative). In this system, the negative of any integer is obtained by changing all zeros to ones and all ones to zeros, and then adding one. Integers take two bytes and lie only in the range minus 32768 to 32767.

A memory address X is a decimal whole number in the range 0 to 65535. This range can be represented in 16 bits, but only if the leading bit is not used as a sign. This is called absolute binary notation. In absolute binary, decimal 65535 is a string of 16 ones, while in two's-complement notation this string represents minus one.

Because Basic always assumes two's-complement is in use, the statement A% = X results in an overflow error if X exceeds 32767. To avoid this, use the alternative statement:

```
IF X > 32767 THEN A% = X - 65536 ELSE A% = X
```

For X > 32767, this takes the 16 bits that are the absolute binary representation of X and allows Basic to store them as if they represented a negative integer (leading bit 1) in two's-complement. For example, the address EF20H (decimal 61216) is 1110111100100000 in absolute binary. In two's-complement, this bit sequence represents decimal minus 4320, which is 61216 minus 65536.

The Model II Adaptation

Program Listing 2 shows the changes to Mr. Wuebker's program. (The August issue contains the entire program.) Line 10 protects memory above EF1FH, where the machine language subroutines to be called are located, and loads PEEK/REL. All variables in this program except X are integers rather than floating point. This increases efficiency of the original version. Line 15 loads CONVERT/REL and defines the entry points of its two subroutines, USR2 and USR3. Lines 40–47 request input of the starting address in hexadecimal, check for a valid response, convert this address to decimal floating point, and pack it into a 2-byte integer.

USR2 in line 45 performs the conversion. On entry to this subroutine, the DE register pair points to a 3-byte string descriptor for Y$. The first byte of this descriptor contains the length of Y$ (four). The next two bytes contain the address where Y$ begins in memory (LSB followed by MSB). USR2 moves this address to the HL register pair, sets up the entry conditions for BINHEX, and converts Y$ to a 16-bit absolute binary address in DE. A call to BINDEC converts this into a 5-byte decimal string whose

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"...avoid modifying byte 1 of a string descriptor."

string descriptor is the same three bytes in RAM. The first byte is modified to contain the new length. The new string returns as the value of USR2(Y$).

PEEKing

The next several lines of Listing 2 (containing GOSUB 65000) replace statements containing PEEKs in Mr. Wuebker's program. In the Model II version of the Disassembler, a given memory location is PEEKed using lines 65000–65020.

The address, packed into a 2-byte integer variable A is first reinterpreted as a 2-byte location string A$, with MKI$. Then A$ = USR1(A$) invokes PEEK/REL. Upon entry to this subroutine, the DE register pair points to a string descriptor for A$. The first byte of this descriptor contains the length of A$ (two), and the next two bytes point to A$ (LSB followed by MSB). A$ in turn contains the address of the location to be PEEKed. PEEK/REL follows this chain of pointers to extract the contents of the desired memory location and insert them into the first byte of A$. Line 65010 then takes this first byte and puts its ASCII value into B as an integer between 0 and 255.

The subroutine calls to 4200 (lines 3320, 3610, and 3810 in Listing 2) replace the statement C = 256 * I2 + I1, which could generate a value greater than 32767. Because C is an integer variable, we need line 4200 to check for this condition.

Lines 5000–5030 perform conversions from integer values to 4-byte hexadecimal strings. The integer C (which contains the contents of one memory location or a packed memory address) converts to a four character hexadecimal string in the range 0000–FFFF by the statements:

A$ = MKI$(C) + " ":C$ = USR3(A$)

Two spaces appended to MKI$(C) make the length of A$ four, the same as the string produced by USR3. If we did not do this, we would have to include in USR3 an instruction to change the first byte of A$'s string descriptor from two to four, so Basic would know USR3(A$) has length four. This would garble some other string since the extra two bytes derive from an adjacent string in the high-RAM area where Basic stores strings. You should avoid modifying byte 1 of a string descriptor. It was no problem when we applied USR2 to Y$ in line 45, because Y$ was the only variable stored in high-RAM. See the instruction in EF2E in Listing 1.

The Model II Disassembler will disassemble instructions at 1.9 per second. Integer

```
      *** USR2: Converts from Hexadecimal to Decimal ***
EF20    D5          PUSH DE         ;move address of string
EF21    DDE1        POP IX          ; descriptor to IX
EF23    DD6E01      LD L,(IX+1)     ;store address of string
EF26    DD6602      LD H,(IX+2)     ; in HL register pair
EF29    3E18        LD A,24         ;BINHEX is SVC 24
EF2B    0601        LD B,1          ;we'll cvt. hex to bin
EF2D    CF          RST 8           ;binary result now in DE
EF2E    DD3400      INC (IX+0)      ;change strng lngth to 5
EF31    0600        LD B,0          ;we'll cvt. bin to dec
EF33    3E15        LD A,21         ;BINDEC is SVC 21
EF35    CF          RST 8           ;cvt to 5 byte dec. strg
EF36    C9          RET             ;Go back to BASIC progr.
-------------------------------------------------------------
 *** USR3: Converts Packed 2-Byte Address to Hex String ***
EF40    D5          PUSH DE         ;move address of string
EF41    DDE1        POP IX          ; descriptor to IX
EF43    DD6E01      LD L,(IX+1)     ;store address of A$
EF46    DD6602      LD H,(IX+2)     ; in HL register pair
EF49    5E          LD E,(HL)       ;move 2-byte bin no. to
EF4A    23          INC HL          ; be converted into
EF4B    56          LD D,(HL)       ; DE register pair
EF4C    2B          DEC HL          ;addr of A$ again in HL
EF4D    0600        LD B,0          ;we'll cvt. bin to hex
EF4F    3E18        LD A,24         ;BINHEX is SVC 24
EF51    CF          RST 8           ;cvt to 4-byte hex strng
EF52    C9          RET             ;Go back to BASIC progr.
```

Program Listing 1. CONVERT/REL

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"The Model II Disassembler will disassemble instructions at 1.9 per second."

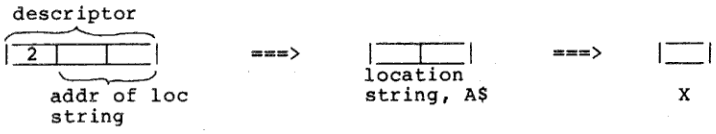
variables rather than floating point, and supervisor calls rather than Basic perform the conversions and improve speed; without them the rate is only 1.3 per second. ■

Professor Richard Faber teaches mathematics and computer science at Boston College and is a consultant in microcomputer applications.

```
1 'DISASSEM/BAS - from Article by Carl Wuebker,
        August 1981 "80-Microcomputing,"
        modified by R. Faber for Model II
10 CLEAR 3000,&HEE1F:GOSUB60000
        :DEFINT A-W
15 SYSTEM "CONVERT/REL":
        DEFUSR2=&HEF20: DEFUSR3=&HEF40
40 INPUT "STARTING ADDRESS (HEX., 4 CHARACTERS)";Y$
        :IF LEN(Y$)<>4 THEN 40
42 FOR I=1 TO 4:
        IF INSTR(HX$,MID$(Y$,I,1))=0 THEN 40
43 NEXT I   'check for valid hexadecimal digits
45 X=VAL(USR2(Y$))
47 IF X>=32768 THEN L=X-65536
        ELSE L=X  'convert address to integer
        (X is floating pt, L is integer)
1000 A=L:GOSUB65000:I0=B
1050 A=L+1:GOSUB 65000:I1=B:
        A=L+2:GOSUB 65000:I2=B
1200 A=L+1:GOSUB 65000:I0=B+256
1300 A=L+1:GOSUB 65000:I0=B
1330 A=L+2:GOSUB65000:I1=B:
      A=L+3:GOSUB 65000:I2=B
1530 A=L+2:GOSUB 65000:C=B
1560 A=L+1:GOSUB 65000:IFB=203 THEN 1660
1570 A=L+1:GOSUB 65000:I0=B:
        A=L+2:GOSUB 65000:I1=B:
        A=L+3:GOSUB 65000:I2=B
1580 IF I0=54 THEN A=L+3:GOSUB 65000: I1=B:I2=0
1660 A=L+3:GOSUB 65000:I0=B+256
3320 GOSUB 4200
3610 GOSUB 4200
3810 GOSUB 4200
4040    A=LT:GOSUB 65000:CT=B AND 127
4070    A=LT:GOSUB 65000:C=B
4200 X=256*I2+I1: IF X>=32768 THEN C=X-65536 ELSE C=X:
        RETURN
4990 '
        ***BINARY TO HEX conversion
5000 A$=MKI$(C)+"  ": C$=USR3(A$)
5010 C$=RIGHT$(C$,2): RETURN  'C converted to 1 byte hex
5020 A$=MKI$(C)+"  ": C$=USR3(A$)
5030 RETURN    'C converted to 2 byte hex
59990 '
        *** LOAD PEEK/REL and define starting address
60000 SYSTEM "PEEK/REL":
        DEFUSR1=&HEF60: RETURN
65000 A$=MKI$(A): A$=USR1(A$)  'call PEEK
65010 B=ASC(A$)   'B = contents of address X
65020 RETURN
65300 END
```

Program Listing 2. Changes in Disassembler Program

```
*** PEEK/REL: Gets contents of a memory location X ***
EF60    D5    PUSH DE       ;move address of string
EF61    E1    POP HL        ;  descriptor to HL
EF62    23    INC HL        ;HL pts to addr of location string
EF63    5E    LD E,(HL)     ;next, move addr of
EF64    23    INC HL        ; location string
EF65    56    LD D,(HL)     ; into DE,
EF66    D5    PUSH DE       ; and then
EF67    E1    POP HL        ; into HL
EF68    5E    LD E,(HL)     ;then, move the location
EF69    23    INC HL        ; string itself
EF6A    56    LD D,(HL)     ; into DE
EF6B    2B    DEC HL        ;addr of location string in HL
EF6C    EB    EX DE,HL      ;exchange register pairs
EF6D    7E    LD A,(HL)     ;load A with contents of X
EF6E    EB    EX DE,HL      ;exchange back
EF6F    77    LD (HL),A     ;move byte from X into loc. strng
EF70    C9    RET           ;back to BASIC program
```



Program Listing 3. PEEK/REL

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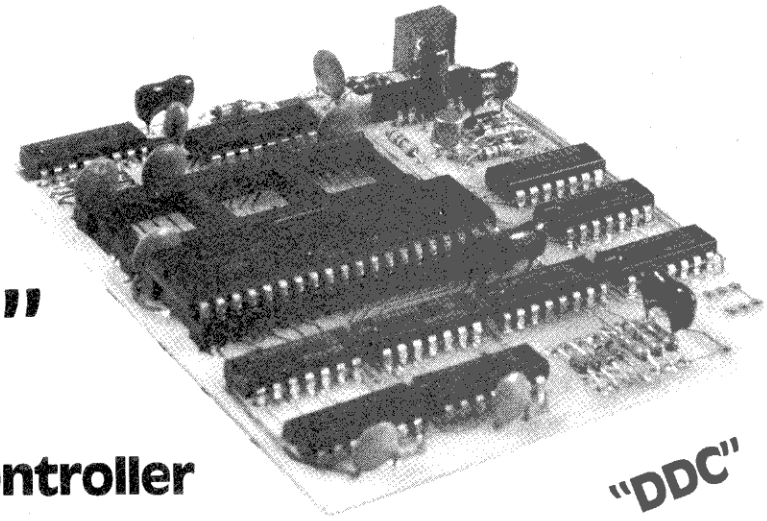

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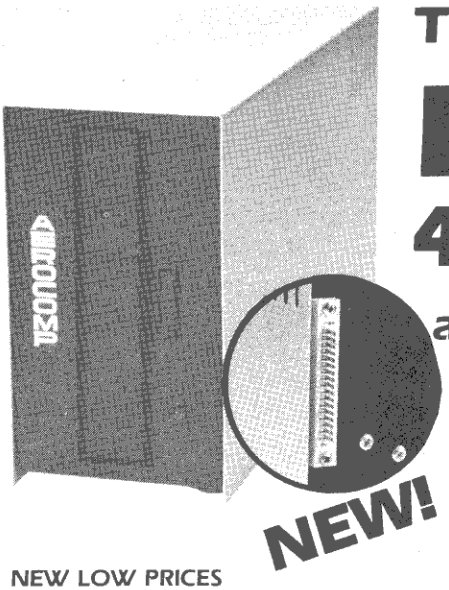
See opposite page ▸▸▸▸▸▸



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The System command is to machine language as CLOAD is to Basic. Both commands load a program from tape into the RAM of the TRS-80. Both also utilize a data transfer method accepting bits from the tape at 500 baud (bits per second). Since many machine language programs are long, a wait of more than two minutes is common. A case in point is Radio Shack's Editor/Assembler program. It takes nearly two minutes to load and it is very discouraging to get nearly through the tape and suddenly get a checksum error, forcing you to start all over again. Wouldn't it be nice if there were a way to load those programs two or three times faster without buying a disk drive, modifying your TRS-80, or sacrificing any of the reliability of the tape system?

Breaking the 500 Baud Barrier

Earlier, I wrote a pair of routines for use in "Fastload," a program which loads and saves Basic programs up to four times faster than CLOAD. The two modules store and retrieve data from tape at 2000 bits per second. These same modules are used here for machine language tapes. With the help of a book called *Pathways Through the ROM,* a disassembled listing of the Level II ROM, the *TRS-80 Technical Reference Handbook,* and several issues of *80 Microcomputing*, I was able to glean enough information to complete this project. I call the program Rapid System Loader (RSL).

Duplicate copies of standard TRS-80 machine language tapes are made by RSL. What's so special about that? The duplicate copies load from two to four times faster than the original copy because they load at 2000 baud. In addition, as soon as the program is successfully loaded, it executes immediately without further help from the human in charge. There is no need to type and enter / to run the program. I call this feature "Auto Start." Not original, but quite useful.

Another feature is a file name display. During loading, all six characters of the file name are displayed, so you know exactly which tape you are running. While creating the RSL backups, up to nine copies in a row can be written without further intervention by the user. RSL will copy any machine language tape not protected. It can even copy itself!

Another nice thing about RSL is it requires no hardware at all. Software alone does the trick. You may have to disable your Radio Shack XRX cassette modification if you have one. With that circuit enabled, RSL will not work.

Program Walks Before It Runs

The TRS-80 has no routines in ROM to load tapes at 2000 baud. Therefore, I have written these routines into a short module tacked automatically to the front of each copy of RSL. When the program is loaded, the preload module is encountered first. It loads at 500 baud and

Program Listing

```
                00090 ; ****************************************
******
                00100 ;*  RAPID SYSTEM LOADER    CONVERSION VERS.
2.1  *
                00110 ;*        SEPT 15,1980 BY DAVID C. HEDINGER
     *
                00115 ; ****************************************
******
0072            00120 BASIC   EQU     072H    ;BASIC RE-ENTRY
0049            00130 KBD     EQU     049H    ;ROM KEYBOARD ROUTIN
E
28A7            00140 DSP     EQU     28A7H   ;MESSAGE OUTPUT: ROM

01C9            00150 CLS     EQU     1C9H    ;ROM: CLS & HOME CUR
SOR
0235            00160 RDBYTE  EQU     235H    ;ROM RD BYTE FROM TA
PE
01F8            00170 MTOFF   EQU     1F8H    ;ROM: TAPE MOTOR OFF

42E9            00180         ORG     42E9H   ;ORG LOW IN MEMORY
42E9 CDC901     00190 SPEED   CALL    CLS
42EC 21BB45     00200         LD      HL,MENU ;POINT TO MENU STRIN
G
42EF CDA728     00210         CALL    DSP     ;DISPLAY IT
42F2 CD4900     00220 INP     CALL    KBD     ;GET INPUT
```

Program continues

takes about seven seconds. The preloader module starts automatically, loads in the object code program at 2000 baud, and transfers control to the program when it is done.

The advantage to using a preloader is you need to load only one tape. Everything is done automatically once you press Enter. One disadvantage is if the program to be converted by RSL occupies the same area in RAM as the preloader, it will not load properly, since the preloader will be overwritten.

Since the preloader loads at normal speed for seven seconds, the overall decrease in loading time for the object code program depends on its original length. A program must be longer than about 20 seconds to show any decrease in loading time with RSL. Longer programs show greater decreases.

The Inner Workings

The program is divided into three main sections. The first section loads a standard machine language tape and stores it byte for byte in a buffer area in RAM. The second section writes a high speed copy of the program in the buffer preceding it with the preloader program. Remember, the preloader is written at normal speed but the object code program in the buffer is written at 2000 baud. The third section is the preloader module.

Rapid System Loader makes use of two subroutines to create and read 2000 baud tapes. One is W byte, responsible for writing a byte on tape at the 2000 baud rate. The other is R byte, included as a part of the preloader module. R byte is the routine for reading a byte of data from tape. These routines are crucial to the program.

Shifting Into High Gear

As you may know by now, the TRS-80 stores information on tape one byte at a time. Each byte is composed of eight synchronizing pulses separated by two milliseconds each. A data pulse is inserted after a sync pulse to denote a one bit. Otherwise, the space between sync pulses is left blank to represent a zero bit. All sync and data pulses are identical in duration, being about 263 microseconds long. The total time to store one byte is two milliseconds times eight bits, or 16 milliseconds. About 62 bytes per second can be stored this way, or 3720 bytes per minute. A 16K program takes about 258 seconds (four minutes 18 seconds) to load.

The two subroutines W byte and R byte replace this format with a new one. Each byte is stored as a single sync pulse followed by eight precisely timed intervals of .5 milliseconds each. Each interval will contain either a pulse, representing a one bit, or no pulse, indicating a zero bit. The entire byte occupies 4.5 milliseconds including the sync bit. Each pulse has a width of 140 microseconds. Using this format, we can store about 220 bytes per second, or 13200 bytes per minute. That 16K program that used to take 258 seconds to load can now be loaded in 73 seconds! If we add seven seconds for the time taken to load the preloader, the total is 80 seconds to load 16K, a significant improvement. See Fig. 1 for a graphic comparison of the two formats.

This change in format is made possible by the fact the cassette input and output circuitry in the TRS-80 is completely under software control and not locked into a single speed or format by hardware. We can create pulses of any width and spacing up to the limits of our clock speed and software. We are limited, however, by the frequency response of the cassette deck used with the computer. I arrived at the 2000 baud data rate as a good compromise between speed and error rate due to frequency response limitations. Using good tape, the RSL copies a load just as reliably as the slower System version. The volume level is still critical, but it is no worse than before.

The Write a Byte Routine

Looking more closely at the W byte routine (lines 2410–2760), we see the first thing done is to save all the Z80 registers for later recovery. On entry to this routine, the A register contains the byte we want to write to tape. The byte is placed in the D register and C is loaded with a count of nine—eight for the byte and one for the sync bit. The Carry Flag determines whether the Pulse routine outputs a pulse to the cassette port or merely waits for a one time slot.

To output the sync pulse line, 2470 sets the Carry Flag and then calls Pulse which does three things: sets port 255 to .85 volts by an Out instruction and runs a short timing loop; next, sets the port to zero volts and runs another short loop; finally, returns the port to its rest voltage of .46 volts, runs the final timing loop and returns to line 2490.

Lines 2480–2530 form a loop, shifting each bit in the D register to the Carry Flag, and call the Pulse routine. When all eight bits are transmitted, the registers are restored and control is returned to the main program.

Now that we have our byte on the tape, let's see how to read it back into the computer. Lines 3430–3670 contain R byte. When R byte is called from the main program, the first thing done is to save the AF and BC registers on the stack. On exit, the A register will contain the byte read

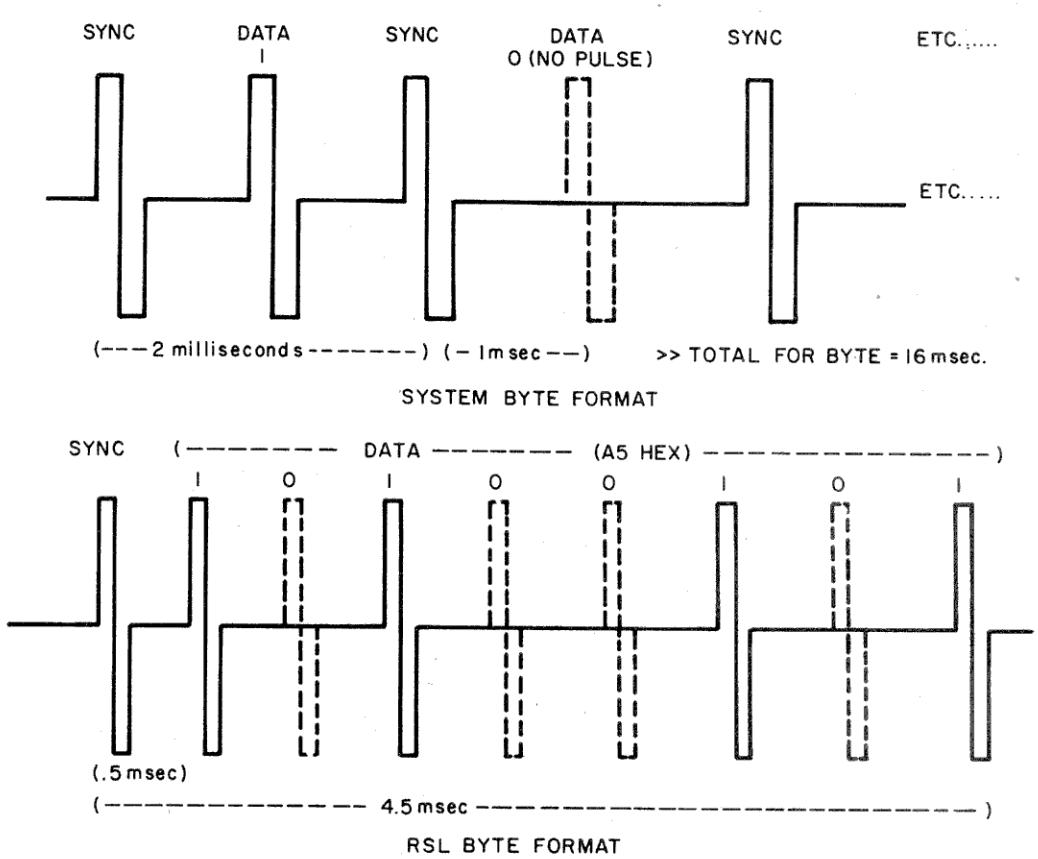

Fig. 1.

Program continued

```
42F5 FE31      00230          CP      31H      ;ASCII '1'?
42F7 280C      00240          JR      Z,SYSLOD          ;YES-LOAD A
TAPE
42F9 FE32      00250          CP      32H      ; '2'?
42FB CADA43    00260          JP      Z,SYSWRT          ;WRITE A FAS
TLOAD TAPE
42FE FE33      00270          CP      33H      ;'3'?
4300 CA7200    00280          JP      Z,BASIC ;EXIT TO BASIC
4303 18ED      00290          JR      INP      ;BAD INPUT: TRY AGAI
N
               00292 ;
               00295 ; ****************************************
********
               00300 ; * THIS SECTION READS A SYSTEM TAPE AND STO
RES IT *
               00310 ; * IN A BUFFER WITH ALL CHECKSUMS AND CONTR
OLS    *
               00314 ; ****************************************
********
               00315 ;
4305 CDC901    00320 SYSLOD   CALL    CLS      ;CLEAR SCREEN
4308 216346    00330          LD      HL,MESG1          ;PROMPT USER

430B CDA728    00340          CALL    DSP
430E CD4900    00350          CALL    KBD      ;WAIT FOR INPUT
4311 11803C    00360          LD      DE,3C80H          ;TO DISPLAY
FILENAME
4314 211347    00370          LD      HL,BUFFER         ;POINT TO BU
FFER
4317 CD9302    00380          CALL    293H     ;ROM:MOTOR ON,READ L
EADER & SYNC
431A 3E40      00390          LD      A,40H    ;'@'
431C 323E3C    00400          LD      (3C3EH),A         ;DISPLAY '@'
431F CD3502    00410          CALL    RDBYTE   ;READ NEXT BYTE
4322 FE55      00420          CP      55H      ;SYSTEM TAPE?
4324 C2BE43    00430          JP      NZ,NOTSYS         ;NOT A SYSTE
M TAPE:JUMP
4327 77        00440          LD      (HL),A   ;PUT 55H INTO BUFFER
```

Program continues

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from the tape, while BC will be unchanged.

Whenever a pulse is received from the tape, the input flip-flop circuit is set at one and remains there until reset by an OUT(255),A instruction. The circuit can be tested with an IN A,(255) instruction. By monitoring this flip-flop, we can detect the pulses coming from the tape and determine their time slot positions in each byte.

Lines 3450 and 3460 clear (Reset) the flip-flop. Next, the C register stores a count of eight for the incoming byte. Then the routine loops until the sync bit is detected. When it is, a short time is spent in a loop and then the flip-flop is reset. The instructions from lines 3530-3650 (labeled BTLOOP) read in a bit once every 500 microseconds and stuff the data into the A register one bit at a time until eight bits (either ones or zeros) are done. Control is then returned to the main program with the entire byte in the A register.

The Machine Language Tape Format

The bytes of data comprising a System program are arranged on the tape in a predefined sequence. In addition to the program itself, the tape contains stuff like sync bytes, loading addresses, checksums, and other assorted control information. These things are necessary to ensure the program loads in the right place in RAM without errors. Here is a brief rundown of the machine language format:

- Leader—256 zero bytes used to allow stabilization of the tape deck and AGC circuits.
- A5 Sync Byte—Reference point to synchronize the input routines with the incoming data.
- 55 System Format Header Byte—Indicates this is a machine language tape and not Basic.
- Filename—Six bytes of ASCII characters padded with spaces.

The next five items may be repeated many times in any one program.

- 3C Data Header Byte—Indicates the start of a block of program data. The block may be up to 256 bytes long.
- XX Length of Data Byte—A number from 0-255 that tells the number of bytes in this block of data.
- Load Address—A two byte address showing where to put the data for this block. Least significant byte (LSB) is first, followed by the most significant byte (MSB).
- Program Data—0-256 bytes of actual program data.
- Checksum—A one byte sum of all the program data bytes and the load address bytes with the overflow ignored. The checksum is used to detect loading errors.

Two items come after the last block of data:

- 78H End of File Marker—Indicates the end of the program.
- Entry Address (LSB/MSB)—Tells where the beginning of the program is.

With this in mind let's see how RSL reads an object code program into the buffer, and how it makes a high speed copy

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Program continued

```
4328 23        00450          INC     HL        ;BUMP POINTER
4329 0606      00460          LD      B,06      ;FILENAME BYTE COUNT
ER
432B CD3502    00470 GTFN     CALL    RDBYTE    ;GET A BYTE FROM TAP
E
432E 12        00480          LD      (DE),A    ;DISPLAY IT
432F 13        00490          INC     DE
4330 77        00500          LD      (HL),A    ;STORE IN BUFFER
4331 23        00510          INC     HL        ;BUMP PNTR
4332 10F7      00520          DJNZ    GTFN      ;LOOP 6 TIMES
4334 CD3502    00530 BLOCLP   CALL    RDBYTE    ;GET MODULE START BY
TE
4337 FE3C      00540          CP      3CH       ;IS IT OK?
4339 202D      00550          JR      NZ,TRANS          ;NO:CHECK FO
R EOF
433B 77        00560          LD      (HL),A    ;YES STORE IN BUFFER

433C 23        00570          INC     HL
433D CD3502    00580          CALL    RDBYTE    ;GET BLOCK LEN
4340 47        00590          LD      B,A       ;STORE IN B
4341 77        00600          LD      (HL),A    ; & IN BUFFER
4342 23        00610          INC     HL        ;BUMP PNTR
4343 AF        00620          XOR     A         ;CLEAR CHECKSUM
4344 4F        00630          LD      C,A       ;        IN C REG
4345 CDB343    00640          CALL    INBYTE    ;GET BLOC LOAD ADDRE
SS LSB
4348 CDB343    00650          CALL    INBYTE    ;GET BLA        MSB
434B CDB343    00660 LDDATA   CALL    INBYTE    ;GET DATA BYTE, DO C
KSM,ETC.
434E 3A4038    00670          LD      A,(3840H)         ;TEST FOR BR
EAK KEY
4351 CB57      00680          BIT     2,A       ;TEST BIT 2 (BREAK)
4353 2094      00690          JR      NZ,SPEED          ;YES: GOTO M
ENU
4355 10F4      00700          DJNZ    LDDATA    ;LOOP TILL BLOCK ENT
ERED
4357 CD3502    00710          CALL    RDBYTE    ;GET CHECKSUM BYTE
435A 77        00720          LD      (HL),A    ; INTO BUFFER
435B 23        00730          INC     HL
435C B9        00740          CP      C         ;SAME?
```

Program continues

with the preloader attached.

The buffer used to store the object code program begins at 4713H and continues to the end of available memory. Every byte read from tape is stored in the buffer verbatim. This includes headers, file names, checksums, and so on. Only the leader and A5 sync byte are not placed in the buffer. Therefore, after the object program is loaded, the buffer contains an exact byte-for-byte image of what was on the tape. Note: The object program will not execute properly at this time; we are only saving it to write on tape at 2000 baud.

Several of the bytes read in are checked to make sure no errors have occurred in the loading process. These include the 55 System Header Byte, the 3C data header byte, the checksum bytes, and the end-of-file byte. If an error occurs in any of these, loading stops and control is sent back to the menu selection routine. Lines 670–690 test the Break key and return to the menu if it is pressed. This gives you a

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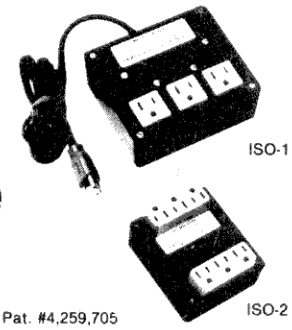

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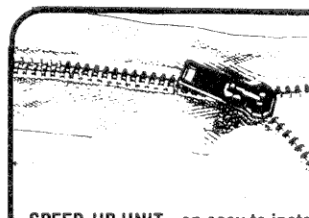

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chance to halt loading at any time, handy if you discover you are loading the wrong program.

When the file name is encountered, lines 470–520 not only store it in the buffer, but also display it on the video on the left side of the screen.

As each byte of data is read from the tape, it is POKEd onto the video display in the upper right corner where the flashing asterisk is usually located. It is more informative to see the actual data being loaded instead of a flashing star, although any errors will still be caught by RSL.

After the last block of data is loaded and the end-of-file byte is checked for validity, the entry address is read from tape and stuffed in the DE register. The address is converted to hexadecimal ASCII characters by the HEXASC routine at line 950 and displayed on video. You can write this address down and use it to re-enter your object program if it crashes at some future time.

Now that we have our object code program in the buffer, the

Program continued

```
435D 2073      00750          JR      NZ,CKERR          ;STOP AND DI
SPLAY ERR MESG
435F 3A3E3C    00760          LD      A,(3C3EH)         ;GET LEFT SY
MBOL
4362 3C        00770          INC     A        ;CHANGE IT
4363 323E3C    00780          LD      (3C3EH),A         ;DISPLAY IT
4366 18CC      00790          JR      BLOCLP   ;DO NEXT BLOCK
4368 FE78      00800 TRANS    CP      78H      ;EOF BYTE?
436A 2061      00810          JR      NZ,TERR  ;NO:DISPLAY ERROR ME
SG
436C 77        00820          LD      (HL),A   ;YES : PUT IN BUFFER

436D 23        00830          INC     HL
436E CD3502    00840          CALL    RDBYTE   ;GET ENTRY PNT. LSB
4371 77        00850          LD      (HL),A
4372 5F        00860          LD      E,A      ;PUT LSB IN E REG
4373 23        00870          INC     HL
4374 CD3502    00880          CALL    RDBYTE   ;MSB
4377 77        00890          LD      (HL),A
4378 57        00900          LD      D,A      ;PUT MSB IN D REG
4379 22D743    00910          LD      (BUFFEN),HL       ;STORE END O
F BUFFER PNTR
437C CDF801    00920          CALL    1F8H     ;OFF MOTOR
437F 21CD3C    00930          LD      HL,3CCDH          ;DISPLAY POS
ITION
4382 0602      00940          LD      B,02H    ;# OF BYTES TO CONVE
RT
4384 7A        00950 HEXASC   LD      A,D      ;GET MSB
4385 CB3F      00960          SRL     A        ;MOVE HI NYBBLE TO L
OW
4387 CB3F      00970          SRL     A
4389 CB3F      00980          SRL     A
438B CB3F      00990          SRL     A
438D CDA943    01000          CALL    TEST     ;CONVERT TO ASCII
4390 77        01010          LD      (HL),A   ;DISPLAY HEX DIGIT
4391 7A        01020          LD      A,D      ;GET LO NYBBLE
4392 E60F      01030          AND     0FH      ;MASK OFF HI BITS
4394 CDA943    01040          CALL    TEST     ;CNVT TO ASCII
```

Program continues

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```
4397 23        01050          INC     HL        ;BUMP DSP PNTR
4398 77        01060          LD      (HL),A    ;DISPLAY NEXT DIGIT
4399 23        01070          INC     HL
439A 53        01080          LD      D,E       ;GET LSB
439B 10E7      01090          DJNZ    HEXASC    ;DO NEXT BYTE
439D 11C03C    01100          LD      DE,3CC0H          ;DSP TEXT LO
C.
43A0 ED532040  01110          LD      (4020H),DE        ;CHANGE CURS
. POS
43A4 217E46    01120          LD      HL,HEXDSP         ;POINT TO ME
SG
43A7 1818      01130          JR      ERROR     ;DISPLAY & RETURN
43A9 F630      01140 TEST     OR      30H       ;ASCII CONV. FACTOR
43AB FE3A      01150          CP      3AH       ;0-9?
43AD FAB243    01160          JP      M,TEST1   ;YES RETURN
43B0 C607      01170          ADD     A,7       ;NO CORRECT FOR A-F
43B2 C9        01180 TEST1    RET
43B3 CD3502    01190 INBYTE   CALL    RDBYTE    ;GET BYTE
43B6 77        01200          LD      (HL),A    ;         INTO BUFFER
43B7 323F3C    01210          LD      (3C3FH),A         ; & DISPLAY
IT
43BA 23        01220          INC     HL        ;BUMP BUFFER PNTR
43BB 81        01230          ADD     A,C       ;DO
43BC 4F        01240          LD      C,A       ;         CHECKSUM &
43BD C9        01250          RET               ;         RETURN
43BE 218C46    01260 NOTSYS   LD      HL,SYSERR         ;PNT TO ERR.
 MES.
43C1 CDA728    01270 ERROR    CALL    DSP               ;DSPLY IT
43C4 CDF801    01280          CALL    MTOFF     ;OFF MOTOR
43C7 CD4900    01290          CALL    KBD       ;INPUT KEYBOARD
43CA C3E942    01300          JP      SPEED     ;RETURN TO BEGINNING

43CD 21AE46    01310 TERR     LD      HL,ERR2 ;PNT TO TRANS. ERR M
SG
43D0 18EF      01320          JR      ERROR     ;DISPLAY AND RETURN
43D2 21CC46    01330 CKERR    LD      HL,ERR3 ;PNT TO CKSUM ERROR
MESG
43D5 18EA      01340          JR      ERROR
43D7 0000      01350 BUFFEN   DEFW    0000
```

Program continues

program waits until we press Enter and returns to the menu. Pressing # and 2 sends control to line 1390—the start of routines to record the object code program on a blank tape at 2000 baud. The going starts to get a little rough here, so hang on.

Lines 1390-1480 ask how many copies we wish to make and store our answer in the memory location labeled COPIES. Now comes a pause, so you can prepare the tape machine for recording. So far, so good. Now for the sticky part.

The WRTTAP routine writes the leader and sync byte using the ROM routine at 284H. The 55 System Tape Header Byte and Filename are read from the buffer by OUT7 and written on tape. This is a sneaky way of transferring the file name of the object code program to the preloader module. Having done this, we cause HL to point to the start of the preloader module, LODMOD, so it can be written on the tape.

Notice LODMOD includes the header bytes, block-length bytes

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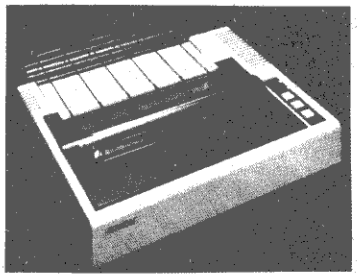

- EPSON MX70 ..... CALL
- EPSON MX80 ..... CALL
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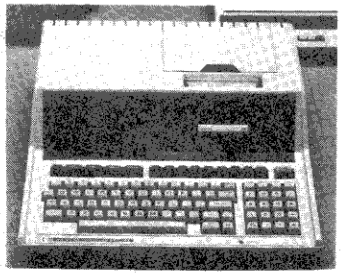

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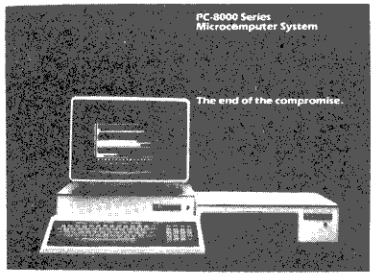

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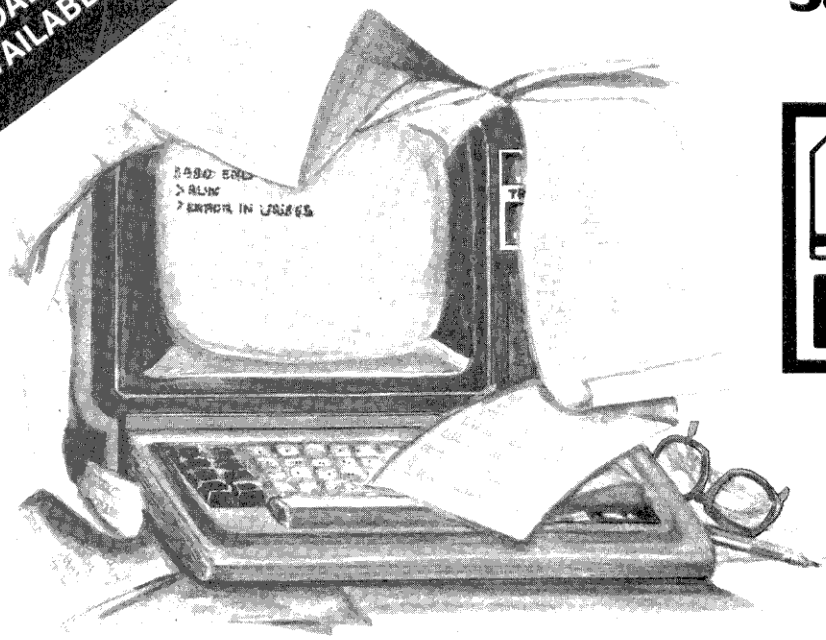

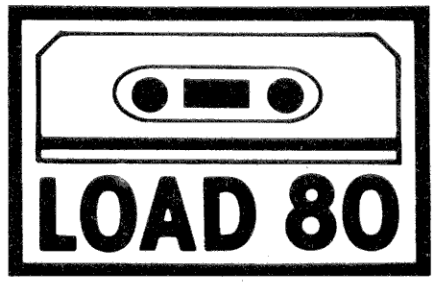

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Program continued

```
43D9 00        01360 COPIES  DEFB    00        ;# OF COPIES TO MAKE

               01365 ;.
               01367 ; ****************************************
*******
               01370 ; * THIS SECTION WRITES A FASTLOAD VERSION O
F THE *
               01380 ; *     SYSTEM PROGRAM WITH A PRELOADER MODU
LE    *
               01384 ; ****************************************
********
               01386 ;
43DA CDC901    01390 SYSWRT  CALL    CLS
43DD 21DB46    01400         LD      HL,MESG3
43E0 CDA728    01410         CALL    DSP
43E3 CD4900    01420         CALL    KBD       ;INPUT # OF COPIES
43E6 FE31      01430         CP      31H       ;LESS THAN 1?
43E8 FADA43    01440         JP      M,SYSWRT          ;YES -TRY AG
AIN
43EB FE3A      01450         CP      3AH       ;LESS THAN OR =9?
43ED F2DA43    01460         JP      P,SYSWRT          ;NO-TRY AGAI
N
43F0 E60F      01470         AND     0FH       ;MASK OFF ASCII PART

43F2 32D943    01480         LD      (COPIES),A        ;STORE IN ME
M
43F5 21ED46    01490 CONT    LD      HL,MESG5          ;'READY TAPE
 FOR RECORD & PRESS ENTER
43F8 CDA728    01500         CALL    DSP
43FB CD4900    01510         CALL    KBD       ;WAIT FOR ENTER
43FE CD8402    01520 WRTTAP  CALL    284H      ;MOT. ON,WRITE LEADE
R AND SYNC
4401 211347    01530         LD      HL,BUFFER         ;POINT TO 55
H,FILENAME
4404 0607      01540         LD      B,7               ;7 BYTES TO
OUTPUT
4406 7E        01550 OUT7    LD      A,(HL)
4407 23        01560         INC     HL
4408 CD6402    01570         CALL    264H      ;OUTPUT A BYTE
```

Program continues

and load address bytes embedded in it. Only the checksums are not included, since these are calculated by the routines writing the preloader to tape. The preloader is divided into four parts. The first part is a line of text with its origin set to load directly on the video screen. The second part loads into the keyboard buffer area of RAM, a section not used by anything else during the loading of a program. It should be out of the way so it won't upset the loading of the object program. The third part is the R byte routine. Its origin is pegged to load at RAM location 403EH, a 64 byte area not used by most programs I know of. If a program you wish to copy does use this area, simply change line 3420 to place R byte somewhere out of the way. Also change line 2770 (labelled V byte) to the new address.

Note: Nowhere in the preloader is R byte called! Instead, there are numerous calls to V byte. Line 2770 (not a part of the preloader) defines V byte as ad-

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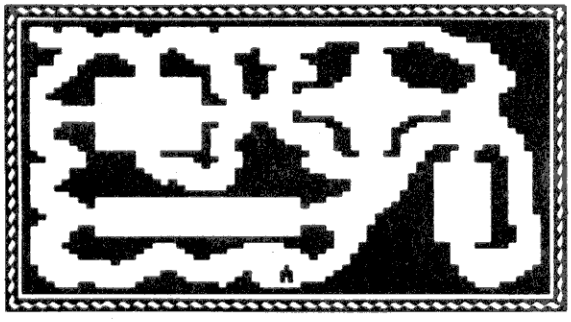

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Program continued

```
440B 10F9      01580          DJNZ    OUT7     ;LOOP 7 TIMES
440D 21D544    01590          LD      HL,LODMOD        ;POINT TO LO
ADER MODULE
4410 7E        01600 HEADER   LD      A,(HL)   ;GET HEADER BYTE
4411 FE3C      01610          CP      3CH      ;OK?
4413 C24344    01620          JP      NZ,QUIT
4416 CD6402    01630          CALL    264H     ;WRITE IT
4419 23        01640          INC     HL
441A 7E        01650          LD      A,(HL)   ;GET LEN
441B 47        01660          LD      B,A      ;  IN B REG.
441C CD6402    01670          CALL    264H
441F AF        01680          XOR     A        ;CLR CHKSUM
4420 4F        01690          LD      C,A      ;IN C REG
4421 3E02      01700          LD      A,2
4423 5F        01710          LD      E,A      ;# OF ADDRESS BYTES
4424 23        01720 WRADD    INC     HL
4425 7E        01730          LD      A,(HL)   ;GET LSB
4426 57        01740          LD      D,A      ;HOLD IT
4427 81        01750          ADD     A,C      ;CKSM
4428 4F        01760          LD      C,A
4429 7A        01770          LD      A,D      ;RETRIEVE BYTE
442A CD6402    01780          CALL    264H     ;TO TAPE
442D 1D        01790          DEC     E        ;CNT BYTE
442E 20F4      01800          JR      NZ,WRADD
4430 23        01810 DATALP   INC     HL
4431 7E        01820          LD      A,(HL)   ;GET BYTE
4432 57        01830          LD      D,A
4433 81        01840          ADD     A,C      ;DO CKSM
4434 4F        01850          LD      C,A
4435 7A        01860          LD      A,D      ;GET BYTE
4436 CD6402    01870          CALL    264H     ;TO TAPE
4439 10F5      01880          DJNZ    DATALP
443B 79        01890          LD      A,C      ;OUTPUT CKSM
443C CD6402    01900          CALL    264H
443F 23        01910          INC     HL       ;3CH OR 78H
4440 C31044    01920          JP      HEADER
4443 FE78      01930 QUIT     CP      78H
4445 C2BE43    01940          JP      NZ,NOTSYS        ;ERROR IF NO
T
4448 CD6402    01950          CALL    264H
444B 23        01960          INC     HL
444C 7E        01970          LD      A,(HL)   ;LSB
444D CD6402    01980          CALL    264H
4450 23        01990          INC     HL       ;MSB
4451 7E        02000          LD      A,(HL)
4452 CD6402    02010          CALL    264H
4455 010030    02020          LD      BC,3000H         ;TIMER CNT
4458 CD6000    02030          CALL    0060H    ;ROM TIMER
445B 0640      02070          LD      B,40H    ;64 LEADER BYTES
445D AF        02080 LEADER   XOR     A
445E C5        02090          PUSH    BC
445F CD9944    02100          CALL    OUTPUT   ;2000 BAUD ROUTINE
4462 C1        02110          POP     BC
4463 10F8      02120          DJNZ    LEADER   ;LOOP
4465 211347    02130          LD      HL,BUFFER        ;PNT TO BUFF
ER (CONTAINS                                    ALL SYNC AND
 CONTROL BYTES
4468 ED5BD743  02140          LD      DE,(BUFFEN)      ;GET END OF
BUFFER
446C 7E        02150 BUFWRT   LD      A,(HL)
446D CD9944    02160          CALL    OUTPUT   ;WRITE BYTE AT FASTL
OAD SPEED
4470 7C        02170          LD      A,H      ;SEE IF
4471 BA        02180          CP      D        ;        WE ARE
4472 2004      02190          JR      NZ,NEXT  ;           DONE
4474 7D        02200          LD      A,L      ;                YET.

4475 BB        02210          CP      E
4476 2803      02220          JR      Z,DONE
4478 23        02230 NEXT     INC     HL       ;MORE: BUMP HL
4479 18F1      02240          JR      BUFWRT   ; & DO NEXT ONE
447B 3AD943    02250 DONE     LD      A,(COPIES)       ;GET COPY CN
T
447E 3D        02260          DEC     A
447F 2812      02270          JR      Z,OFFMOT         ;DONE :FINIS
H UP & RET
4481 32D943    02280          LD      (COPIES),A       ;RESTORE COU
NT
4484 0603      02290          LD      B,03
4486 210000    02300          LD      HL,0000  ;TIMER INNER LOOP
4489 2B        02310 INLOOP   DEC     HL
448A 7C        02320          LD      A,H
448B B5        02330          OR      L
448C 20FB      02340          JR      NZ,INLOOP
448E 10F9      02350          DJNZ    INLOOP   ;LONG TIMER
4490 C3FE43    02360          JP      WRTTAP   ;DO ANOTHER COPY
4493 CDF801    02370 OFFMOT   CALL    1F8H     ;OFF MOTOR
```

Program continues

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```
4496 C3E942    02380          JP      SPEED    ;GOTO MENU
4499 0610      02390 OUTPUT   LD      B,10H
449B 10FE      02400          DJNZ    $        ;LOOP FOR A WHILE
               02404 ;
               02405 ;*** WRITE A BYTE IN 2000 BAUD FORMAT ***
               02406 ;
449D E5        02410 WBYTE    PUSH    HL       ;SAVE
449E D5        02420          PUSH    DE       ;       ALL
449F C5        02430          PUSH    BC       ;               REGS
.
44A0 F5        02440          PUSH    AF
44A1 0E09      02450          LD      C,09     ;# OF BITS +SYNC
44A3 57        02460          LD      D,A      ;STORE BYTE IN D
44A4 37        02470          SCF              ;ADD SYNC
44A5 CDB344    02480 BYTLP    CALL    PULSE    ;OUTPUT A PULSE
44A8 7A        02490          LD      A,D      ;RETRIEVE BYTE
44A9 07        02500          RLCA             ;ROTATE NXT BIT TO C
ARRY
44AA 57        02510          LD      D,A      ;SAVE IT AGAIN
44AB 0D        02520          DEC     C        ;COUNT THE BIT
44AC 20F7      02530          JR      NZ,BYTLP         ;LOOP 9 TIME
S
44AE F1        02540          POP     AF       ;RESTORE
44AF C1        02550          POP     BC       ;       ALL
44B0 D1        02560          POP     DE       ;           REGS.
44B1 E1        02570          POP     HL
44B2 C9        02580          RET              ;EXIT PT.
44B3 301B      02590 PULSE    JR      NC,ZTIME         ;BLANK SPACE
 FOR 0
44B5 3E05      02600          LD      A,05H    ;1ST PART OF PULSE
44B7 D3FF      02610          OUT     (255),A
44B9 0608      02620          LD      B,08H
44BB 10FE      02630          DJNZ    $        ;TIMER LOOP
44BD 3E06      02640          LD      A,06H    ;2ND PART OF PULSE
44BF D3FF      02650          OUT     (255),A
44C1 0608      02660          LD      B,08H
44C3 10FE      02670          DJNZ    $
44C5 3E04      02680          LD      A,04     ;3RD PART OF PULSE
44C7 D3FF      02690          OUT     (255),A
44C9 062A      02700 → 0A     LD      B,2AH
44CB 10FE      02710          DJNZ    $        ;312.37 MICROSECONDS

44CD FD23      02720          INC     IY       ;ACTS AS NOP FOR TIM
ING
44CF C9        02730          RET
44D0 063F      02740 ZTIME →  LD  1F  B,3FH    ;458.97 MICROSECS
44D2 10FE      02750          DJNZ    $
44D4 C9        02760          RET
               02762 ;
               02764 ; ***********************************
               02766 ;        PRELOADER MODULE FILE
               02768 ; ***********************************
403E           02770 VBYTE    EQU  ORG  403EH  ;RBYTE CALL PNT
44D5 3C39      02780 LODMOD   DEFW    393CH    ;BLOC & LEN
44D7 003C      02790          DEFW    3C00H    ;START ADDRESS
44D9 52        02800          DEFM    'RAPID SYSTEM LOADER      (C)
'1980 BY DAVID C. HEDINGER '
4512 3C6E      02810          DEFW    6E3CH    ;BLOC START AND LEN
*****151DEC
4514 E841      02820          DEFW    41E8H    ;LOAD ADDRESS (KBD B
UFFER)
4516 3E04      02830          LD      A,04
4518 D3FF      02840          OUT     (255),A  ;TURN ON MOTOR
451A CD3E40    02850 SYNCIT   CALL    VBYTE    ;LOOK FOR SYNC
451D FE55      02860          CP      055H
451F 20F9      02870          JR      NZ,SYNCIT
4521 0606      02880          LD      B,06     ;FILENAME COUNT
4523 11403C    02890          LD      DE,3C40H         ;POINT TO 2N
D LINE
4526 CD3E40    02900 FN       CALL    VBYTE    ;GET FILENAME
4529 12        02910          LD      (DE),A   ;DISPLAY IT
452A 13        02920          INC     DE
452B 10F9      02930          DJNZ    FN       ;LOOP 6 TIMES
452D CD3E40    02940 BLOOP    CALL    VBYTE
4530 FE3C      02950          CP      3CH      ;BLOC START?
4532 2027      02960          JR      NZ,EOF   ;NO- CHECK FOR EOF
4534 CD3E40    02970          CALL    VBYTE    ;OK GET LEN BYTE
4537 47        02980          LD      B,A      ;       INTO B REG
4538 0E00      02990          LD      C,00     ;CLEAR CHECKSUM
453A CD3E40    03000          CALL    VBYTE    ;GET LSB START ADDR
453D 6F        03010          LD      L,A
453E 81        03020          ADD     A,C      ;DO
453F 4F        03030          LD      C,A      ;       CHECKSUM
4540 CD3E40    03040          CALL    VBYTE    ;MSB
4543 67        03050          LD      H,A
4544 81        03060          ADD     A,C
4545 4F        03070          LD      C,A
```

Program continues

dress 404EH. This means whenever we call V byte, we actually call 403EH.

The reason for this is simple. When the preloader is loaded into its working location at 41E8H, R byte ends up at 403EH, not its original location, 4588H. If we called R byte, we would be calling a nonexistent routine, causing an immediate crash! So we call V byte instead, the program goes to 403EH, and everything works fine.

The final section of the preloader is a single instruction loaded into RAM location 41E2H. The instruction is a jump to 41E8H, the entry point of the preloader. Location 41E2H normally contains a return instruction. It is called by the system command at the end of loading any machine language tape. By putting a jump to our preloader here, control is transferred to it as soon as it is loaded.

Remember: Everything we have put on tape is in standard TRS-80 machine language format. However, as soon as the preloader has been written, the program comes to line 2020 leaving a blank space on the tape. From now on, all bytes are written at the 2000 baud speed.

Making High Speed Copy

Lines 2080–2120 form a loop. It writes 64 zero bytes forming a leader for the 2000 baud tape. When this is completed, HL and DE are pointed to the start and end addresses of the object code program buffer. The routine labelled BUFWRT scans the buffer and sends each byte to the tape. Since all control and checksums are already included in the buffer, no calculating need be done other than checking for the end of the program.

If you asked for more than one copy to be made, lines 2250–2360 will allow a few seconds of blank tape to run and then loop to line 1520 (WRTTAP) to make another. If all copies have been made, the motor is turned off and the program branches back to the menu for further instructions.

Loading a RSL Format Program

To load a program in the RSL format, use the same procedure

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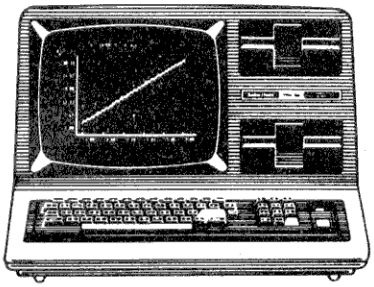
TRS-80 MODEL III



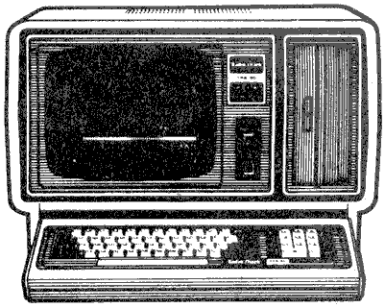
TRS-80 16K Model III $825.00
TRS-80 48 K Model III $849.95
TRS-80 48 K Model III
with one disk drive $1499.95
TRS-80 48K Model III
with two drives $1749.95

*Model III is also available with dual head and 80 track drives. Drives listed give same performance as standard Radio Shack units.

THERE'S NO SECRET

There's no secret as to why we can sell TRS-80 computer equipment for less. Low overhead — that's the reason — pure, simple and straight! As everyone knows, Radio Shack is a huge corporation...with huge expenses. We are able to buy the bare-bones computers from Radio Shack. To these computers, we add our own memory chips, disk drives, cables, etc. The result is a computer system which is equal to, or in many cases, superior to the one you would get from Radio Shack in both price and performance capabilities. There is one thing that you don't get from Radio Shack — their 90 day warranty. What you get in its place is the exclusive 120 days American Small Business Computer's Warranty. So...if you like the Radio Shack computer, but don't like the price...**CHECK US OUT!!!**

TRS-80 MODEL II



64K MODEL II WITH ONE DISK DRIVE

$3287.00

AW...WHAT THE HECK

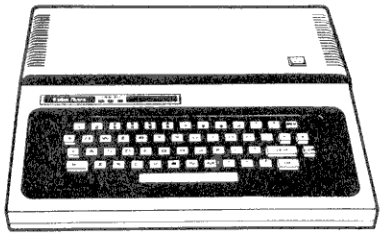
RAM Memory Chips for the TRS-80 *Apple* and others

It is the policy of American Business Computers to offer merchandise at the lowest price possible. Several months back we began selling RAM Memory Chips for the TRS-80 for $45.00 per set. Someone else sold chips for $44.00. We sold them for $38.00. They sold them for $37.95. So we say "AW...WHAT THE HECK!" Let's see the other guys beat this price.

$17.95 PER 16K SET

These chips are brand new 4116's. These 200 nanosecond chips are fully compatible with all TRS-80 products. Instructions for insertion are included; however, the dip shunts required for converting a 4K Model I to a 16K Model I are not included at this low price.

COLOR COMPUTER



COLOR COMPUTER 4K LEVEL I $318.00
COLOR COMPUTER 16K
EXTENDED BASIC $487.00
COLOR COMPUTER DISK
DRIVE 1 ..... $499.95
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DISCOUNT PRICES ON Model III Software

Profile	(26-1562)	$69.95
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VisiCalc	(26-1566)	$80.00
VisiCalc III	(26-1569)	$175.00
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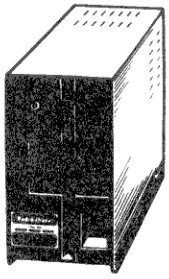
Scripsit Dictionary	(26-1591)	$131.00

CC DISK DRIVE



COLOR COMPUTER DISK DRIVE UNIT

$499.95

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Program continued

```
4546 CD3E40   03080 DLOOP   CALL   VBYTE    ;GET DATA
4549 77       03090         LD     (HL),A   ;PUT IN MEM
454A 23       03100         INC    HL       ;BUMP HL
454B 81       03110         ADD    A,C      ;DO
454C 4F       03120         LD     C,A      ;  CHECKSUM
454D 10F7     03130         DJNZ   DLOOP    ;LOOP TILL BLOCK ENT
ERED
454F CD3E40   03140         CALL   VBYTE    ;GET CKSUM
4552 B9       03150         CP     C        ;SAME?
4553 202A     03160         JR     NZ,LDERR         ;DISPLAY ERR
OR
4555 3E2A     03170         LD     A,2AH    ;'*'
4557 12       03180         LD     (DE),A   ;DSP *
4558 13       03190         INC    DE
4559 18D2     03200         JR     BLOOP    ;GET NXT BLOC
455B FE78     03210 EOF     CP     78H      ;EOF BYTE?
455D 201C     03220         JR     NZ,EOFERR        ;DISPLAY ERR
OR
455F CD3E40   03230         CALL   VBYTE    ;GET ENTRY PNT LSB
4562 6F       03240         LD     L,A
4563 CD3E40   03250         CALL   VBYTE
4566 67       03260         LD     H,A      ;MSB TO H
4567 3EC9     03270         LD     A,0C9H   ;RET
4569 32E241   03280         LD     (41E2H),A
456C 22DF40   03290         LD     (40DFH),HL       ;STR ENTRY P
NT
456F CDF801   03300         CALL   1F8H     ;OFF MOTOR
4572 E9       03310         JP     (HL)     ;AUTO START
4573 00       03320         NOP
4574 CDF801   03330 EXIT    CALL   1F8H     ;OFF MOTOR
4577 C37200   03340         JP     072H     ;RETURN TO BASIC
457A 00       03350 AUTO    DEFB   00
457B 3E45     03360 EOFERR  LD     A,45H    ;'E' EOF ERROR
457D 1802     03370         JR     XERR
457F 3E43     03380 LDERR   LD     A,43H    ;'C' CHKSUM ERROR
4581 12       03390 XERR    LD     (DE),A   ;DISPLAY ERROR CODE
4582 18F0     03400         JR     EXIT     ;RETURN TO BASIC
4584 3C29     03410         DEFW   293CH    ;BLOC & LEN
4586 3E40     03420         DEFW   403EH    ;START ADDRESS
```

Program continues

used to load the original program. In other words, type and enter 'SYSTEM'. Enter the file name of the program as usual. You should see the text load on the screen followed by a few seconds of asterisk blinking. This is the preloader. The whole thing should take about seven seconds. The preloader will auto start and begin loading the object code program. This is indicated by the file name appearing on the second line of video. Every time a block of data is loaded, an additional asterisk will appear after the file name. If an error occurs, a 'C' will replace the last asterisk and loading will stop. Reset and when the memory size question appears on the screen try again. If all goes well, the program will start itself as soon as it is loaded.

Enter RSL

Use the Editor/Assembler and enter the RSL program. If you make any modifications to the preloader (lines 2780–3730) affecting its length, you must alter

CONVERT YOUR SERIAL PRINTER TO PARALLEL

NEW MODEL UPI-3 SERIAL PRINTER INTERFACE MAKES IT POSSIBLE TO CONNECT AN ASCII SERIAL PRINTER TO THE PARALLEL PRINTER PORT ON THE TRS-80.

Software compatibility problems are totally eliminated because the TRS-80 "THINKS" that it has a parallel printer attached. NO MACHINE LANGUAGE DRIVER NEEDS TO BE LOADED INTO HIGH MEMORY BECAUSE THE DRIVER ROUTINE FOR THE UPI-3 IS ALREADY IN THE TRS80 ROM! SCRIPSIT, PENCIL, RSM 2, ST80D, NEWDOS, FORTRAN, BASIC etc. all work as if a parallel printer was in use.

The UPI-3 is completely self contained and ready to use. A 34 conductor edge card connector plugs onto the parallel printer port of the model I Expansion Interface or onto the parallel printer port on the TRS-80 III. A DB25 socket mates with the cable from your serial printer. The UPI-3 converts the parallel output of the TRS-80 printer port into serial data in both the RS232-C and 20 MA. loop formats.

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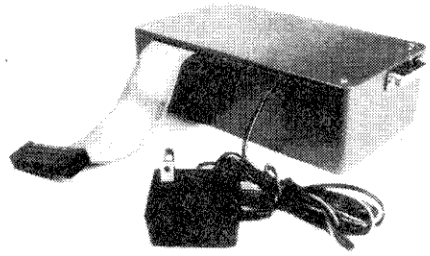

Switch selectable options include:
- Linefeed after Carriage Return
- Handshake polarity (RS232-C)
- Nulls after Carriage Return
- 7 or 8 Data Bits per word
- 1 or 2 Stop Bits per Word
- Parity or No parity
- ODD or EVEN Parity

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UPI-2 for TRS80 Model II	$149.95
UPI-3 for TRS80 Model I or 3	$149.95
UPI-4 for use with Model 1 and RS Printer Interface Cable (no expansion interface required)	$159.95
Manual only (may be applied to order)	$ 5.00
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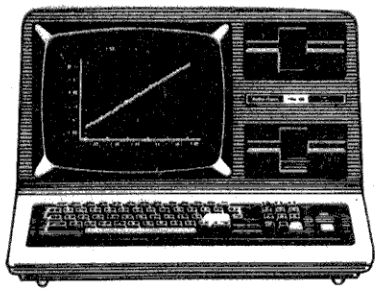
TRS-80 MODEL 3 MINI DISK DRIVES

Our Model 3 Mini Disk Drive is based on the famous Tandon mini disk unit. Because of it's low cost and high reliability, we thought this Tandon unit the perfect choice for the Model 3. Much testing confirmed our opinion, and we think you'll agree that it's the best mini disk for the money (and the Model 3)!!!



INTERNAL DISK DRIVE KITS FOR THE MODEL III COMPUTER

The kit includes one disk drive of your choice, controller, power supply, cables, mounting hardware, and complete instructions for easy installation.

DRIVE TYPE	DRIVE 0	DRIVE 1	DRIVE 2	DRIVE 3
Single Side 40 Track Stores about 180,000 Bytes/Disk Drive	$595.00	239.95	265.00	265.00
Dual Head 40 Track Stores about 360,000 Bytes/Disk Drive	$729.95	379.95	369.95	369.95
Single Side 80 Track Stores about 360,000 Bytes/Disk Drive	$729.95	379.95	369.95	369.95
Dual Head 80 Track Stores about 720,000 Bytes/Disk Drive	$829.95	479.95	499.95	499.95

*Drives 0 and 1 may be installed externally (with controller and power supply mounted internally). Please add $40.00 for cost of cabinet and cover.

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TRS-80* MODEL 1 MINI DISK DRIVES

Our Mini Disk Drives are based on the world famous TEAC Mini Disk Unit. The TEAC Unit features an estimated 8000 power-on-hours mean time between failure (that's 8 hours a day, 5 days a week, for 3.85 years!!). Our drives also feature a lead screw head positioner. This type of positioner insures accurate head positioning over the read-write media while giving a very quiet, noise-free read-write operation. If you have any doubts about our drives, our **one year** warranty should convince you that **we** know this unit is the **best** drive at the **best** price on the American market. This is one example where you can pay less and get more!!

MODEL 1 40 TRACK FULLY TRS-80 COMPATIBLE DISK DRIVE.....$265
MODEL 1 80 TRACK DRIVE (Requires NEWDOS 80 or equivalent software to work).....$369.95
NEWDOS 80 (Version 2.0).....$139.95
BOX OF 10 VERBATIM DATALIFE DISKETTES.....$29.95
2 DRIVE CABLE.....$29.95
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$250
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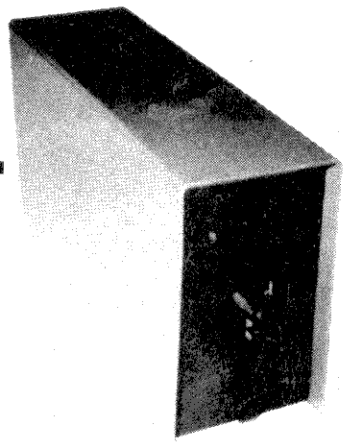

COMPLETE DRIVE WITH POWER SUPPLY

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the length byte in line 2780, 2810 or 3410. For instance, suppose you change line 2800 to eliminate my name from the text. (Shame on you!) You must subtract the number of characters deleted (18 decimal or 12 hex) from 39 hex and put this new number in line 2780. Line 2780 would then be DEFW 273CH.

Assemble the program and check for errors. When all is well save the source and object code on tape a few times. You are now ready to use the program. Load RSL using the System command. Measure how long it takes to load. Execute the program by typing and entering /. You should see the menu appear on the video.

Now use the program to make a copy of itself in the 2000 baud format. Press 1 to load a machine language tape. Place the RSL object code tape back in the recorder and prepare to load it in. Press Enter when ready. The program will input the tape, display the file name and entry point, then stop. Press Break to return

Program continued

```
                 03422 ;
                 03424 ;        ***********************************
***
                 03426 ;        *  READ A BYTE FROM TAPE AT 2000 BAU
D *
                 03428 ;        ***********************************
***
4588 C5          03430 RBYTE    PUSH    BC
4589 F5          03440          PUSH    AF
458A 3E04        03450          LD      A,04
458C D3FF        03460          OUT     (255),A ;CLR F.F.
458E 0E08        03470          LD      C,08    ;BIT CNTR
4590 DBFF        03480 LKSYNC   IN      A,(255) ;SYNC?
4592 17          03490          RLA
4593 30FB        03500          JR      NC,LKSYNC ;NO, KEEP LOOKING
4595 0625        03510  12 →    LD      B,25H 13 ;268.39US 1/2BIT
4597 10FE        03520          DJNZ    $  14
4599 3E04        03530 BTLOOP   LD      A,04
459B D3FF        03540          OUT     (255),A
459D 063D        03550 → 18     LD      B,3DH  19
459F 10FE        03560          DJNZ    $
45A1 FD23        03570          INC     IY      ;NOP
45A3 DBFF        03580          IN      A,(255) ;GET A BIT
45A5 47          03590          LD      B,A     ;SAVE IT
45A6 F1          03600          POP     AF      ;GET OTHER BITS
45A7 CB10        03610          RL      B       ;SHIFT DATA TO CARRY

45A9 17          03620          RLA             ;& INTO A REG
45AA F5          03630          PUSH    AF      ;SAVE IT
45AB 0D          03640          DEC     C       ;CNT IT
45AC 20EB        03650          JR      NZ,BTLOOP       ;8 TIMES
45AE F1          03660          POP     AF
45AF C1          03670          POP     BC
45B0 C9          03680          RET
45B1 3C03        03690 ASTART   DEFW    033CH   ;MOD & LEN
45B3 E241        03700          DEFW    41E2H   ;ORG ADDRESS
45B5 C3E841      03710          JP      41E8H   ;INPUT BUFFER AREA
45B8 78          03720          DEFB    78H     ;EOF
45B9 E841        03730          DEFW    41E8H   ;ENTRY PNT
```

Program continues

THE ALTERNATE SOURCE

Programmer's Journal

We could tell you that it's the best available,

BUT WE'D RATHER PROVE IT.

Supporting TRS-80 Models I and III only...

If you're the type of person whose satisfaction is NOT from loading a computer program, BUT from knowing what makes it tick, what makes it work and how to improve it, then you are invited to accept a guaranteed, no risk, money back offer. The Alternate Source Programmer's Journal would like YOU to critique it's contents. A thinking, creative mind like yours is not content to simply accept things the way they are. Just now we are learning to effectively utilize the power inherent in that little gray box of yours. You're looking for newer, faster, and better ways to utilize this power. Thousands of computerists rely on TAS to provide this information; we GUARANTEE their satisfaction. Consider a NO RISK trial subscription today -- if you're unhappy with the first issue, drop us a note and we'll refund your money. We think you'll like it, though, with our easy-to-understand features and dozens of enlightening articles on programming the computer you love. In over two years of publication, only TWO persons have requested their money back. Discover why -- try an issue of The Alternate Source Programmer's Journal today! Twelve issues are $24. Published eight times annually.

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Special for 80 Micro readers!

DDSD/CMD allows automatic density recognition of both single and double density disks when using NEWDOS/80 Version 2.0, eliminating previous headaches with drive parameters. Just execute it when booting the system, and forget it! Regularly $19.95, just $10 when subscribing to TAS. Limited offer.

( ) I'll try 12 issues of TAS; enclosed is $24.
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Due to a very special purchase, American Business Computers is able to offer a limited number of Radio Shack* Expansion Interfaces at the lowest price ever.

American Business Computers guarantees Expansion Interfaces to be Brand New — with original documentation and in perfect working condition.

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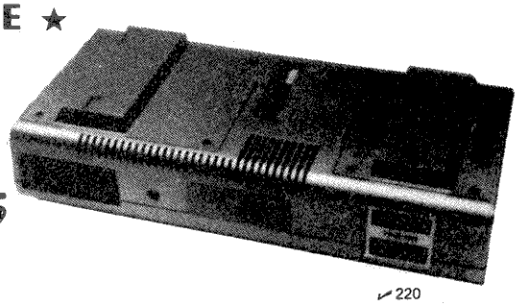

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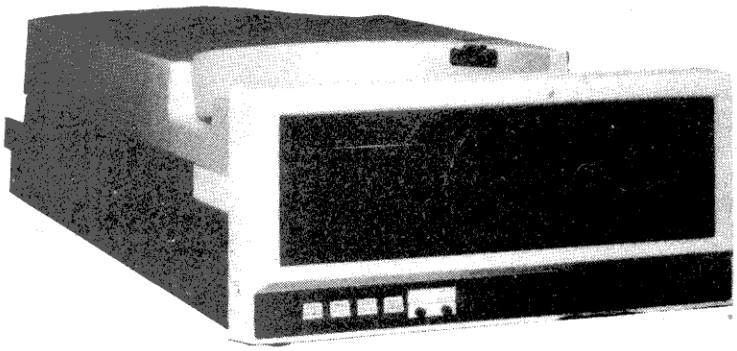
CAMEO HARD DISK DRIVES FOR TRS-80 MODEL II

The Cameo Hard Disk offers TRS-80 Model II users 10 million bytes of on-line disk storage. Five million bytes are stored on a standard non-removable disk platter. The second five million bytes are stored on a removable "disk pack". This configuration allows, for example, the accounts receivable to be stored on one disk pack, accounts payable on still another disk pack, mailing list on another, etc., etc.

The Cameo also allows up to four computers to share the same disk drive. This means one person working at one computer can be updating accounts payable, while another person working at another computer can be retrieving records from a data base. So...when your business needs soar beyond a floppy disks limitations, call AMERICAN SMALL BUSINESS COMPUTERS and ask for THE CAMEO CONNECTION.

CALL FOR PRICING INFORMATION

★ **Dealers needed for all Cameo Hard Disk Products** ★



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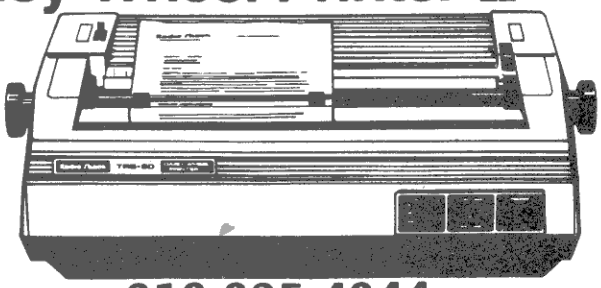
TRS-80™ Daisy Wheel Printer II

By Radio Shack

Yes, this is the **same** Daisy Wheel sold by Radio Shack for a couple of hundred bucks more. This is just one more reason why it **really** pays to shop American Small Business Computers.



$1649.95

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TRS-80™ LINE PRINTER 7

$325.00

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Program continued

```
                 03732 ;
                 03734 ;        ***************************
                 03740 ;        ***** PROMPT STRINGS *****
                 03741 ;        ***************************
                 03742 ;
45BB 52          03750 MENU     DEFM    'RAPID SYSTEM LOADER:  2000
BAUD SYSTEM TAPE CONVERSION'
45F1 0D          03760          DEFB    0DH
45F2 56          03770          DEFM    'VERSION 2.1  9/15/80 BY DAV
ID C. HEDINGER'
461B 0D          03780          DEFB    0DH
461C 0D0D        03790          DEFW    0D0DH
461E 31          03800          DEFM    '1 = LOAD A SYSTEM TAPE'
4634 0D          03810          DEFB    0DH
4635 32          03820          DEFM    '2 = WRITE A FASTLOAD COPY'
464E 0D          03830          DEFB    0DH
464F 33          03840          DEFM    '3 = RETURN TO BASIC'
4662 00          03850          DEFB    00H
4663 52          03860 MESG1    DEFM    'READY TAPE & PRESS =ENTER='

467D 00          03870          DEFB    00H
467E 45          03880 HEXDSP   DEFM    'ENTRY POINT ='
468B 00          03890          DEFB    00H
468C 4E          03900 SYSERR   DEFM    'NOT A SYSTEM TAPE : PRESS =
ENTER='
46AD 00          03910          DEFB    00
46AE 4D          03920 ERR2     DEFM    'MISPLACED TRANSFER BYTE ERR
OR'
46CB 00          03930          DEFB    00
46CC 43          03940 ERR3     DEFM    'CHECKSUM ERROR'
46DA 00          03950          DEFB    00
46DB 48          03960 MESG3    DEFM    'HOW MANY COPIES?'
46EB 0D00        03970          DEFW    000DH
46ED 52          03980 MESG5    DEFM    'READY TAPE FOR RECORD & PRE
SS =ENTER='
4712 00          03990          DEFB    00
4713 00          04000 BUFFER   DEFB    00
42E9             04010          END     SPEED
00000 TOTAL ERRORS
```

to the menu. Also press Break if an error occurs.

After readying the recorder for record mode, press 2 to make a copy. Answer the "How many copies?" prompt with a number from one to nine. Press Enter to proceed with the recording. When the menu returns to the screen, press 3 to return to Basic command mode. Rapid System Loader has just copied itself.

Load the high speed copy using the System command as usual. Again, measure the time it takes to load. There should be a significant improvement in speed. Longer programs will show more improvement. (Try EDTASM.)

Some Last Thoughts

This program has greatly increased the amount of work I can do with my computer. I am more likely to use programs that load in one minute instead of three or four. It has also curbed my urge to buy that disk drive I want so much, if only for a while. ■

MONEY BACK GUARANTEE

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- UNIVERSAL INDUSTRY ACCEPTANCE

DATA TRAC — C-10, C-20
MUSI TRAC — C-45, C-90 ✓156

HERE'S WHAT USERS SAY ABOUT YORK 10 CASSETTES:

"Excellent tape – I haven't had a bad 'CSAVE' and volume level for 'CLOAD's is consistent for all cassettes. Your tape is good enough for me to order more; enclosed is a money order for two dozen more cassettes." Robert W. Bruggemeyer, Long Beach, CA

"The quality to price ratio is very high on these cassettes – had very good luck loading programs back to the computer." Douglas Elkins, Millinocket, ME

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A program that finds errors for you!

LŌC-EDITOR

Jon Mark O'Connor
56 Eustis Parkway
Waterville, ME 04901

It is four in the morning. You have been at the keyboard 16 hours. Line 20000 just crashed again. You check the line, run it again and it crashes again. You check every letter of every word and discover you spelled Print with an M instead of an N.

> *"Lōc-Editor is a resident program to trap errors."*

Sound familiar? Lōc-Editor (see the Program Listing) is a resident program to trap errors.

```
0 ONERRORGOTO31000
20000 PRINT:PRINT:PRINT"THIS IS A TEST!!":PRINT:PRINT:PRINT:PRIN
T:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PR
INT:PRINT:PRINT:PRINT:PRIMT:PRINT:PRINT:PRINT:PRINT:A=A/0:PRINT
30999 GOTO30999
31000 CLEAR2000:DEFINTG-Z:DEFSTRB:DIMB(145):PRINT@960,"READING Y
OUR DATA";
31001 READUU$:IFUU$<>"***"THEN31001ELSECLS:PRINT@193,CHR$(95):PR
INT@256,"LOC-EDITOR":PRINT"ACTIVATED!":FORGJ=0TO145:READB(GJ):NE
XT:ZW=ERL
31002 PRINT" LINE  ......... ":BZ=STR$(ZW):XP=PEEK(16548)+PEEK(
16549)*256
31003 PRINT@402,USING"##### ";YP;:IFYP=ZWTHEN31004ELSEXP=PEEK(XP
)+PEEK(XP+1)*256:YP=PEEK(XP+2)+PEEK(XP+3)*256:GOTO31003
31004 JU=0:XP=XP+4:PRINT@448+LEN(BZ),;:FORL=XPTO(PEEK(16622)+PEE
K(16623)*256)
31005 IFPEEK(L)<128PRINTCHR$(PEEK(L));:JU=JU+1:NEXTELSEPRINTB(PE
EK(L)-128);:JU=JU+LEN(B(PEEK(L)-128)):NEXT
31006 IFPEEK(L)=0THEN31008ELSEIFPEEK(L)<>58ANDPEEK(L)<128PRINTCH
R$(PEEK(L));:KU=KU+1:L=L+1:GOTO31006
31007 IFPEEK(L)<>58PRINTB(PEEK(L)-128);:KU=KU+LEN(B(PEEK(L)-128)
):L=L+1:GOTO31006ELSEIFJU<6THENJU=0
31008 PRINT@512+JU+LEN(BZ),STRING$(KU,61):PRINTSTRING$((32-LEN(B
(122+ERR/2+1))/2),32)+B(122+ERR/2+1)
31009 PRINTTAB(20)"HIT "ABS(JU)"/ HIT SPACE BAR":PRINTSTRING$(64
,61);:PRINT@448,;:EDIT.
31010 DATA"***",END,FOR,RESET,SET,CLS,CMD,RANDOM,NEXT,DATA,INPUT
,DIM,READ,LET,GOTO,RUN,IF,RESTORE,GOSUB,RETURN,REM,STOP,ELSE,TRO
N,TROFF,DEFSTR,DEFINT,DEFSNG,DEFDBL,LINE,EDIT,ERROR,RESUME,OUT,O
N,OPEN,FIELD,GET,PUT,CLOSE,LOAD,MERGE,NAME,KILL,LSET,RSET,SAVE,S
YSTEM
31011 DATALPRINT,DEF,POKE,PRINT,CONT,LIST,LLIST,DELETE,AUTO,CLEA
R,CLOAD,CSAVE,NEW,TAB(,TO,FN,USING,VARPTR,USR,ERL,ERR,STRING$,IN
STR,POINT,TIME$,MEM,INKEY$,THEN,NOT,STEP,+,-,*,/,,AND,OR,>,=,<,S
GN,INT,ABS,FRE,INP,POS,SQR,RND,LOG,EXP,COS,SIN,TAN,ATN,PEEK,CVI
31012 DATACVS,CVD,EOF,LOC,LOF,MKI$,MKS$,MKD$,CINT,CSNG,CDBL,FIX,
LEN,STR$,VAL,ASC,CHR$,LEFT$,RIGHT$,MID$,"NEXT W/OUT FOR","SYNTAX
 ERROR","RETURN W/OUT GOSUB","OUT OF DATA","ILLEGAL FUNCTION CAL
L",OVERFLOW,"OUT OF MEMORY","UNDEFINED LINE"
31013 DATA"BAD SUBSCRIPT","REDIMENSIONED ARRAY","DIVISION BY ZER
O","ILLEGAL DIRECT","TYPE MISMATCH","OUT OF STRING SPACE","STRIN
G TOO LONG","COMPLEX STRING FORMULA","CAN'T CONTINUE","NO RESUME
","RESUME WITHOUT ERROR"
31014 DATA"UNPRINTABLE ERROR","MISSING OPERAND","BAD DATA FILE",
"L3 OR DISK BASIC ONLY"
31015 END
```

Program Listing

Best of all, Lōc-Editor displays the entire line up to and including the error. The error is underlined.

Lōc-Editor displays:

SYNTAX ERROR
HIT 144 / HIT SPACE BAR

Type 144 and hit the space bar. The cursor stops at the P in PRIMT. The whole word is treated as the error. Change M to N (you are in the Edit mode) and proceed. The process took 10 seconds.

Example

The $ has been omitted from STRING$ in the line below:

PRINT STRING (29,191)

This will be declared as a Bad Subscript. The entire statement will be underlined.

To merge Lōc-Editor, remove line zero and reinsert it after the merge. ■

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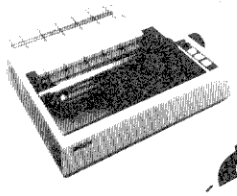

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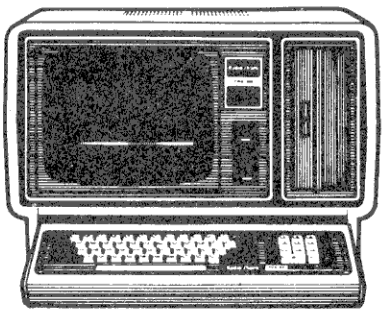

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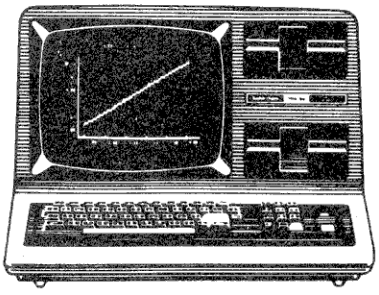

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LOAD 80

A collection of valuable subroutines.

Zubroutines

Peter Ashley
10 Clinton Street
Portland, ME 04103

Since the early days of the TRS-80, there have been many discoveries about the Model I not documented in the original Level II manual. Short routines, valuable PEEK and POKE addresses and other software tricks have slowly made their way to the TRS-80 user.

If you own a disk system and have lots of money to spend on software, tips are available in ready-to-use utility programs. A less expensive option is to build a collection of hints on scraps of paper. Now if you could only remember where you put that one showing how to disable the Break key.

What is really needed is a collection of routines the computer remembers. At the same time, the collection must be easily modified and loaded into the TRS-80 at the beginning of each computer session. Enter... *Zubroutines.*

Zubroutines

Zubroutines is a collection of about 50 short subroutines to assist you in programming for your TRS-80. Most Zubroutines are only one line long, accessed with the GOSUB command. Zubroutines can assist in writing a program or can be called from within a running program.

Zubroutines uses the concept of structured programming. Instead of rewriting program lines over and over again for formatting the screen or creating graphics, you simply call (via GOSUB) a program already in your program listing. Zubroutines also gives you an instant display of a table, such as the CHR$ codes, allowing you to stay at the keyboard.

Zubroutines sounds a little silly, doesn't it? Zubroutines is so named because the variables in its routines all contain the letter Z (Z, Z$, ZD, SZ, and so on). Just avoid the letter Z as a variable in your own main programming. This is simple to remember and will eliminate any problems brought about by conflicting variables.

Zubroutines uses about 3.5K of RAM memory. All the routines are written in Basic, although some POKE machine language and others string pack machine language. All routines are in lines 11-99. You can use lines 0-10 in your own programs for remarks and titles. Of course if you increase your collection of routines you must increase the number of lines beyond 99.

It takes less time and memory for the TRS-80 to find line numbers at the beginning of a program. Subroutines with low value line numbers are more efficient. If you use this program in conjunction with one from a magazine, it is very likely the magazine program has line numbers beginning with 10 incremented in intervals of 10. In this case it is better to relocate Zubroutines at higher line numbers. To relocate, call GOSUB 19 and renumber Zubroutines as lines 32011-32099. This renumbering process will not correct GOTO or GOSUB. Correct these by hand. If you do not need the routines containing GOTO or GOSUB your renumbering task is simple.

The following line numbers contain GOTO or GOSUB commands: 22, 47, 54, 55, 56, 58, 87, 88. It is easy to make the needed corrections. Edit the line number containing GOTO or GOSUB and prefix any line number 99 or less with 320. For example, line 22 would be edited to read 32022.

The Program

To use this new utility, first type in the program listing and make a copy or two on cassette. Every time you begin a programming session CLOAD and run Zubroutines. At this point you have POKEd 16553,255 (for ma-

The Key Box

Basic Level II
Model I
Disk System

chines with touchy ROMs), cleared 500 bytes for string routines, and issued a GOTO to line 100.

Line 100 is where you should begin programming. When you need a particular routine, issue a GOSUB to its line number. Table 1 is a list of the Zubroutines and their line numbers. Some routines require you to assign values before issuing the GOSUB. Line 20 needs a title or message assigned to Z$. Line 43 requires a value between zero and 47 assigned to ZY. Line 52 requires values for the beginning and ending addresses.

Some routines work more effectively nested in a For... Next loop.

```
110 Z=9: ZF$="POP": FOR R=1 TO 9: GOSUB 27: NEXT R
```

This flashes POP nine times. Others work better combined with additional Zubroutines.

```
110 GOSUB 28: GOSUB 18: GOSUB 33
```

This line flashes the error message and awaits an input.

The routines in line 32 and lines 80-82 are sound generating routines. For these connect the Aux cable to an audio ampli-

LINE	DESCRIPTION
11	Disable the Break key
12	Enable the Break key
13	Send the video information to the printer
14	Restore the video information to the screen
15	Send the printer information to the screen
16	Restore the printer information to the printer
17	Buzz the cassette relay
18	Jitter the screen and buzz the relay
19	Add 32000 to all the line numbers
	This does not correct GOTO or GOSUB
20	Print a title (Z$) at the top of the screen
21	Print a message (Z$) in the center of the screen
22	Print a message (ZB$) at the bottom of the screen
23	Print a message in the center of the next line
24	Clear the top line and home the Cursor
25	Start the text on a particular line (ZL)
26	Protect the text above a particular line (ZP)
27	Flash a message (ZF$) at screen location (Z)
28	Clear the screen and print an Input Error message
29	Convert all Print to LPRINT (for 16K)
	Do not use END in any program to be converted
30	Save the contents of the video screen in memory Z(ZI)
31	Recall the saved video Z(ZI) from memory to screen
32	Generate a four second audio prompt
33	Stop the program until Enter is pressed
34	Stop the program until any key is pressed
35	Clear the top half of the screen
36	Clear the bottom half of the screen
37	Clear the left half of the screen
38	Clear the right half of the screen
39	Clear a box in the center of the screen
40	White-out the screen
41	Print a line of graphic characters (ZG)
42	Print a line of alphanumeric characters (ZA$)
43	Print a horizontal line at ZY on the Y-axis
44	Print a moving horizontal line at ZY on the Y-axis
45	Print a vertical line at ZX on the X-axis
46	Print a moving vertical line at ZX on the X-axis
47	Display a chart of the graphic codes (128-191)
48	Display a chart of the PRINT@ locations
49	Delay the program for ZS seconds
50	Print the current memory size
51	Examine the memory (DEC) used by the current program
52	Examine the memory between addresses Z1 and Z2
53	Convert a decimal address into TRS-80 code (LSB,MSB)
54-59	Print a list of the codes for Basic keywords along with a table of their Entry-point addresses
61-62	Time the Input period (Z) Z$ returns the Input Value using INKEY$.
65-66	Draw a line from point A (X1,Y1) to point B (X2,Y2)
	X values must be between 0 and 127
	Y values must be between 0 and 47
76-77	LPRINT the contents of the video screen
80-82	Generate sounds, using X=USR(T)
83-88	Draw on the screen from the keyboard
90-96	Print a list of variables and their current values
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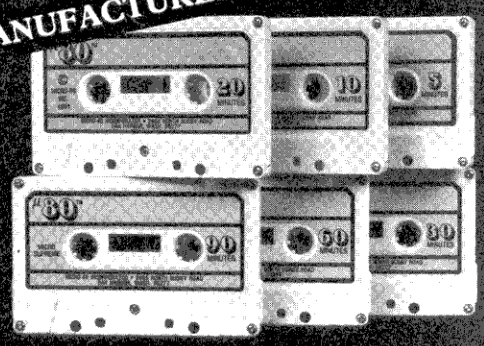

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fier. After the sound routine in lines 80–82 has been called, you can delete those lines and still have sound in your program. When you desire sound, use the statement X = USR(T). T represents the tone or frequency value; use any value between one and 255. The tones vary from the lowest frequency with T having a value of one, to the highest frequency with T having a value of 255. If you use other machine language routines in your program remember you have already assigned the USR entry address in line 82 via POKE 16526 and POKE 16527.

The drawing routine beginning in lines 83–88 uses the arrow keys to draw lines up, down, left or right. To erase a line or to move the cursor without drawing, press the space bar and the arrow key at the same time. The Clear key clears the screen at any time. To end the drawing routine press Enter. To begin drawing at a particular screen location, assign ZX a horizontal value between 0–127 and assign ZY a vertical value between 0–47 before calling this routine.

The following lines contain only the REM abbreviation: 60,63,64,67–75,78,79,89,97,98. Place your own Zubroutines in any of these lines, or delete them. Finally, if it becomes important to conserve memory for longer programs, delete the line numbers of any Zubroutines not needed in that particular program.■

Peter Ashley has been using his TRS-80 since 1978. He now has a two disk system. Other interests are photography and camping.

Program Listing

```
10 POKE 16553,255: CLEAR500: GOTO 100
11 POKE 16396,23:RETURN
12 POKE 16396,201:RETURN
13 POKE16414,141:POKE16415,5
14 POKE16414,88: POKE16415,4
15 POKE16422,88: POKE16423,4
16 POKE16422,141:POKE16423,5
17 FORZ=1TO50:OUT255,4:OUT255,0:NEXT:RETURN
18 FORZ=1TO50:OUT255,0:OUT255,15:NEXT:OUT255,PEEK(16445):RETURN
19 Z=17129:FORZZ=1TO9000:IFPEEK(Z+1)>0THENPOKEZ+3,PEEK(Z+3)+125:
Z=PEEK(Z)+256*PEEK(Z+1):NEXT
20 ZT$=STRING$((62-LEN(Z$))/2,143):PRINT@0,ZT$;" ";Z$;" ";ZT$:RE
TURN
21 ZC$=CHR$(183)+" "+Z$+" "+CHR$(187):Z=448+(64-LEN(ZC$))/2:PRIN
T@Z,ZC$;:RETURN
22 Z=960+(64-LEN(ZB$))/2:PRINT@Z,ZB$;:GOSUB26:RETURN
23 Z=(64-LEN(ZN$))/2:PRINTTAB(Z)ZN$:RETURN
24 PRINTCHR$(28);CHR$(30);CHR$(28);:RETURN
25 PRINT@64*(ZL-1),;:RETURN
26 PRINT@64*ZP,;:FORZQ=1TO(14-ZP):PRINTCHR$(255):NEXTZQ:PRINT@64
*ZP,;:RETURN
27 PRINT@Z,ZF$;:FORZD=0TO30:NEXT:PRINT@Z,STRING$(LEN(ZF$)," ");:
FORDZ=0TO30:NEXT:RETURN
28 CLS:PRINTCHR$(23):PRINT@404,"S O R R Y ,":PRINT@530,"INPUT ER
ROR.":PRINT@780,"PLEASE TRY AGAIN.":RETURN
29 FORZ=17129TO32767:IFPEEK(Z)=128 RETURNELSEIFPEEK(Z)=178THENPO
KEZ,175:NEXTZELSENEXTZ:RETURN
30 DIMZ(1024):FORZI=0TO1023:Z(ZI)=PEEK(15360+ZI):NEXT:RETURN
31 FORZI=0TO1023:POKE15360+ZI,Z(ZI):NEXT:RETURN
32 PRINT#-1,""
33 PRINTTAB(34)"PRESS <ENTER> TO CONTINUE";
34 Z9$=INKEY$:IFZ9$=""THEN 34 ELSE RETURN
35 FORZ=0TO7:PRINT@Z*64,CHR$(30);:NEXT:RETURN
36 FORZ=8TO15:PRINT@Z*64,CHR$(30);:NEXT:RETURN
37 FORZ=1TO16:PRINT@0+64*(Z-1),CHR$(223);:NEXT:RETURN
38 FORZ=1TO16:PRINT@32+64*(Z-1),CHR$(30);:NEXT:RETURN
39 FORZ=6TO8:PRINT@64*Z+16,CHR$(223);:NEXT:RETURN
40 FORZ=0TO960STEP64:PRINT@Z,STRING$(64,191);:NEXT:RETURN
41 PRINTSTRING$(64,CHR$(ZG));:RETURN
42 PRINTSTRING$(64,ZA$);:RETURN
43 FORZX=0TO127:SET(ZX,ZY):NEXT:RETURN
44 FORZX=0TO127:SET(ZX,ZY):NEXT:FORZX=0TO127STEP2:RESET(ZX,ZY):N
EXT:FORZX=0TO127:RESET(ZX,ZY):NEXT:RETURN
45 FORZY=0TO47:SET(ZX,ZY):NEXT:RETURN
46 FORZY=0TO47:SET(ZX,ZY):NEXT:FORZY=0TO47STEP2:RESET(ZX,ZY):NEX
T:FORZY=0TO47:RESET(ZX,ZY):NEXT:RETURN
47 CLS:Z$="GRAPHIC CHARACTER CODES":GOSUB20:PRINT:ZC=127:FORZ=1T
O7:FORZ1=1TO10:ZC=ZC+1:IFZC>191GOTO33ELSE PRINTZC;CHR$(ZC);:NEXT
Z1:PRINT:PRINT:NEXTZ
48 CLS:PRINT@0," 'PRINT@' LOCATIONS";:FORZ=24TO984STEP8:PRINT@Z,
Z;:NEXT:GOSUB33
49 FORZ=0TO345*ZS:NEXT:RETURN
50 PRINT"MEMORY SIZE WAS SET AT";PEEK(16561)+PEEK(16562)*256+2:R
ETURN
51 FOR Z=17129TOPEEK(16633)+256*PEEK(16634): PRINTZ;PEEK(Z),:NEX
T:RETURN
52 FOR ZA=Z1TOZ2: PRINTZA;PEEK(ZA);: NEXT: RETURN
53 INPUT"DECIMAL ADDRESS";ZA:ZN=FIX(ZA/256):ZL=ZA-(ZM*256):PRINT
ZL;"(LSB) ";ZM;"(MSB)":RETURN
54 CLS:Z$="INTERNAL CODES FOR BASIC KEYWORDS":GOSUB20:PRINT"ASCI
I";"  KEYWORD",,"DEC ENTRY","LSB";" - MSB":PRINT:Z=5712:Z$="E":F
ORZD=1TO124
55 Z=Z+1:IFPEEK(Z)<128THENZ$=Z$+CHR$(PEEK(Z)):GOTO55
56 PRINTZD+127;"   ";Z$,,:IFZD<61ZA=6176+2*ZD ELSE IFZD>87ANDZD<
124ZA=5464+2*ZD ELSE 58
57 ZB=PEEK(ZA):ZC=PEEK(ZA+1):PRINT ZB+ZC*256,ZB;ZC;
58 IFZD/10=INT(ZD/10):PRINT:PRINT:GOSUB33:ZP=2:GOSUB26
```

Program continues

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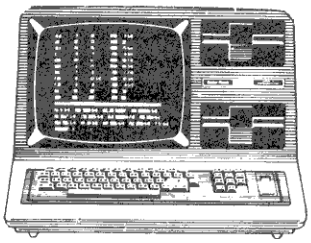

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Program continued

```
59 Z$=CHR$(PEEK(Z)-128):PRINT:NEXT
60 '
61 FORIZ=0TOZ:Z$=INKEY$:IFZ$=""THENNEXTIZELSE RETURN
62 PRINT"TIME'S UP":RETURN
63 '
64 '
65 ZX=SGN(X2-X1):ZY=SGN(Y2-Y1):IFZX=0THENFORY=Y1TOY2STEPZY:SET(X
1,Y):NEXT:RETURN
66 ZL=(Y2-Y1)/(X2-X1):Y=Y1:FORX=X1TOX2STEPZX:SET(X,Y):Y=Y+ZL*ZX:
NEXT::RETURN
67 '
68 '
69 '
70 '
71 '
72 '
73 '
74 '
75 '
76 CLEAR1500:FOR X=15360TO16359 STEP64: Z$=""
77 FORY=0TO63:Z$=Z$+CHR$(PEEK(X+Y)):NEXTY:LPRINTZ$:NEXTX:RETURN
78 '
79 '
80 DATA 205,127,10,144,140,69,62,1,211,255,16,254,69,62,2,211,25
5,16,254,13,32,239,201
81 FORZ=1TO23:READSZ:SZ$=SZ$+CHR$(SZ):NEXT
82 POKE16526,PEEK(VARPTR(SZ$)+1):POKE16527,PEEK(VARPTR(SZ$)+2):R
ETURN
83 DEFINTZ:Z=PEEK(14400)
84 IFZAND8ZY=ZY-1 ELSE IFZAND16ZY=ZY+1 ELSE IFZAND32ZX=ZX-1 ELSE
 IFZAND64ZX=ZX+1
85 IFZX>127ZX=ZX-1 ELSE IFZX<0ZX=ZX+1 ELSE IFZY>47ZY=ZY-1 ELSE I
FZY<0ZY=ZY+1
86 IFZ=2CLS ELSE IFZ=1RETURN
87 IFZ>12OSET(ZX,ZY):FORDZ=1TO1:NEXT:RESET(ZX,ZY):GOTO83
88 RESET(ZX,ZY):FORDZ=1TO1:NEXT:SET(ZX,ZY):GOTO83
89 '
90 XZ!=0:XZ%=0:XZ#=0:XZ$="":VZ!(3)=VARPTR(XZ$):VZ!(2)=VARPTR(XZ%
):VZ!(4)=VARPTR(XZ!):VZ!(8)=VARPTR(XZ#)
91 FOR NZ!=PEEK(16633)+256*PEEK(16634)TO PEEK(16635)+256*PEEK(16
636)-1:TZ!=PEEK(NZ!)
92 IF PEEK(NZ!+1)=90THEN96 ELSE PRINT CHR$(PEEK(NZ!+2));CHR$(PEE
K(NZ!+1));
93 PRINT HID$(".%$!...#",TZ!,1);" ";
94 FOR KZ!=0TOTZ!-1:POKE VZ!(TZ!)+KZ!,PEEK(NZ!+3+KZ!):NEXT
95 IF TZ!=3 PRINTXZ$,ELSE IF TZ!=2 PRINTXZ%,ELSE IF TZ!=4 PRINTX
Z!, ELSE PRINTXZ#,
96 NZ!=NZ!+TZ!+2: NEXT NZ!: PRINT: RETURN
97 '
98 '
99 FORZ=1TO3:PRINT"COPY # ";Z:CSAVE"A":FORZD=0TO2000:OUT255,20:N
EXTZD,Z
100 CLS:Z$="ZUB-ROUTINES ARE READY":GOSUB20
```


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Many TRS-80 disk routines cannot be accessed directly from Disk Basic—reading from or writing to a particular disk sector, for example, or utilizing the operating system's automatic ability to block and manage records of under 256-byte lengths (without wasting a single sector byte).

Usually, you can access the various disk I/O routines under TRSDOS and NEWDOS et al only through custom machine language programs. How convenient it would be to access them directly from a Basic program, using string variables as input buffers.

I use the following program to do just that. I have used it to read directories directly into string arrays, to set up a sophisticated data base management system, to create a custom disk editor and set up automatic copy or purge routines. Its uses are limited only by your imagination.

To run any of Table 1's routines, you must load the required information into the appropriate register and make a call to the RAM address listed on the left. Below is a list of the abbreviations I used.

Buffer A reserved area of RAM of up to 256 bytes, used to hold the contents of a sector to be read from or written to the disk.

DCB Device Control Block. For disk this is a 32-byte buffer containing the name of the file to be opened. After the file is opened it contains information to be used in managing the file.

LRL Logical Record Length. Any record length up to 256 bytes can be defined by the user. If LRL = 0, then the record length is 256.

UR A reserved area of RAM assigned by the user for records of less than 256 bytes. It is separate from the buffer and must be equal in length to the LRL.

LRN Logical Record Number. The record number used by the disk operating system to determine which record is to be written to or read from. It can be any number from 1 to 65535 and is used only to locate a record.

Let's write a program in Basic to read a particular disk sector into a buffer which we assign to the variable BF$.

Since we cannot load the registers directly from Basic, we will set up a simple machine routine for doing so. There are several ways of doing this. We can load an object file into high memory, POKE a routine into high or low memory, or use a string variable.

Since the routine we plan to use is only 17 bytes long, we'll use the string variable approach. It has the advantage of not requiring memory protection. In addition, you can insert into the string easily and quickly.

An Assembly program for loading registers and calling a particular Disk I/O routine is shown in Sample Listing 1.

The following Basic statements will set up the 17-byte routine as a string variable:

```
100 RT$ = ""
110 FOR I = 1 TO 17 : READ A : RT$ = RT$ +
    CHR$(A) : NEXT I
120 DATA 217, 3, 0, 0, 6, 0, 14, 0, 22, 0, 30, 0,
    205, 0, 0, 217, 201
```

Now all that remains is to insert the register values and buffer addresses into the string variable RT. We have initially set all the bytes in the string corresponding to these variables to a value of 00H. The following is a listing of these bytes:

Bytes 3 & 4	Address in RAM of Buffer (BF$)
Byte 6	Value to be inserted in B register
Byte 8	Value to be inserted in C register
Byte 10	Value to be inserted in D register
Byte 12	Value to be inserted in E register
Bytes 14 & 15	Address of Disk I/O Routine

From Table 1 we note that each disk routine requires different values to be loaded into the various registers. For example, to call the routine for reading a disk sector into a buffer, the HL registers must first be loaded with the address of the buffer area we have set aside; the B register must be

```
217     D9      EXX             ;SAVE REGISTERS
33,0,0  21,00,00 LD HL, BUFFER  ;LOAD BUFFER ADDR
6,0     06,00   LD B, LRL       ;LOAD LOGICAL REC LGTH
14,0    0E,00   LD, C, DRIVE    ;LOAD DRIVE #
22,0    16,00   LD D, TRACK     ;LOAD TRACK #
30,0    1E,00   LD E, SECTOR    ;LOAD SECTOR #
205,0,0 CD,00,00 CALL DISKIO    ;CALL DISK ROUTINE
217     D9      EXX             ;EXCH REGISTERS
201     C9      RET             ;RETURN
```

Sample Listing 1. Assembly Program for Loading Registers.

RAM Address	Description	Entry Information into registers
46DD	Reads a sector from disk	HL>Buffer, C>Drive, D>Track #, E>Sector #
46E6	Writes a sector to disk	Same as above
4424	Opens an existing file	HL>Buffer, DE>DCB, B>LRL
4442	Locates a particular record #	DE>DCB, BC>LRN
4436	Reads a logical record	HL>Buffer, DE>DCB
4439	Writes a logical record	Same as above
4428	Closes a file	DE>DCB
442C	Kills a file & deletes it from dir	DE>DCB

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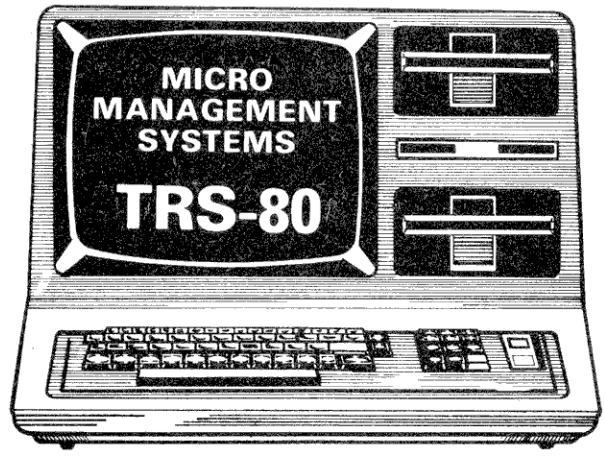

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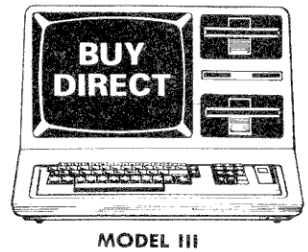

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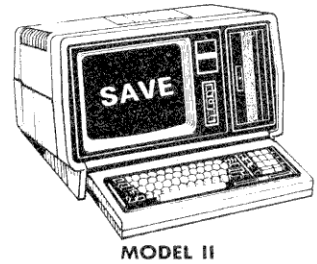

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loaded with the logical record length (LRL)—256 bytes (LRL = 0); and the C, D, and E registers must be loaded with values for the Drive, Track, and Sector numbers respectively.

After this is done, we then call the address of the Sector Read Routine (46DDH). For those NEWDOS owners, use the same addresses with the exception of the sector read and write routines. They are at the following locations:

Routine	TRSDOS	NEWDOS
Read from a disk sector	46DDH	460DH
Write to a disk sector	46E6H	4623H

To facilitate inserting the values, it is more convenient initially to assign input values to an integer array rather than directly into the RT string. We'll create the RT string after we've assigned all values. The following lines assign values to a 17-element array RT(X).

```
160 FOR I = 1 TO 17:READ RT(I):NEXT I
170 DATA 17,33,0,0,6,0,14,0,22,0,30,0,205,
    0,0,217,201
```

The following will assign 255 bytes of RAM to the variable BF$ as our buffer and insert the address of buffer into elements three and four.

```
160 BF$ = STRING$(255,32)
```

Line	Comment
100-140	Initializes the program.
150	Assigns 255 bytes of memory to buffer using the string variable BF$.
160-170	Load our machine routine into the array RT.
500-530	POKE drive number and drive bit into memory locations.
540-630	Read sectors 2-9 and load into array PR$(X).
5000-5030	Load the various addresses and register values into the RT array.
5050	Creates string variable RT$ using RT array.
5500-5540	Transfers control to the starting address of string variable RT$ that now contains our machine-language routine.

Table 2. Listing 1 Structure

```
500 RT(3) = PEEK(VARPTR (BF$) + 1)
    'LOAD LSB
510 RT(4) = PEEK(VARPTR (BF$) + 1)
    'LOAD MSB
```

The VARPTR

For those of you not familiar with the VARPTR, it is used to obtain information regarding variables stored in RAM. VARPTR (A$) returns the address to RAM where information relating to the string variable A is stored. The first byte at that address is equal to the length of A$, while bytes 2 and 3 are equal to the address in RAM where A$ begins.

Byte 2 contains the least significant byte (LSB) of the address and byte 3 the most significant byte (MSB). Line 500 above PEEKs byte 2 (LSB) and loads it into the third element of our array (RT). Line 510 does the same with byte 3 and the fourth element, respectively.

We next load the values to be inserted into registers B, C, D and E, using elements 6, 8, 10 and 12, as called for in Table 1. The value for register B is loaded into RT (6), that for register C into RT(8) and so on. Finally, we insert the address of the Disk I/O routine from Table 1 into RT (14) and RT (15).

There is one other consideration, only applicable to the reading or writing of a disk sector. The bytes located at 4308H and 4309H must be loaded with the drive number and drive bit respectively, prior to calling the disk routine. The drive bit represents the bit corresponding to the drive number.

For Drive 0, the first bit is set; for Drive 1, the second bit and so on. For Drives 0, 1, 2 and 3 the corresponding drive bit values would be 1, 2, 4 and 8. We accomplish this with the following lines:

```
610 DB = 1 : IF DR > 0 THEN DB = 2↑ DR
'SET DRIVE BIT (DB)
610 POKE (&H4308),DR : POKE (&H4309),
    DB 'POKE DRIVE # & BIT
```

After loading the address of our buffer BF$ into RT(3) and RT(4), we then load the drive number into RT(8), the track number into RT(10) and the sector number into RT(12), representing the C, D and E registers.

Now we create the RT string, which contains the routine and all values. We find (through VARPTR) the address of RT$ and transfer control to it using the USR function.

We are now ready to write our Basic program. Program Listing 1 reads a disk directory into a string array PR$(X). It assumes that the directory is located on track 17 starting at sector 0 and is 10 sectors in length. If these assumptions do not apply we can add a relatively simple routine to read the directory track number from sector 0, byte 3 and assign the value to TR.

Table 2 explains Listing 1's organization.

Line 5000 assigns the address of the disk sector read routine. TRSDOS uses 46DDH. NEWDOS uses 460DH.

The buffer we set up on line 150 reserves only 255 bytes, the maximum string length allowed under Microsoft Basic. A disk sector, however, contains 256 bytes. Under this arrangement the last byte in the sector will not be read or written to.

While not important to our directory reading program,

```
100 'PROGRAM NAME: DIRECTRD                          H. FINK   2/81
110 'PROGRAM TO READ A DISK SECTOR
120 CLEAR 5000
130 DEFINT A-Z
140 DIM RT(20),PR$(50)
150 BF$=STRING$(255,32) 'SET UP BUFFER & LOAD WITH BLANKS
160 FOR I=1 TO 17:READ RT(I):NEXT'LOAD M/L ROUTINE INTO RT ARRAY

170 DATA 217,33,0,0,6,0,14,0,22,0,30,0,205,0,0,217,201
180 '
190 '
500 CLS:PRINT:INPUT"ENTER DRIVE NO. (0-3) ";DR
510 IF DR<0 OR DR>3 THEN 500
520 IFDR<1THENDB=1:ELSEDB=2[DR 'DRIVE # BIT
530 POKE(&H4308),DR:POKE(&H4309),DB 'POKE DRIVE # & DRIVE BIT
540 K=1:TR=17 'SET UP TRACK & SECTOR VALUES
550 GOSUB5000
560 FOR SC=2 TO 9:MID$(RT$,12,1)=CHR$(SC):GOSUB 5500
570     FOR J=6 TO 240 STEP 32
580         IF ASC(MID$(BF$,J-5,1))=16 THEN PR$(K)=MID$(BF$,J,11
):K=K+1
590     NEXT J
600 NEXT SC
610 FOR I=1 TO K-1 : PRINT PR$(I);"     ";:NEXT
620 PRINT:INPUT"PRESS (ENTER) TO CONTINUE ";Z
630 GOTO100
640 '
5000 RT(14)=221:RT(15)=70: 'SECTOR READ ADDRESS
5005 'FOR nEWDOS rt(14)=13
5010 'LOAD BUFFER ADDRESS (INTO HL REGISTERS)
5020 RT(3)=PEEK(VARPTR(BF$)+1):RT(4)=PEEK(VARPTR(BF$)+2)
5030 RT(8)=DR:RT(10)=TR:RT(12)=SC 'LOAD DRIVE,TRACK,SECTOR
5040 'SET UP ROUTINE IN STRING RT$
5050 RT$="":FOR I=1 TO 17:RT$=RT$+CHR$(RT(I)):NEXTI
5060 RETURN
5500 'FIND ADDRESS OF STRING RT$
5510 M1=PEEK(VARPTR(RT$)+2)*256+PEEK(VARPTR(RT$)+1)
5520 IFM1>32767THENM1=M1-65536
5530 DEFUSR1=M1 :X=USR1(0)
5540 RETURN
```

Program Listing 1. Reads a disk directory into a string array.

Lines	Comment
100-150	Initialize programs.
160	This PEEKs high memory address at 4049H and 404AH, reduces it by 512 bytes, sets the buffer at the top of the new memory, and POKEs the new high memory value.
180	Assigns 32 bytes of memory to DCB using string variable DC$.
190	Set the logical record length to 50 bytes. LRL can be any number from 1-256 bytes. For 256 bytes, LR = 0.
200	Assigns 50 bytes of RAM to the user record buffer (UR$). It should be equal in length to LRL.
220-230	Loads the machine-language routine into array RT(X).
500-590	Input drive, filename and function.
1000-1030	Routine to read the record. After the record number is input, the program runs a subroutine at line 4030 for positioning a file and for reading at line 4050.
1100-1200	Routine to write a record to disk. Input fields are combined into one string and inserted into UR$ (user record buffer). Position and write routines (at lines 4030 and 4060) are then invoked.
4000-4070	Values are entered into the RT array required by the open, position, read, write and close routines (Table 1).
4500-4550	Addresses of various buffers are loaded into the RT array.
5000-5050	Create RT$ (containing our DOS I/O routines) and transfer control to the address of our RT$ via the USR function.

Table 3. Listing 2 Structure

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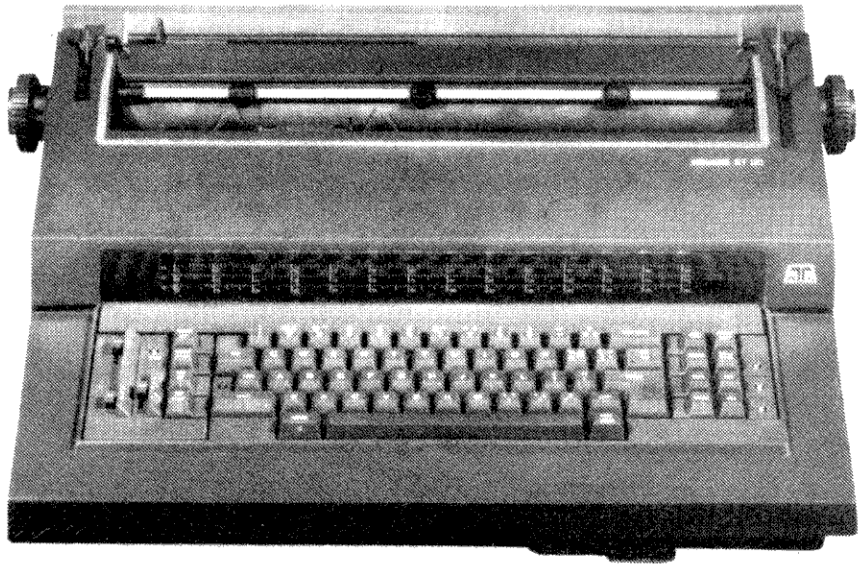

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some applications require control of all 256 bytes. To control all 256 bytes, we must forego the convenience of buffering directly into a string variable and assign a 256-byte protected area of RAM as our buffer.

I took this approach in Program Listing 2 (lines 160,170 and 4530).

We are now going to use the DOS I/O routines for file and record control. Listing 2 demonstrates the routines to open, position, read, write and close a file using a record length of up to 256 bytes. DOS will field and block our records for us automatically, and every byte within a disk sector will be used.

Any overflow from one sector will be written to the following sector, and DOS will keep track of each record location. In addition it will field the record directly into a buffer assigned by us.

From Table 1 you know that the disk file routines require a

Program Listing 2. Controls files and records.

```
100 'PROGRAM NAME: DISKRD3                          H. FINK   2/81
110 'PROGRAM TO OPEN & CLOSE A FILE & READ & WRITE A RECORD
120 'UTILIZING DOS I/O ROUTINES
130 CLEAR 1000
140 DEFINT A-Z
150 DIM RT(20)
160 M1=PEEK(&H4049): M2=PEEK(&H404A): M3=PEEK(&H4070)' MEM ?
165 'REDUCE HIGH MEMORY BY 512 BYTES AND SET NEW MEM PROTECT
170 IFM2<>M3THENM2=M2-2:POKE(&H404A),M2: POKE(&H40B2),M2: POKE(&
H4070),M2:GOTO 100
180 DC$=STRING$(32,32)  'SET UP DIR CONTROL BLOCK
190 LR=50 'SET LOGICAL RECORD LENGTH TO 50
200 UR$=STRING$(LR,32) 'SET UP USER RECORD AREA
210 T$=STRING$(LR,32)
220 FOR I=1 TO 17:READ RT(I) :NEXT 'LOAD M/L ROUTINE INTO RT ARR
AY
230 DATA 217,33,0,0,6,0,14,0,22,0,30,0,205,0,0,217,201
240 '
500 CLS :PRINT :PRINT :INPUT"ENTER DRIVE NO. (0-3) ";DR$:DR=VAL(
DR$)
510 IF DR<0 OR DR>3 THEN 500
520 INPUT"ENTER FILE NAME ";FL$:IF FL$="" THEN 520
530 FL$=FL$+":"+DR$+CHR$(13) :MID$(DC$,1,LEN(FL$))=FL$
540 GOSUB 4010:GOSUB 5000
550 INPUT"1.READ RECORD  2.WRITE RECORD  3.END (CLOSE FILE) ";S
560 ON S GOSUB 1000,1100,1300
570 IFS=1THENPRINT UR$
575 MID$(UR$,1,LR)=T$
580 PRINT :INPUT"PRESS (ENTER) TO CONTINUE ";Z
590 IF S=3 THEN 100 :ELSE 560
600 '
1000 'READ RECORD
1010 CLS :PRINT :INPUT"ENTER RECORD NO OR 999 FOR MENU ";RN
1015 IF RN=999 THEN 550
1020 GOSUB 4030 :GOSUB 5000
1030 GOSUB 4050 :GOSUB 5000 :RETURN
1040 '
1100 'WRITE RECORD
1110 CLS :PRINT :INPUT"ENTER RECORD NO OR 999 FOR MENU ";RN
1120 IF RN=999 THEN 550
1130 FOR I=1TO6 :N$(I)="":NEXT I ' CLEAR INPUT ARRAY N$
1140 INPUT"ENTER NAME ";N$(1)
1150 INPUT"ENTER ADDRESS ";N$(2)
1160 INPUT"ENTER CITY ";N$(3)
1170 INPUT"ENTER STATE ";N$(4)
1180 INPUT"ENTER ZIP ";N$(5)
1190 INPUT"ENTER TELEPHONE NO. ";N$(6)
1200 F2$="" :FOR I=1 TO 6 :F2$=F2$+N$(I)+CHR$(13) :NEXT I
1210 F2$=LEFT$(F2$,LR) :MID$(UR$,1,LEN(F2$))=F2$
1220 GOSUB 4030 :GOSUB 5000
1230 GOSUB 4060 :GOSUB 5000 :RETURN
1240 '
1300 'CLOSE FILE
1310 GOSUB 4070 :GOSUB 5000 :RETURN
1320 '
4000 'DISK I/O ROUTINES - LOAD JUMP VECTORS
4010 RT(6)=LR :RT(8)=DR 'LOAD LRL & DRIVE #
4020 GOSUB 4500 :GOSUB 4520 :RT(14)=36 :RT(15)=68 :RETURN 'OPEN
FILE
4030 RT(6)=INT(RN/256) :RT(8)=RN-RT(6)*256 'LOAD RECORD NUMBER
4040 GOSUB 4500 :RT(14)=66 :RT(15)=68 :RETURN 'POSITION FILE
4050 GOSUB 4500 :GOSUB 4540 :RT(14)=54 :RT(15)=68 :RETURN 'READ
LOGICAL RECORD
4060 GOSUB 4500 :GOSUB 4540 :RT(14)=57 :RT(15)=68 :RETURN 'WRITE
 LOGICAL REC
4070 GOSUB 4500 :RT(14)=40 :RT(15)=68 :RETURN 'CLOSE FILE
4080 '
4500 'LOAD DCB ADDRESS (INTO DE REGISTERS)
4510 RT(10)=PEEK(VARPTR(DC$)+2):RT(12)=PEEK(VARPTR(DC$)+1):RETUR
N
4520 'LOAD BUFFER ADDRESS (INTO HL REGISTERS)
4530 RT(3)=M1 :RT(4)=M2 :RETURN
4540 'LOAD USER RECORD ADDRESS (HL REGISTERS)
4550 RT(3)=PEEK(VARPTR(UR$)+1):RT(4)=PEEK(VARPTR(UR$)+2):RETURN
4560 '
5000 'CALL DISK ROUTINES
5010 RT$="" :FOR I=1 TO 17 :RT$=RT$+CHR$(RT(I)) :NEXTI
5020 M1=PEEK(VARPTR(RT$)+2)*256+PEEK(VARPTR(RT$)+1)
5030 IF M1>32767 THEN M1=M1-65536
5040 DEFUSR1=M1 :X=USR1(0)
5050 RETURN
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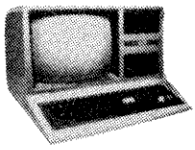

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32-byte area of memory for the Device Control Block (DCB), which we must initially load with the name of our file. Once we open the file, DOS uses the DCB area to store information necessary to manage the file.

In addition to the DCB, we must also set aside an area of memory at least equal in size to our logical record (LRL) to permit DOS automatically to field our record. You can create both these buffers by using string variables. We will use the variable DC$ as our DCB and UR$ as our user record buffer.

Listing 2 works equally well under TRSDOS, NEWDOS and NEWDOS-80 without any change of the DOS addresses. I didn't include routines to open a new file, since it is more convenient to use Disk Basic for this.

Use the following Basic statement:

```
OPEN"R",1,"FILENAME:D":CLOSE
```

Line 190 of our program sets the logical record length to 50, but you can set any value from one-256 bytes (0 = 256 bytes). The program will request drive number and filename. The file should already exist on the drive number requested. You can then read, write or end. You can switch between read and write by entering 999.

When you are finished be sure to End in order to close the file, and write end of file information (EOF) to the directory. You can examine information stored in the DCB buffer DC$ (see TRSDOS manual for details) at any point by inserting the following subroutine:

```
FOR I = 1 TO 32: PRINT I;".";ASC(MID$
(DC$,I,1)); :NEXT I
```

We have just highlighted some of the things you can do by accessing DOS I/O routines directly from Basic. You can insert these Basic subroutines in any program and they will provide you with substantially increased power, flexibility and speed in all your disk operations. ■

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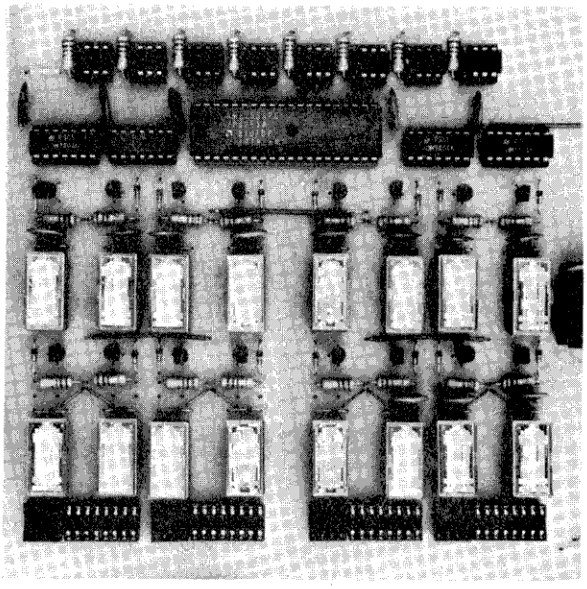

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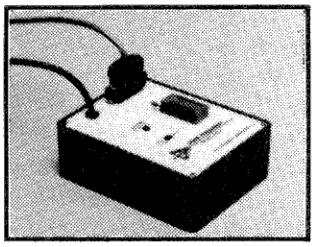

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Install the AXX3027 character generator chip.

A New Generation of Characters

Walter C. Park Sr.
4722 Robinwood Drive
Chattanooga, TN 37416

After reading John Burgan's "Lowercase Done Right" (*80 Microcomputing*, September 1981), I sent off to E.B. Garcia and Associates for an AXX3027 character generator chip. Because they no longer carried this item, I bit the bullet and ordered one from Radio Shack.

Here's the Procedure!

I received the AXX3027 character generator chip from the local Radio Shack store about a week after ordering. When I removed the plastic cover from my computer I found all 18 legs of the Z-29 solidly soldered in place on the PC board. Why couldn't it have been plugged in?

If you do not want to salvage this chip remove it by snipping the IC leads at the body of Z-29 as close as possible.

Use a soldering iron with a small point and needle nose pliers to remove each lead. Then use a round toothpick to re-establish the lead holes by heating the feed-through points where the IC leads were. Push the toothpick through and twist it until it feels stuck. This lets you know the solder has hardened. You may want to sharpen the toothpick for maximum penetration. Use the soldering iron on the trace side of the board and the toothpick on the component side. A bright light under the board lets you see what you are doing.

Install the new character generator chip where the old one was. Touch up the top side with fresh solder where traces meet the pins. Check for trace solder balls and bridges with the same light behind the board.

If you are not experienced with PC board handling and IC removal find someone who is. If you are going to salvage the old chip, use an IC de-soldering iron. Solder wicks leave enough solder to rip up traces if you are not careful. Support and handle the boards with care. If the strap connector from the keyboard to the main board is pulled loose it will be expensive to repair.

When you are removing the IC, too much iron heat can lift the traces. A 115 V wall plug-in iron can blow several ICs on the board if you are working on a metal desk. Battery irons are my first choice on any PC application for the home computer modifier. Work with a towel under the unit on a wood work table, use a PC board vise if you have one and stand on a rubber mat. Keep a 100 percent cotton rag handy to keep the soldering iron tip clean.

To Switch Or Not To Switch

John Burgan did not install an uppercase/lowercase control switch—I wondered why not.

I installed the Electric Pencil modification several years ago and had left the switch in lowercase on shut-down the night I finished installing the new character generator chip. When I powered-up the next day and was inputting some basic code I noticed I wasn't getting those wierd hieroglyphics. Changing the switch from lowercase to uppercase and back gave no results.

It seems there are two sets of characters in this chip. If I call a graphic with the U/L switch in lowercase, for example PRINT CHR$(191) (all pixels on), I get the graphics. I get uppercase without a driver and upper/lowercase with the driver.

I was running a basic coded program and noticed that it did not like lowercase code (the lowercase driver was active) input from the keyboard. My computer gives me uppercase characters, with the shift key. If the lowercase driver is inactive all is normal. This showed me I did not need the external switch with the AX3027 character generator IC.

Now I can edit quicker and scanning text is a pleasure with proper characters. Before, typographical and spelling errors would slip by because of high "a"s and descenders that did not descend. ■

Walter Park is a micro systems analyst and programmer as well as a technical writer.

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- All Ø's in address labels are replaced by easier to read 0's.
- All labels optionally support an "Attn:" line.
- Many user defined fields with plenty of options for **simultaneous** purging and selecting...even allows for inequalities...powerful and easy to use!!
- Continuous display of numbers of labels/envelopes printed.
- Each disk entry automatically "remembers" how many mailings have been made for that particular entry...Can be tied in with purge/select.
- Primarily written in BASIC for easy modification... embedded machine code for those speed sensitive areas.
- Editing is simple and fast...automatic search.
- Supports the 9 digit zip code.
- Deleted entries have "holes" on disk filled automatically ...and alph. order is still maintained!
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```
SSSSSSSS  TTTTTTTT  OOOOOOOO  PPPPPPPP          LL      OOOOOOOO  OOOOOOOO  KK    KK
SS    SS  TTTTTTTT  OO    OO  PP    PP          LL      OO    OO  OO    OO  KK  KK
SS        TTT       OO    OO  PP    PP          LL      OO    OO  OO    OO  KK KK
SSSSSSSS  TTT       OO    OO  PPPPPPPP  ========LL      OO    OO  OO    OO  KKKK
SSSSSSSS  TTT       OO    OO  PPPPPPPP          LL      OO    OO  OO    OO  KKKK
      SS  TTT       OO    OO  PP                LL      OO    OO  OO    OO  KK KK
SS    SS  TTT       OO    OO  PP                LL      OO    OO  OO    OO  KK  KK
SSSSSSSS  TTT       OOOOOOOO  PP                LLLLLLLL  OOOOOOOO  OOOOOOOO  KK    KK
```

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Sample Sort Times

8 sec. for 1000 dbl. prec. numbers...50 sec. for 5000 integers. (Ours is one of the only alphabetizers that both ignores non alph. characters and treats upper and lower case alike.) ✓ 63

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Test your memory—amaze your friends.

Computer Repeat

Randolph A. Fontenot
734 Choctaw Dr.
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Your video flashes a continuous stream of random characters. You anticipate each letter and then a new one is added. A question mark appears and suddenly you are in control. You carefully type in a duplicate of the stream of letters you have just seen. The display clears and you discover you've mastered another level of skillfulness. You're winning Computer-Repeat!

Those of you familiar with a variety of hand-held electronic games will recognize the nature of this one. Computer-Repeat is designed to test your skill and memory. The hand-held version has been popular with both children and adults for the past couple of years. But, why go out and pay $20 or more when you can simulate this game on your TRS-80?

The program listing is only 29 lines and merits a little explanation.

Line Description

Lines 90–180 print the instructions for Computer-Repeat. The user is given the choice of seeing the instructions or starting the game.

Lines 190–200 get a skill level from the user and set the length of the winning sequence accordingly.

Line 210 initializes the screen for playing the game.

Line 220 starts the game.

Line 230 gets a random letter and adds it to the computer's sequence of letters.

Lines 240–290 print the computer's sequence one letter at a time. You are allowed sufficient time to see the letter before the next one is shown.

Lines 300–340 prompt the user to repeat the computer's sequence. The letters are accepted through an INKEY$ routine hiding the letters the user is typing. This prevents the user from making associations between the positions of the letters.

Line 350 decides whether to continue play or to print a losing message.

Line 360 prints a winning message if the game has been successfully completed.

Line 370 asks the user whether to start a new game or quit.

User Modifications

A few changes may add to your enjoyment of this game.

You can speed up the computer's speed sequence by changing line 260. Change the number 500 to any more suitable value. Increasing the value will increase the time between the appearance of the letters in the sequence.

Or, for a more interesting effect, change line 260 to

```
260 FOR X = 1 to 1000 STEP LEN(MY$):
NEXT X
```

This will begin printing the first few characters slowly, but will increase the speed greatly as the length of the computer's sequence grows.

To print both upper- and

```
10 '*************************************************
20 '**                                             **
30 '**  COMPUTER-REPEAT FOR LEVEL 2 TRS-80         **
40 '**  BY RANDOLPH FONTENOT    JAN 1981           **
50 '**  734 CHOCTAW DRIVE                          **
60 '**  OPELOUSAS, LA 70570                        **
70 '**                                             **
80 '*************************************************
90 CLEAR150:INPUT"DO YOU WANT INSTRUCTIONS, Y/N";A$
100 IF A$<>"Y"THEN190
110 CLS:PRINT@16,"INSTRUCTIONS FOR COMPUTER-REPEAT":PRINT
120 PRINT"   COMPUTER-REPEAT IS A GAME OF SKILL AND MEMORY.  YOU WILL BE"
130 PRINT"SHOWN A SEQUENCE OF RANDOM LETTERS AT THE CENTER OF THE SCREEN."
140 PRINT"WHEN THE QUESTION MARK APPEARS, CAREFULLY REPEAT THE SEQUENCE"
150 PRINT"OF LETTERS."
160 PRINT"   IT IS A REAL CHALLENGE TO WIN AT SKILL LEVEL 5!  GOOD LUCK!":PRINT
170 INPUT"ARE YOU READY TO ACCEPT THE CHALLENGE OF COMPUTER-REPEAT, Y/N";A$:IF A$=
180 INPUT "PRESS <ENTER> WHEN READY";A$
190 INPUT"ENTER SKILL LEVEL, 1-5";SL:MY$=""
200 IF SL=1,N=4 ELSEIF SL=2,N=8 ELSEIF SL=3,N=16 ELSEIF SL=4,N=32 ELSEIF SL=5,N=64
210 CLS:PRINTCHR$(23):PRINT@16,"COMPUTER-REPEAT":PRINT@470,"==>   <=="
220 FORI=1TON
230   L=RND(25)+65:MY$=MY$+CHR$(L)
240   FOR Z=1TO LEN(MY$)
250     PRINT@478,MID$(MY$,Z,1)
260     FORX=1TO500:NEXTX
270     PRINT@478," "
280     FORX=1TO50:NEXTX
290   NEXTZ
300   PRINT@478,"?":YOUR$=""
310   FORX=1TO LEN(MY$)
320     Y$=INKEY$:IFY$=""THEN320
330     YOUR$=YOUR$+Y$
340   NEXTX
350 IF MY$=YOUR$ THEN NEXTI ELSE CLS:PRINTCHR$(23):PRINT`448,"YOU LOSE AT SKILL LE
360 CLS:PRINTCHR$(23):PRINT@448,"YOU WIN AT SKILL LEVEL ";SL:PRINT"CONGRATULATIONS
370 INPUT"PLAY AGAIN, Y/N";A$:IF A$="Y" THENGOTO190ELSE CLS:END
```

Program Listing

I	Counter
L	ASCII code of random letter
N	Length of winning sequence
SL	User's skill level
X	Counter
A$	Multi-purpose string variable
MY$	Computer's sequence of letters
Y$	Used to build user's sequence
YOUR$	User's sequence of letters

Computer-Repeat Variable List

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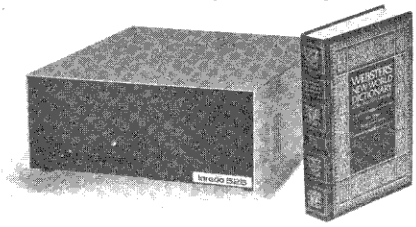

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✓ 256

lowercase letters, change line 230 to

```
230 RANDOM:L1 = RND(2):L = RND(26)
:IF L1 = 1 THEN L = L + 64 ELSE L =
L + 96:MY$ = MY$ + CHR$(L)
```

To expand playing beyond the 64 letters of skill level five requires one of two possible changes. Either change the values assigned to the variable N in line 200 or add new skill levels to that line.

To add a new skill level make the following changes:

- Change Line 200 to:

```
200 IF SL = 1,N = 4 ELSE IF ELSE IF
SL = 2,N = 8 ELSE IF SL = 3, N = 16
SL = 4, N = 32 ELSE IF SL = 5,N = 64
ELSE IF SL = 6,N = 28 ELSE GOTO 190
```

Remember to end this line with ELSE GOTO 190. It is an error handling feature.

- Change the value of the bytes to be cleared in line 90. That value should be set slightly higher than twice the largest number set equal to N in line 200. Thus, using the above example, you should clear about 275 bytes.
- Change line 190 to show the user the new range of skill levels:

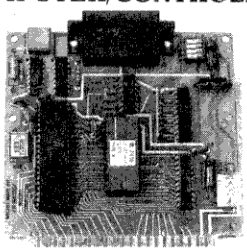
```
190 INPUT"ENTER SKILL LEVEL,
1-6";SL:MY$ = ""
```

Follow this same procedure to add additional skill levels.

My program does not require the user to retype the computer's sequence of letters within a certain time period. That is because the program uses the very efficient INKEY$ function to get the sequence from the user. It is possible to add a timer within the keyboard scan loop, but I don't recommend it because the extra statements within the loop will cut down its efficiency. I will leave it up to you to find an efficient timer routine for lines 310–340.

Though this is a game, its underlying purpose is important. It will improve your memory skills and make you more familiar with your keyboard. So enjoy Computer-Repeat and have fun. ■

Z8 BASIC COMPUTER/CONTROLLER



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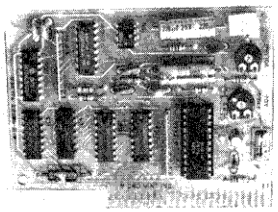

As Featured In Byte Magazine, September 1981

- Utilizes VOTRAX SC-01A speech synthesizer chip.
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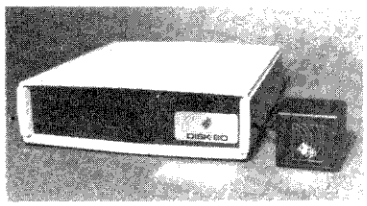

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If I discover once more that after having loaded a five-minute tape that I must reload it because I neglected to set the correct memory size, I might easily throw my keyboard at the wall. Deciding that there must be a better way, I discovered how to utilize machine language programs in Basic programs without using two tapes or even worrying about setting memory size.

Storing Machine Language Programs

The secret to this pocket miracle is to store the machine language routine as a string array and then jump to the actual location of the address in the array to execute the program. Thankfully there are only a few points you have to watch in order to avoid all your variables falling over each other.

First, let me explain how to store machine language programs as string arrays. For an example, let's use one of the sound modules (Program Listing 1) that Dennis Kitsz provided in his Babybeep article (April 1980, *80 Microcomputing*). Fig. 1 is the hexadecimal values converted to decimal; this conversion is essential because Level II Basic can utilize decimal numbers only. Program Listing 2 illustrates how the data is formed into a string by defining each byte of data with the CHR$() function.

Initially, you may feel that in order to define this string you are committed to a rather substantial memory allotment; remember that Basic stores all its resident commands as a single byte. So although "CHR$()" uses five screen locations, it is only occupying one byte in memory. Even though an additional two bytes of memory is still required for each machine command (one for the closing parenthesis and one for the plus sign) it is a small price to pay for the convenience.

As the input buffer in the computer's memory can only accommodate 255 characters, in this example it was necessary to use two program lines to fully construct the array. (You can use as many lines as you need as long as you don't exceed the maximum string length, but we will cover that later.) We must add together the string of data we already have formed in line 110 with the remaining data in line 120 by stipulating that A$ is equal to what A$ is already, as well as the additional data that follows. You are probably familiar with how this works from alphabetic string use; if the first line of a program says A$ = Fish and the next line says A$ = A$ + And Chips then A$ will now equal Fish And Chips.

Ignorance Is Bliss

Try typing in the two lines in Program Listing 2, run it and then type PRINT A$. Even though the traditional use for strings is the storage of alphanumeric data, the computer cannot tell what is and what isn't. What you see on the screen is the TRS-80's rather futile attempt to display a machine language program.

We use the machine language program via the VARPTR function, which identifies the actual memory location of any variable in a Basic program. Program Listing 3 shows exactly how we extract the required address location information and pass this to the USR function of Level II Basic, which requires that the least and most significant bytes of the routine's location be POKEd into locations 16526 and 16527 respectively.

After that's done it is a simple matter of calling the USR subroutine. The program then determines the current location of A$ (which now holds our complete machine language program) and then it jumps to that location (Program Listing 4). Note that you have to use the Clear function to reserve enough room in memory for your string requirements. Load and run it. To hear the program load you must plug the microphone jack from the computer into an external amplifier or put your tape recorder in the record mode and plug an earphone or speaker into the earphone plug.

Now that you understand the procedure, I want to underline some important points: Although you needn't dimension the array at the very beginning of your program, you must dimension it before you execute the subroutine it carries.

When transferring the address of the array to the USR function (as in Program Listing 3), you must not dimension any new arrays until after you have returned from execution of the machine language subroutine. That goes for redefinition of existing arrays as well. The reason for this is that the Basic interpreter constantly shifts the location of variables around in memory. Redefining an existing array may well result in the machine language subroutine being relocated in memory. If that happens after you have identified the location of the program and transferred this address to the USR function, invoking the USR call could well put you into a no-man's land of program bugs and crashes. So if

HEX VALUE:	0E	08	06	C0	3A	3D	40	E6	FD
DECIMAL VALUE:	14	08	06	192	58	61	64	230	253
	C6	02	D3	FF	D6	02	D3	FF	C5
	198	02	211	255	214	02	211	255	197
	10	FE	C1	10	F2	0D	79	F6	00
	16	254	193	16	242	13	121	246	00
	20	EA	C9						
	32	234	201						

Fig. 1. Hexadecimal to Decimal

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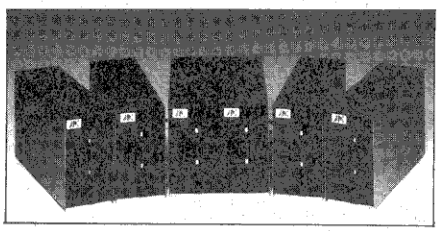

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```
                                                FIRST EXECUTABLE BYTE

HEX VALUE: 21  34  23  FA  CE  02  3A  3E  28  02  FE  . . .
BYTE NO.    0   1   2   3   4   5   6   7   8   9  10
```

Fig. 2. Transfer of Program Execution

```
                    LOCATION OF CALL COMMAND
                        LSB OF DESTINATION ADDRESS        DUMMY
                            MSB OF DESTINATION ADDRESS    ADDRESS
                                                    JUMP TO HERE

HEX VALUE:  3E  CD  00  00  FE  0A  84  . . .  42  53  21  12
BYTE NO.     0   1   2   3   4   5   6  . . .  56  57  58  59
```

Fig. 3. Non-relative Jumps

```
Original Code:

HEX VALUE: 3A   4C   32  . . .  4B   32   3E   06   4A   AE
BYTE NO.    0    1    2  . . . 251  252  253  254  255  256

----------

Separate Code:

HEX VALUE: 3A   4C   32  . . .  4B   32   +   C3   00   00
BYTE NO:    0    1    2  . . . 251  252       253  254  255

                                                add unconditional
                                                jump command

HEX VALUE: 3E   06   4A   AE
BYTE NO:    0    1    2    3      new byte sequence
```

Figure 4

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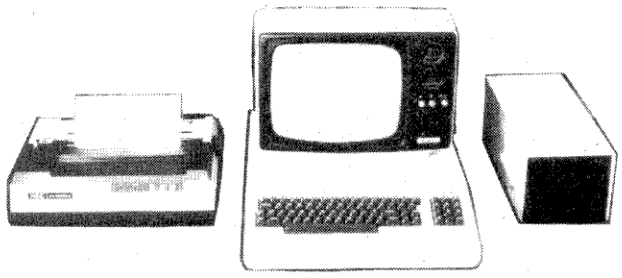

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at all possible, and there will be exceptions, keep the address transfer and the USR call as close together as possible.

Going Further

As mentioned previously, the Basic interpreter takes care of ensuring enough space for our machine language program through its regular housekeeping chores. It does this by moving our array around in memory to accommodate the changes in the length of other arrays and variables in other parts of our Basic program. However, this can be the source of many problems if we aren't careful about the type of commands we use in our machine language subroutines. The above method for storing machine programs as strings works only if the proposed machine language subroutine you want to use meets all of the following requirements:

- The first executable instruction is the first character of the array.
- It uses only relative jumps.
- It uses no subroutines.
- It is less than 255 bytes long.
- It has no requirements for storage of data, i.e., its length will not change.

There are ways, however, of getting around all of the above restrictions, so let's tear down the walls one by one. Things may get a little confusing for those of you without Assembly or machine language programming experience. If you are unfamiliar with machine code it would be wise to stick with programs that meet the above criteria.

First Things First

If for some reason execution of your machine program cannot start with the first byte, you merely have to calculate the offset and add this to the address you will be transferring to the USR

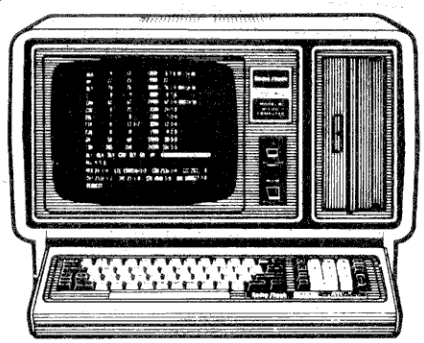
```
                00100 ;*****************************************
                00110 ;
                00120 ;        FIRST MODULE: RISING GLISSANDO
                00130 ;                 FROM "BABYBEEP"
                00140 ;                 BY DENNIS KITSZ
                00150 ;
                00160 ;       FROM 80 MICROCOMPUTING MAGAZINE
                00170 ;                  APRIL 1980
                00180 ;
                00190 ;*****************************************
0000            00200 ORG  0000H      ;CODE IS RELOCATABLE
0000 0E08       00210 LD   C,08H      ;NUMBER OF ZIPS
0002 06C0       00220 LD   B,0C0H     ;SPEED AND FREQUENCY
0004 3A3D40     00230 LD   A,(403DH)  ;GET CASSETTE STATUS BYTE
0007 E6FD       00240 AND  0FDH       ;SAVE MOTOR STATUS
0009 C602       00250 ADD  A,02H      ;ADD TONE VALUE
000B D3FF       00260 OUT  (0FFH),A   ;OUTPUT TO CASSETTE PORT
000D D602       00270 SUB  02H        ;ADJUST TONE VALUE
000F D3FF       00280 OUT  (0FFH),A   ;OUTPUT TO CASSETTE PORT
0011 C5         00290 PUSH BC         ;SAVE REGISTER PAIR
0012 10FE       00300 DJNZ $-00H      ;COUNT OFF FREQUENCY
0014 C1         00310 POP  BC         ;RESTORE REGISTER PAIR
0015 10F2       00320 DJNZ $-0CH      ;REPEAT IF NOT ZERO
0017 0D         00330 DEC  C          ;DECREMENT ZIP COUNT
0018 79         00340 LD   A,C        ;TEST FOR ZIP COUNT
0019 F600       00350 OR   00H        ;IF IT IS NOT ZERO
001B 20EA       00360 JR   NZ,$-14H   ;THEN REPEAT SEQUENCE
001D C9         00370 RET             ;RETURN TO BASIC
0000            00380 END
00000 TOTAL ERRORS

==========================================================
```

Program Listing 1. Babybeep Sound Module

```
100 CLEAR 80
110 A$=CHR$(14)+CHR$(8)+CHR$(6)+CHR$(192)+CHR$(58)+CHR$(61)+
      CHR$(64)+CHR$(230)+CHR$(253)+CHR$(198)+CHR$(2)+
      CHR$(211)+CHR$(255)+CHR$(214)+CHR$(2)+CHR$(211)+
      CHR$(255)+CHR$(197)+CHR$(16)MKS$CHR$(254)
120 A$=A$+CHR$(193)+CHR$(16)+CHR$(242)+CHR$(13)+CHR$(121)+
      CHR$(246)+CHR$(0)+CHR$(32)+CHR$(234)+CHR$(201)
```

Program Listing 2. Data Strings



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function. Fig. 2 shows a hypothetical example of a machine language program that begins execution with the sixth byte. Program Listing 5 shows how to translate this requirement and pass the correct starting address to the USR function. This approach is quite useful for machine language subroutines that have a number of entry points.

If your subroutine has an absolute jump, necessitated by a subroutine call or something of that nature, you must adjust the relevant address bytes in the routine before you execute it. Fig. 3 indicates the offender (an unconditional subroutine call) and the address bytes that follow. You may use any address value here as it serves only as a dummy address that is changed by the Basic program. Fig. 3 also indicates where the program is supposed to branch with the subroutine call in order to effect proper program flow.

Program Listing 6 sorts everything out. Variable C1 is the starting address of the machine language program added to the byte number of the least significant byte in the call instruction. When calculating byte numbers always start the count at zero. The variable D1 is a calculation of the exact destination address of the subroutine call and is calculated by taking the machine language program's address value and adding to it the byte number of the first byte of the subroutine (in this case 56). This address is broken down into a two-byte composite address (line 140) and POKEd into the locations immediately following the subroutine call, replacing the dummy address we had installed previously.

If your program is 256 bytes long, Fig. 4 is an illustration of a 259-byte program. The first thing that must be done with an oversize program is to break it up into lengths that are no longer than 252 bytes each, because Level II Basic restricts strings to a length of 255 characters and you must put an unconditional jump at the end of each string in order to redirect the program flow to the next string where the remainder of the program is found. As it takes three bytes for an unconditional jump, this brings you to the maximum al-

```
130 POKE 16526,PEEK(VARPTR(A$)+1)
140 POKE 16527,PEEK(VARPTR(A$)+2)
```

Program Listing 3. Transfer the string address to USR

```
100 CLEAR 80
110 A$=CHR$(14)+CHR$(8)+CHR$(6)+CHR$(192)+CHR$(58)+CHR$(61)+
      CHR$(64)+CHR$(230)+CHR$(253)+CHR$(198)+CHR$(2)+
      CHR$(211)+CHR$(255)+CHR$(214)+CHR$(2)+CHR$(211)+
      CHR$(255)+CHR$(197)+CHR$(16)+CHR$(254)
      CHR$(193)+CHR$(16)+CHR$(242)+CHR$(13)+CHR$(121)
120 A$=A$+CHR$(193)+CHR$(16)+CHR$(242)+CHR$(13)+CHR$(121)+
      CHR$(246)+CHR$(0)+CHR$(32)+CHR$(234)+CHR$(201)
130 POKE 16526,PEEK(VARPTR(A$)+1)
140 POKE 16527,PEEK(VARPTR(A$)+2)
150 A=USR(B)
160 GOTO 150
```

Program Listing 4. Basic Program

```
100 B1=PEEK(VARPTR(A$)+1)
110 B1=B1+(PEEK(VARPTR(A$)+2)*256)
120 B1=B1+6  -- byte number of first executable byte
130 B2=FIX(B1/256)
140 POKE 16526,B1-(B2*256)
150 POKE 16527,B2
```

Program Listing 5

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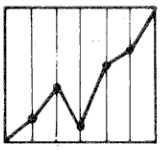

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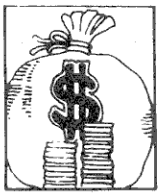

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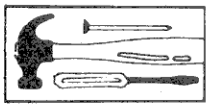

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lowable (252 + 3 = 255) character string. Be sure, too, that you are breaking up the strings at the completion of valid commands. In other words, you can't insert the required jump after only one byte of what would otherwise be a two-byte instruction.

After you have separated your program into these code sections of no more than 255 bytes, you must add the hex code C3 at the end of each one, followed by two bytes of zero. These dummy address bytes will be completed by the Basic program at run-time. It is also essential to count how many bytes in from the beginning of each section the first zero byte of each dummy address is located. Assign each string a different variable name and define each one separately as was shown in Program Listing 2.

Program Listing 7 makes it work. The first and second strings have been assigned the variables of A$ and B$ respectively. Lines 100 and 110 calculate the memory location of B$, lines 120 and 130 calculate the location of A$. Line 140 assigns the variable E1 to the address value of the least significant dummy address byte of the unconditional jump instruction at the end of A$. Line 150 determines the most significant byte value of the B$ address and lines 160 and 170 POKE this address into the last two locations of the A$, thereby replacing the existing dummy address bytes. Subsequent to this procedure it is still necessary to initialize the USR function by transferring the address of A$ to the USR function as in Fig. 1. (Ensure that no relative jumps result in the program flow leaving the string it is currently executing in; these jumps must be changed to absolute instructions.)

The most complex arrangement that you would encounter is a non-relative jump between portions of your machine language program that are in different strings. The same sort of dynamic relocation that was required in the last example is necessary here. If your machine language program is calling a subroutine resident in another Basic string it will be necessary for you to calculate the location of the string the subroutine is in as well as its relative location within that string. The addition of these two values determines its location at run-time. It is then necessary to break up the address into a two-byte address pair that must be POKEd into the existing address bytes of your machine language subroutine call.

I hope the material presented here allows you to incorporate your machine language routines directly into your Basic programs; and hopefully I'll never have to answer the Memory Size question again. If any of you encounter difficulties, I would be more than happy to answer your questions. ■

```
100 B1=PEEK(VARPTR(A$)+1)
110 B1=B1+(PEEK(VARPTR(A$)+2)*256)
120 C1=B1+2
130 D1=B1+56
140 D2=FIX(D2/256)
150 POKE C1,D1-(D2*256)
160 POKE C1+1,D2
```

Program Listing 6

```
100 D1=PEEK(VARPTR(B$)+1)
110 D1=D1+(PEEK(VARPTR(B$)+2)*256)
120 C1=PEEK(VARPTR(A$)+1)
130 C1=C1+PEEK(VARPTR(A$+2)*256)
140 E1=C1+254  --byte number of the LSB of the Jump command
150 D2=FIX(D1/256)
160 POKE E1,D1-(D2*256)
170 POKE E1+1,D2
```

Program Listing 7

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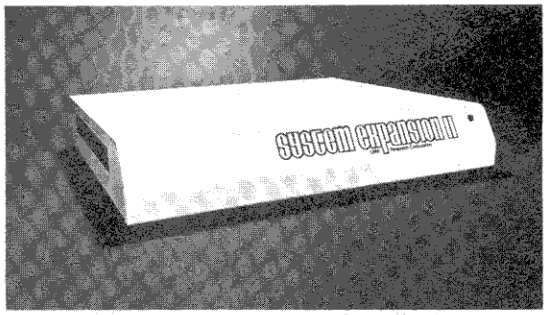

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Save Basic programs in SYSTEM format.

SYSTEMized Basic

Greg Browne
1515 Jefferson
Alamogordo, NM 88310

After reading a review of Dennis Kitsz' KEEPIT program, I really liked the idea of saving my Basic programs in the System format with or without variables. I set out to write a short program that can do some of the things that KEEPIT does. What I wanted to do was save the part of RAM dedicated to Basic and take a few addresses from that part of RAM and save the memory between those addresses. The System tape format is shown in Table 1.

Program Notes

The successful operation of this program (see Program Listing 1) depends on the use of two unpublished ROM routines and knowing the location of dedicated RAM. It may not work on the new ROM and will not work on the Model III. If you have a different ROM chip find your equivalent areas and routines and modify my program to work on your system. The program is patched to the disk command Save, so if you are already using that for a patch, substitute one of the alternate patches included in Listing 1. The locations of these jump vectors may not be the same in other ROM's.

The program asks for a file name to use and then saves in one 256-byte block the portion of RAM holding the information Basic needs to function. The program then extracts some of those same addresses and saves the memory from the start of Basic to the end of the program, from the start of the simple variables to the end of the array variables, and from the bottom of the assigned string space actually in use to the top of memory. All this is done in the largest blocks possible for the System command to read later. The program ignores the unused space from the end of the array table to the beginning of assigned string space actually in use. This shortens recording time.

Operating Notes

Set the memory size to 32550 before you load the System tape. The Basic version in Program Listing 2 will set its own memory size. If you relocate the routine, be sure to change the values in the memory sizing line or, if you prefer, you can remove it entirely and set the size on power-up. However, be sure to enter only one command patch. If you enter all the listed patch lines, they will jump you to the program.

After you load the system tape, hit the Break key. The Basic version sets itself up automatically. The program provides a new command (Save, in my case) which is then available for use.

Saving Programs

If you want to save a Basic program, first decide whether you want to save the variables with the program. If you do not want to Save them, issue a Clear command just before you save a program. This will erase Basic's memory of the variable tables and cause Saver to save only the dedicated RAM and the main body of the program. If you want to save your program with variables intact, the program must have a logical breakpoint from which you can use the Continue command, or at least a line you can go to without destroying variables. If this condition is met, you are ready to save the program; once the variables are in place hit the Break key. When Ready appears on the screen, type Save. The Saver program will request a filename, and then save your program with all existing variables as they were when you hit the Break key.

When you issue the Save command, you will be asked for a filename. At this point, the Break key is still active and will let you abort the process without hurting the program. Hitting the Break key returns you to the Ready message. If you want to save the program, enter the filename that you want to use to load the program later. The filename must start with an alphabetic character and be from one to six characters long. When your tape is ready to record, enter your chosen filename. When recording is complete, you will be returned to the Ready message and you can continue or go to a line.

Loading a Saved Program

Use the System command to load a program you have saved with the Saver program. Answer

The Key Box

Basic Level II
Model I
16K RAM

the first *? prompt with the name you assigned the tape when you saved it. Your program loads like any other System tape and returns you to the second *? prompt character. At this point, hit Break and return to the Ready message. You will now have the option to use or erase the variables you saved. If you do not want to use the previously saved variables, then Run will erase them.

If you forget to hit Break after loading your System tape, the Enter command will get you to Ready, but the Continue command will then produce a ?CN ERROR message. You must then go to the desired point. If you have the Saver program in place, you can then save this program any time.

The Saver program is very useful during the development and testing of a program. At almost any stage, I can save a copy of a program, and if it blows up later, I can reload the Saver program and continue at an intermediate development point rather than having to start over. I also frequently use the Saver program in conjunction with my Basic text editor. Using Saver is a quicker, easier way to save text files than the normal Input# and Print# statement method. That method uses long leaders and transfers very limited amounts of data with each leader. The extra time taken to save the body of the program is usually less than the time used writing all those leaders. The Saver method doesn't require any special processing to allow storage of strings containing commas and colons. ■

Greg Browne is a 34-year old C.P.A. He is an avid hobby and business micro- and minicomputer user.

Hex Value	Purpose
00	Leader of 256 zeroes
A5	Sync byte
55	System format identifier
XX XX XX XX XX XX	Filename padded with blanks
Repeated	(As necessary to contain all data)
3C	Data header
YY	Data block size byte 0 = 256 bytes
LSB	Least significant byte of load address
MSB	Most significant byte of load address
XX XX XX	Data to be loaded total of YY bytes
CC	Checksum total of load address and data
78	End of data indicator
LSB	Least significant byte of entry address
MSB	Most significant byte of entry address

Table 1. System tape format for TRS-80.

Program Listing 1. Basic version.

```
10 CLS :
   POKE 16561 , 37 : POKE 16562 , 127 :
   CLEAR 50 : DEFINT A-Z

20 REM - Patches to BASIC commands as indicated
   ******************************************

30 POKE 16800 , 195 : POKE 16801 , 39 : POKE 16802 , 127
   REM - SAVE command patch

35 POKE 16782 , 195 : POKE 16783 , 39 : POKE 16784 , 127
   REM - NAME command patch

40 POKE 16803 , 195 : POKE 16804 , 39 : POKE 16805 , 127
   REM - LINE command patch
```

Program Listing 1 Continues

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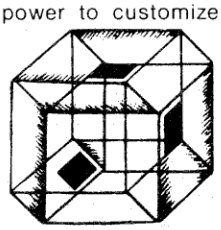

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Program Listing 1 Continued

```
50 POKE 16779 , 195 : POKE 16780 , 39 : POKE 16781 , 127
   REM - MERGE command patch

60 POKE 16770 , 195 : POKE 16771 , 39 : POKE 16772 , 127
   REM - PUT command patch

65 REM - Short loop to READ and POKE machine
         language routine from DATA statements
   ****************************************

70 FOR ADDRESS = 32551 TO 32766 :
   READ BYTE : POKE ADDRESS , BYTE :
   NEXT ADDRESS :
   NEW

990 REM - DATA statements containing machine
          language subroutine for POKE loop
   ****************************************

1000 DATA 217,8,42,164,64,237,91,253,64,35,35,223,40,86,43,43,
          235,205,164,127,237,83,147,127,205,201,127,56,71,175,
          205,18,2,205,132,2,6,7,33,149,127,205,190,127,33,65,
          64,6,0,205,170,127,121,205,100

1010 DATA 2,42,164,64,237,91,147,127,205,227,127,42,214,64,235,
          42,177,64,223,40,9,205,164,127,42,214,64,205,227,127,
          62,120,205,100,2,62,25,205,100,2,62,26,205,100,2,205,
          248,1,8,217,195,25,26,0
1020 DATA 0,85,255,255,255,255,255,255,13,78,65,77,69,32,62,0,
          229,237,82,235,225,201,62,60,205,100,2,120,205,100,2,
          125,132,79,125,205,100,2,124,205,100,2,121,134,79,
          126,35,205,100,2,16,246,201,33

1030 DATA 156,127,205,167,40,33,150,127,6,6,62,32,119,35,16,
          252,33,150,127,175,6,6,195,217,5,122,183,40,12,6,0,
          205,170,127,121,205,100,2,21,24,240,123,183,200,67,
          205,170,127,121,205,100,2,201
```

Program Listing 2. Machine language versions.

```
                00100 ;*************************************
                00110 ;*      SAVER                        *
                00120 ;*      BY - GREG BROWNE             *
                00130 ;*                                   *
                00140 ;*      A MACHINE LANGUAGE PROGRAM   *
                00150 ;*      TO SAVE BASIC PROGRAMS       *
                00160 ;*      WITH OR WITHOUT VARIABLES    *
                00170 ;*      IN SYSTEM FORMAT             *
                00180 ;*************************************
                00190 ;****
                00200 ;****
                00210 ;****   BASIC COMMAND PATCH
                00220 ;****
41A0            00230 SAVE    EQU     41A0H
418E            00240 NAME    EQU     418EH
41A3            00250 LINE    EQU     41A3H
418B            00260 MERGE   EQU     418BH
4182            00270 PUT     EQU     4182H
                00280 ;****
41A0            00290         ORG     SAVE            ;CHOOSE FROM
 LIST ABOVE
41A0 C3277F     00300         JP      SAVER           ;SET UP JUMP
 TO PROGRAM
                00310 ;****
                00320 ;****   MAIN PROGRAM
                00330 ;****
7F27            00340         ORG     32551           ;SET FOR YOU
R SYSTEM
7F27 D9         00350 SAVER   EXX                     ;SAVE REGIST
ERS BY USING
7F28 08         00360         EX      AF,AF'          ;  ALTERNATE
S FOR THIS
7F29 2AA440     00370         LD      HL,(BASICP)     ;START OF BA
SIC HERE
7F2C ED5BFD40   00380         LD      DE,(FRESPC)     ;START OF FR
EE SPACE
7F30 23         00390         INC     HL              ;MOVE START
OF BASIC UP
7F31 23         00400         INC     HL              ; AND COMPAR
E WITH FREE
7F32 DF         00410         RST     18H             ;  SPACE - Z
 = NO PROGRAM
7F33 2857       00420         JR      Z,ERROR         ;ERROR IF NO
 PROGRAM
7F35 2B         00430         DEC     HL              ;MOVE BACK T
O START OF
7F36 2B         00440         DEC     HL              ; BASIC IF N
O ERROR
7F37 EB         00450         EX      DE,HL           ;GET BIGGER
# IN  HL
7F38 CDCA57F    00460         CALL    GETNBR          ;GO GET # OF
 BYTES IN DE
7F3B ED53947F   00470         LD      (PGLEN),DE      ;SAVE PROGRA
M+VARIABLE
                00480                                 ; TABLE LENG
TH
7F3F CDCA7F     00490         CALL    GETNAM          ;GET A FILEN
AME
7F42 3848       00500         JR      C,ERROR         ;IF C = SET,

 BREAK PUSHED
7F44 AF         00510         XOR     A               ;START WITH
A=0
7F45 CD1202     00520         CALL    DEFINE          ;DEFINE DRIV
E (0) AND
7F48 CD8402     00530         CALL    LEADER          ; WRITE LEAD
ER AND SYNC
7F4B 0607       00540         LD      B,7             ;SET # BYTES
```

Program Listing 2 Continues

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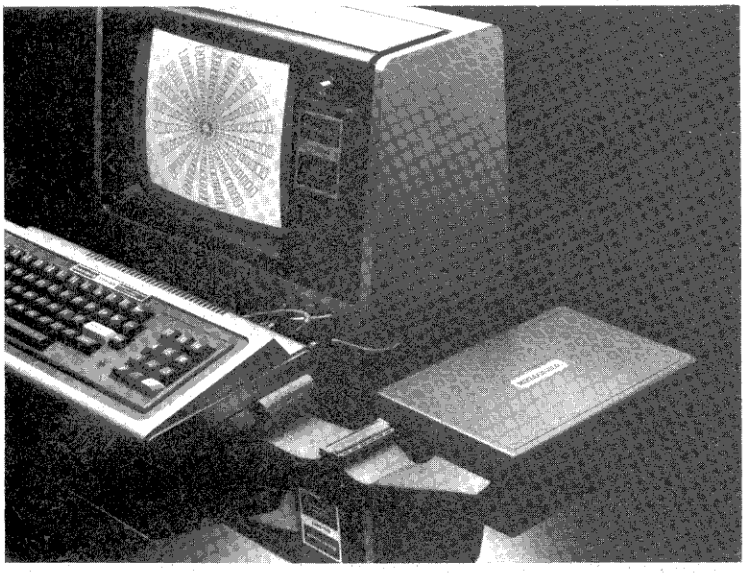

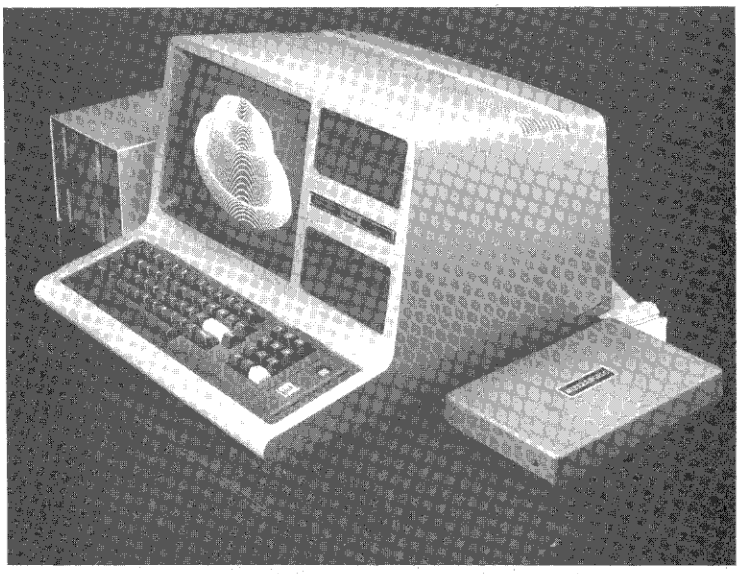

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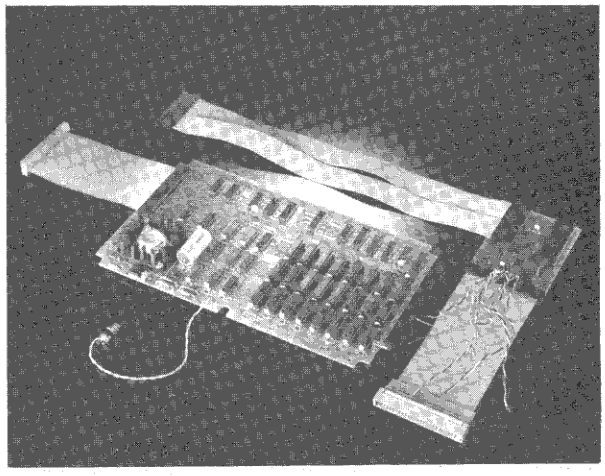

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Program Listing 2 Continued

```
 TO WRITE
7F4D 21967F   00550          LD      HL,TITLE-1      ;POINT TO WH
ERE-1
7F50 CDBF7F   00560          CALL    NOTHER          ;WRITE THE F
ILENAME
7F53 214140   00570          LD      HL,DDCRAM       ;POINT TO DE
DICATED RAM
7F56 0600     00580          LD      B,0             ;SET # TO WR
ITE (256)
7F58 CDAB7F   00590          CALL    BLKWR           ;WRITE THE B
LOCK
7F5B 79       00600          LD      A,C             ;RETRIEVE TH
E CHECKSUM
7F5C CD6402   00610          CALL    BYTOUT          ; AND WRITE
IT, TOO.
7F5F 2AA440   00620          LD      HL,(BASICP)     ;POINT TO PR
OGRAM BODY
7F62 ED5B947F 00630          LD      DE,(PGLEN)      ;RETRIEVE WR
ITE LENGTH
7F66 CDE47F   00640          CALL    LOOP1           ;CALL MULTIB
LOCK WRITER
7F69 ED5BD640 00650          LD      DE,(STRSPC)     ;POINT TO NE
XT AVAILABLE
              00660                                  ; STRING SPA
CE
7F6D 2AB140   00670          LD      HL,(MEMTOP)     ;POINT TO TO
P OF MEMORY
7F70 DF       00680          RST     18H             ;COMPARE THE
M - IF Z
7F71 280A     00690          JR      Z,DONE          ; NO STRINGS
 TO WRITE
7F73 CDA57F   00700          CALL    GETNBR          ;IF NZ THEN
GET HOW MANY
7F76 2AD640   00710          LD      HL,(STRSPC)     ;POINT TO ST
ART OF STRING
7F79 23       00720          INC     HL              ; SPACE WITH
 THIS INC
7F7A CDE47F   00730          CALL    LOOP1           ;CALL MULTIB
LOCK WRITER
7F7D 3E78     00740 DONE     LD      A,78H           ;GET END-O-D
ATA INDICATOR
7F7F CD6402   00750          CALL    BYTOUT          ; AND WRITE
IT
7F82 3E19     00760          LD      A,19H           ;SET UP ENTR
Y ADDRESS
7F84 CD6402   00770          CALL    BYTOUT          ; AS THE NOR
MAL
7F87 3E1A     00780          LD      A,1AH           ;  JUMP TO B
ASIC
7F89 CD6402   00790          CALL    BYTOUT          ;   FOR INSU
RANCE
7F8C CDF801   00800 ERROR    CALL    CASOFF          ;TURN OFF TH
E CASSETTE
7F8F 08       00810          EX      AF,AF'          ;RESTORE THE
 ORIGINAL
7F90 D9       00820          EXX                     ;  REGISTER
VALUES
7F91 C3191A   00830          JP      1A19H           ;AND BACK TO
 WORK
              00840 ;****
              00850 ;****    A LITTLE STORAGE SPACE
              00860 ;****    AND A PROMPT OR SO
              00870 ;****
7F94 0000     00880 PGLEN    DEFW    0               ;PROGRAM+VAR
IABLE LENGTH
              00890                                  ; TEMPORARY
STORAGE
7F96 55       00900          DEFB    55H             ;SYSTEM HEAD
ER BYTE
0006          00910 TITLE    DEFS    6               ;SPACE FOR F
ILENAME
7F9D 0D       00920 MSG      DEFB    13              ;PROMPT MESS
AGE
7F9E 4E       00930          DEFM    'NAME >'        ; REALLY ORI
GINAL LOOKING
7FA4 00       00940          DEFB    0               ;VIDEO ROUTI
NE NEEDS THIS
              00950 ;
              00960 ;****    SUBROUTINE TO DETERMINE NUMBER
              00970 ;****    OF BYTES TO BE WRITTEN TO TAPE
              00980 ;
7FA5 E5       00990 GETNBR   PUSH    HL              ;SAVE START
LOCATION
7FA6 ED52     01000          SBC     HL,DE           ;GET DIFFERE
NCE
7FA8 EB       01010          EX      DE,HL           ;PUT IT INTO
  DE
7FA9 E1       01020          POP     HL              ;RESTORE STA
RT LOCATION
7FAA C9       01030          RET                     ;BACK TO WOR
K
              01040 ;****
              01050 ;****    SUBROUTINE TO WRITE A BLOCK
              01060 ;****    IN SYSTEM FORMAT AND ACCUMULATE
              01070 ;****    A CHECKSUM (TO BE WRITTEN LATER)
              01080 ;****
              01090 ;****            ENTER WITH B = # OF BYTES TO
 WRITE
              01100 ;****                     HL= POINTER TO ST
ART OF BLOCK
              01110 ;****
7FAB 3E3C     01120 BLKWR    LD      A,3CH           ;GET DATA HE
ADER
7FAD CD6402   01130          CALL    BYTOUT          ;   WRITE IT
 TO TAPE
7FB0 78       01140          LD      A,B             ;GET # OF BY
TES
7FB1 CD6402   01150          CALL    BYTOUT          ;   WRITE IT
, TOO.
7FB4 7D       01160          LD      A,L             ;START CHECK
SUM BY
7FB5 84       01170          ADD     A,H             ; ADDING ADD
RESS BYTES
7FB6 4F       01180          LD      C,A             ;  AND SAVIN
G IN  'C'
```

Program Listing 2 Continues

Program Listing 2 Continued

```
7FB7 7D         01190          LD      A,L             ;SAVE LOAD A
DDRESS NEXT,
7FB8 CD6402     01200          CALL    BYTOUT          ; WRITING LS
B FIRST AND
7FBB 7C         01210          LD      A,H             ;  THEN WRIT
ING THE MSB
7FBC CD6402     01220          CALL    BYTOUT          ;   H=MSB
L=LSB
                01230 ;****
                01240 ;****    ALTERNATE ENTRY USED TO WRITE FILENA
ME
                01250 ;****    AND SYSTEM FORMAT TAPE HEADER
                01260 ;****
7FBF 79         01270 NOTHER   LD      A,C             ;UPDATE CHEC
KSUM BY
7FC0 86         01280          ADD     A,(HL)          ; ADDING NEX
T BYTE
7FC1 4F         01290          LD      C,A             ;  AND SAVIN
G RESULT
7FC2 7E         01300          LD      A,(HL)          ;NOW, GET BY
TE TO WRITE
7FC3 23         01310          INC     HL              ; POINT TO N
EXT BYTE
7FC4 CD6402     01320          CALL    BYTOUT          ;  AND WRITE
 THIS ONE
7FC7 10F6       01330          DJNZ    NOTHER          ;DO IT AGAIN
 UNTIL B=0
7FC9 C9         01340          RET                     ;ON TO BETTE
R THINGS
                01350 ;****
                01360 ;****    THIS SUBROUTINE ISSUES A PROMPT,
                01370 ;****     CLEARS OUT THE FILENAME AREA,
                01380 ;****    AND ACCEPTS A NEW FILENAME
                01390 ;****
7FCA 219D7F     01400 GETNAM   LD      HL,MSG          ;POINT TO NA
ME> PROMPT
7FCD CDA728     01410          CALL    MSGOUT          ; AND PRINT
IT ON SCREEN
7FD0 21977F     01420          LD      HL,TITLE        ;POINT TO FI
LENAME BUFFER
7FD3 0606       01430          LD      B,6             ;CLEAR OLD N
AME BY
7FD5 3E20       01440          LD      A,20H           ; FILLING TH
E BUFFER
7FD7 77         01450 BLANK    LD      (HL),A          ;  WITH SIX
BLANKS
7FD8 23         01460          INC     HL              ;   MOVE UP
TO NEXT BYTE
7FD9 10FC       01470          DJNZ    BLANK           ;    KEEP DO
ING TILL DONE
7FDB 21977F     01480          LD      HL,TITLE        ;POINT TO IN
PUT BUFFER
7FDE AF         01490          XOR     A               ;CLEAR ACCUM
ULATOR
7FDF 0606       01500          LD      B,6             ;SET MAXIMUM
 ACCEPT
7FE1 C3D905     01510          JP      5D9H            ;JUMP TO INP
UT (ENDS
                01520                                  ; IN A RET I
NSTRUCTION)
                01530 ;****
                01540 ;****    SUBROUTINE TO WRITE A SERIES OF
                01550 ;****    256 BYTE BLOCKS UNTIL A SPECIFIC
                01560 ;****    LENGTH OF MEMORY HAS BEEN WRITTEN
                01570 ;****
                01580 ;****            DE = TOTAL BYTES TO WRITE
                01590 ;****            HL = POINTER TO WHERE TO STA
RT
                01600 ;****
7FE4 7A         01610 LOOP1    LD      A,D             ;D = NUMBER
OF FULL
7FE5 B7         01620          OR      A               ;     BLOCKS
 TO WRITE
7FE6 280C       01630          JR      Z,LAST1         ;  0 = ONLY
PARTIAL LEFT
7FE8 0600       01640          LD      B,0             ;SET BYTES T
O 256
7FEA CDAB7F     01650          CALL    BLKWR           ;WRITE A WHO
LE BLOCK
7FED 79         01660          LD      A,C             ;GET THAT CH
ECKSUM
7FEE CD6402     01670          CALL    BYTOUT          ;  AND WRITE
 IT, TOO.
7FF1 15         01680          DEC     D               ;DECR FULL B
LOCK COUNT
7FF2 18F0       01690          JR      LOOP1           ;  AND SEE I
F WE GO AGAIN
7FF4 7B         01700 LAST1    LD      A,E             ;GET # OF BY
TES LEFT
7FF5 B7         01710          OR      A               ;CHECK IN CA
SE IT IS 0
7FF6 C8         01720          RET     Z               ; AND QUIT I
F IT IS
7FF7 43         01730          LD      B,E             ;OTHERWISE S
ET HOW MANY
7FF8 CDAB7F     01740          CALL    BLKWR           ; AND DO A B
LOCK OF THEM
7FFB 79         01750          LD      A,C             ;GET THE CHE
CKSUM AND
7FFC C36402     01760          JP      BYTOUT          ;JUMP TO WRI
TER (SAVE A
                01770                                  ; BYTE WITH
NO EXTRA RET)
                01780 ;****
                01790 ;****    ROM MEMORY LOCATION EQUIVALENTS
                01800 ;****
40A4            01810 BASICP   EQU     40A4H
40FD            01820 FRESPC   EQU     40FDH
40D6            01830 STRSPC   EQU     40D6H
40B1            01840 MEMTOP   EQU     40B1H
4041            01850 DDCRAM   EQU     4041H
01F8            01860 CASOFF   EQU     1F8H
0212            01870 DEFINE   EQU     212H
0264            01880 BYTOUT   EQU     264H
0284            01890 LEADER   EQU     284H
28A7            01900 MSGOUT   EQU     28A7H
1A19            01910          END     1A19H
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  ROI: 51%
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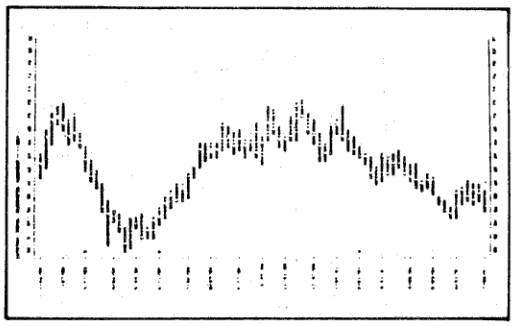
  3 BUY/SELL signals
  ROI: 40%
- Storage Tech.-5/18/80 to 6/22/81
  3 BUY/SELL signals
  ROI: 111%



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What the documentation didn't tell you.

Using Test1A

Claude T. Moultrie, Jr.
5105 Sherman Drive
Box 92802
The Colony, TX 75056

One of the best memory tests available for the TRS-80 Model I, TEST1A/CMD, comes as a freebie with Radio Shack's TRSDOS 2.3 operating system. Two problems with this test reduce its usefulness. This article describes some undocumented control commands that are a part of the test and shows how to use the test with operating systems other than TRSDOS.

The Key Box

Model I
TRSDOS 2.3

Hidden Commands

TEST1A/CMD is normally completely automatic. As soon as it loads, it tests the Basic ROM and proceeds to a series of tests of RAM memory. At the beginning of each test, two hex digits are printed on the screen; if all goes well, this happens 32 times. The series ends with a message to hit Enter. When you do, the system will reboot.

This automatic sequence is fine if there are no memory problems. But if a memory problem is detected, the screen fills with error messages indicating the memory address where the problem was detected, the byte written, and the byte actually read. The memory chips that would produce that error are then listed.

There is, however, a problem with the error messages: They fly by on the screen so fast that it is impossible to read them. The author of the program provided a way to halt the error messages for reading and then to continue them when ready. Unfortunately, Radio Shack neglected to document this feature. Three keys will affect execution of the test, greatly enhancing its usefulness. (See Table 1.)

Using TEST1A with Other Operating Systems

TEST1A will work with NEWDOS 2.1, but not with NEWDOS80 or with LDOS. It interferes with the keyboard debounce routines of these operating systems. Also it will not work if you or your operating system place a keyboard or video driver in high memory. It will test through any high memory driver and, when it tries to use the keyboard or video, funny things will happen.

The solution to all of these problems is relatively simple. Restore the ROM keyboard and video driver addresses to the vector locations in the keyboard and video DCB's before execution of the test. Most operating systems offer a way to turn off the keyboard debounce and to suppress the loading of special high memory drivers. This is usually done by holding down a key or keys when the system is booted up. Check the documentation for your operating system to determine the exact method. Boot your operating system using the specified method, and you should be able to use TEST1A.

While this method will work, it can be very frustrating. When your computer is acting strangely and you want to do a memory test, you are probably not in the mood to have to remember a special booting sequence.

A better method is to modify the program to take care of the keyboard and video problem before it begins testing. To do this, just add the 15 bytes of code in Program Listing 1 to the end of the program. This appendage will restore the ROM keyboard and video driver addresses to the vector locations in the DCB's, and then jump to the normal start of the program to begin execution. The appended program will now work with TRSDOS as well as with other operating systems.

KEY	FUNCTION
H	Halt text execution. Only recognized during printing to screen (hex digits or error message).
C	Continue test execution. Use after H to resume test or error messages.
E	Exit test. The "Press Enter to Continue" message will appear. Enter will return to DOS. Only recognized during printing to screen (hex digits or error message).

Note: Since H and E are only recognized during printing to screen you must hold the key down until printing occurs for the key to have effect.

Table 1. TEST1A Commands

You can use Debug to add the 15-byte appendage. Be sure to save the modified program under a new name so it is not confused with the original. The procedure for producing the modified program is:

- Load TEST1A/CMD into memory without execution (use the DOS Load command).
- Execute Debug.
- Use Debug's modify memory command (M) to add the appendage.
- Return to DOS at 402DH (G 402D).
- Use the DOS Dump command to save the modified program to disk. The start address for the dump is 63F0H, the end address is 67FFH, and the transfer address (where to begin execution) is 67F0H.

Now you can run the test whenever needed, without using a special booting procedure. ■

```
                00100 ;  Listing 1
                00110 ;
                00120 ;
                00130 ;  Appendage to Radio Shack's TEST1A/CMD
                00140 ;  to restore the Basic ROM keyboard and
                00150 ;  video drivers before test execution.
                00160 ;
67F0            00170 ;  ORG  67F0H
                00180 ;
67F0 21E303     00190    LD   HL,03E3H    ;ROM KBD driver address
67F3 221640     00200    LD   (4016H),HL  ; to keyboard DCB.
67F6 215804     00210    LD   HL,0458H    ;ROM video driver address
67F9 221E40     00220    LD   (401EH),HL  ; to video DCB.
67FC C3F063     00230    JP   63F0H       ;Go to start of TEST1A.
0000            00240    END
00000 Total errors
```

Program Listing 1

"TOO MUCH" FOR RADIO SHACK!

Radio Shack REFUSED to include MISADVENTURE #1 in their SOURCEBOOK due to our description of the game!

#0201 Misadventure #1 [Madam Rosa's Massage Parlor]
#0202 Misadventure #2 [Wet T-Shirt Contest]
#0301 Dohne' Bugg [Adventure-Decoder]

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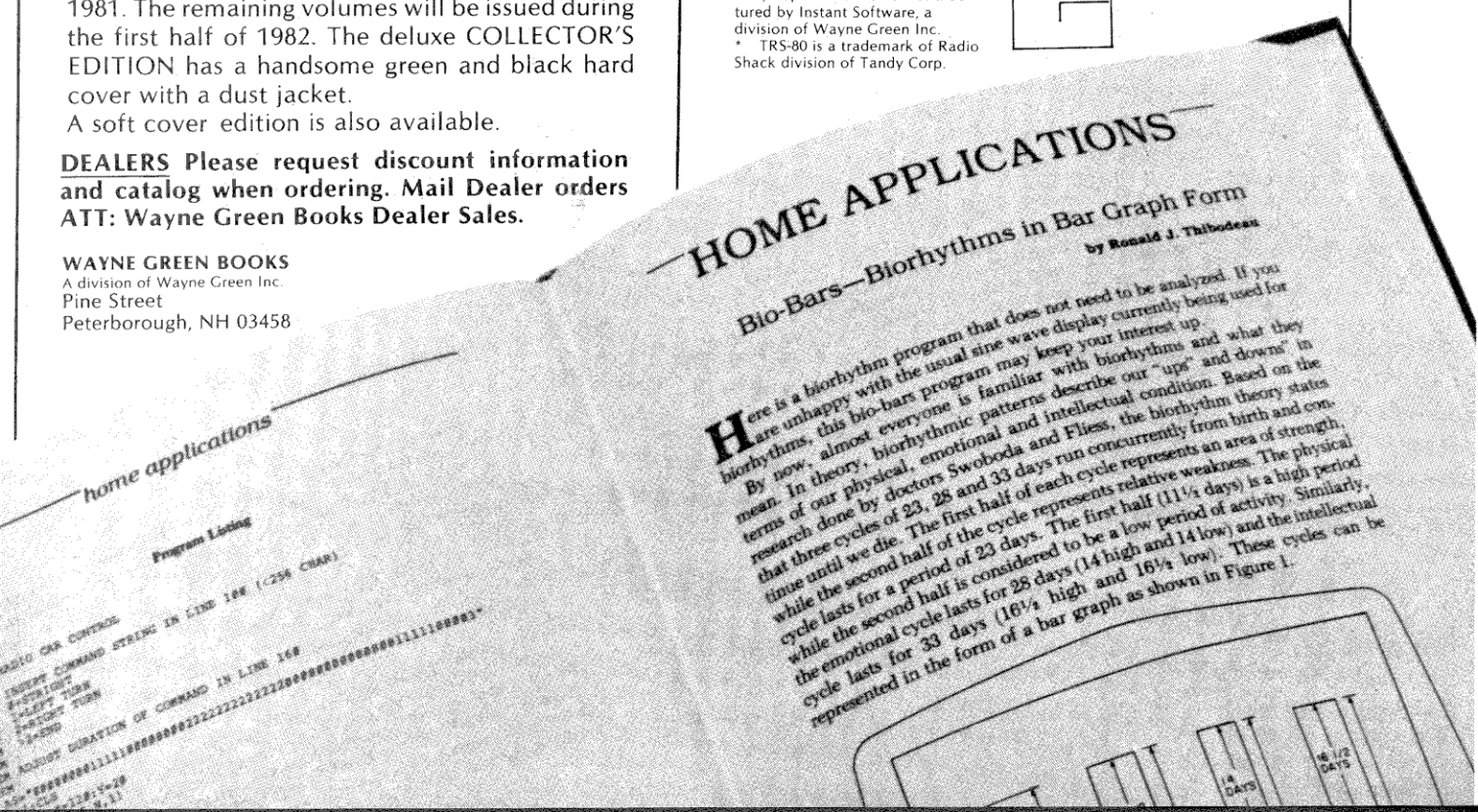

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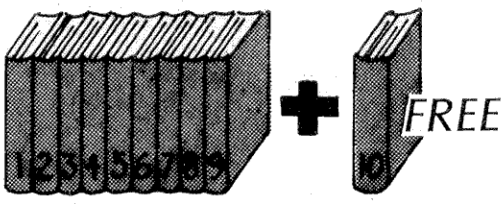

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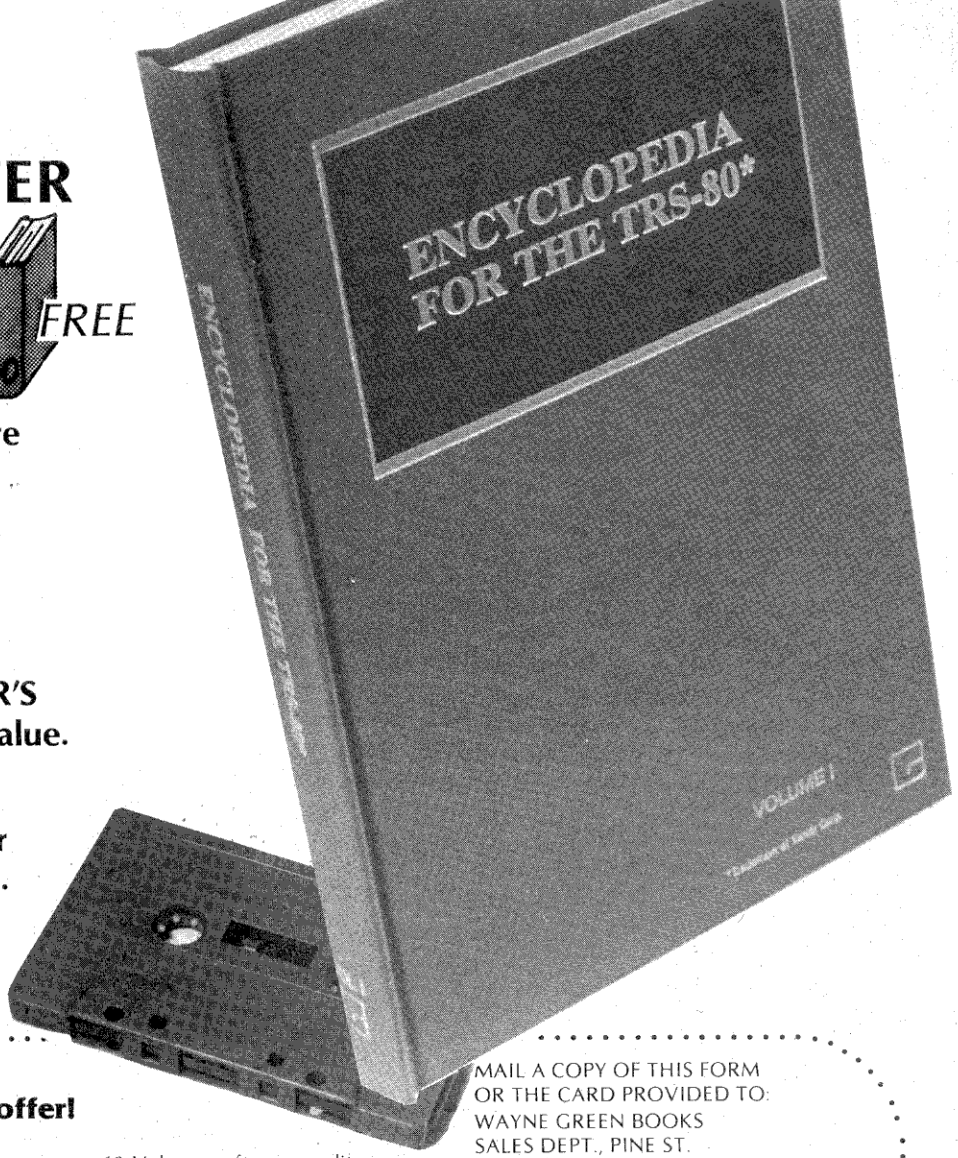

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Get direct access to machine-language routines.

Command Interpreter

Roger C. Alford
2633 Braeburn Circle
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I recently wrote some assembly routines for my TRS-80 allowing me to use it as a terminal, a device controller, and an interval timer; a small machine language monitor allows me to view and change memory locations. I placed these routines in ROM, but had to keep a small sheet of paper listing the routine entry addresses near my computer. I entered the desired routines using the System command, but found this method inconvenient and error-prone. I wanted to enter a direct command such as Terminal to enter terminal mode, or Monitor to enter the machine language monitor. By carefully studying the Level II line input routine I created my own commands. These commands allow direct access to any machine language routine.

Line Input Routine

The Level II line input routine begins at location 05D9H. When it is called, the buffer beginning address (the area of memory where the characters are stored as they are entered) must be in the Z80's HL register pair; the maximum number of characters allowed must be in the B register. The routine immediately pushes the HL pair onto the stack, and pops it back into the HL register pair before returning from the line input routine. The portion of the program that gets a character ends with a jump to the routine whose address is in locations 4016H-4017H. These locations hold the address of the keyboard driver routine (normally 03E3H), generally where the keyboard interception is made for key-debounce routines, including KBFIX.

When the line input routine jumps to the keyboard driver routine, the stack holds the key information for the command interpreter. The top of the stack holds the address of a routine at location 03DDH. This routine restores the DE, IX, HL, and BC register pairs by popping them off the stack and is executed following the return from the keyboard driver routine. When the routine at 03DDH is finished it returns control to the line input routine call point.

The HL register pair holds the address where the next character is to be stored. When a character is retrieved from the keyboard driver routine it is placed at the location pointed to by HL. The C register holds the maximum number of characters allowed in the input line (normally 240). The B register originally holds this same number, but is decremented after each character. At the end of the line input routine, the B register contains the total number of characters entered (C minus B).

I call my command interpreter routine Cmdint. The Program Listing is a sample; choose your own commands and your own command service routines. I include a few commands for demonstration. Use your imagination to create commands for your own needs.

How It Works

The initialization sequence, executed only once, stores the keyboard driver routine address from locations 4016H-4017H in an unused area of memory (in non-disk systems), locations 4044H-4045H. It then stores the address of its own intercept routine Rout in locations 4016H-4017H. After these initializations, control returns to the Basic interpreter with the Rout routine ready to intercept and interpret the new commands.

When the line input routine requests a character, Rout is called. Rout then calls the real keyboard driver routine to get a

Program Listing

```
7000            00100          ORG     7000H
01C9            00110 CLEAR    EQU     01C9H    ;CLEAR SCREEN ROUT.
40A2            00120 CHKBAS   EQU     40A2H    ;CUR. LINE RUNNING I
N BASIC
4016            00130 INROUT   EQU     4016H    ;LOC. OF INPUT ROUT.

06CC            00140 BASIC    EQU     06CCH    ;BASIC ENTRY POINT
4044            00150 STROUT   EQU     4044H    ;STOR. INPUT ROUT. A
DDR.
4046            00160 SPTEMP   EQU     4046H    ;TEMP STOR FOR SP.
28A7            00170 PRMSG    EQU     28A7H    ;PRINT MSG ROUT.
40A7            00180 BUFFER   EQU     40A7H    ;LOC OF INPUT BUFFER

4048            00190 SAVCHR   EQU     4048H    ;TEMP STOR FOR CHAR
@ (HL)
000D            00200 RETURN   EQU     0DH
                00210 ;
7000 2A1640     00220 CMDINT   LD      HL,(INROUT)      ;GET CUR. IN
PUT ROUT ADDR
7003 224440     00230          LD      (STROUT),HL      ;STOR FOR LA
TER USE
7006 210F70     00240          LD      HL,ROUT          ;GET YOUR IN
TCPT ROUT ADR
7009 221640     00250          LD      (INROUT),HL      ;STOR IN INP
 ROUT ADR LOC
700C C3CC06     00260          JP      BASIC            ;RETURN TO B
ASIC
                00270 ;*****************************************
*****
                00280 ;* ROUT INTERCEPTS THE INPUT FROM THE KEYBOA
```

Program continues

The Key Box

Basic Level II
Model I
32K RAM

character from the keyboard. Rout checks the characters for a carriage return and then checks the entered line for a match with its command table. If a Return was not entered, the character returns to the line input routine without further processing.

When Rout gets a Return, it checks that the input line was not requested from a running Basic program. If the line was called from a running program, it is returned without further ado. If the line was not called from a running program, Rout gets the HL value from the stack and returns it to the HL register pair. HL then points to where the next character is to be stored. Rout gets the character currently at this location and stores it for later replacement (necessary because of the Level II Basic line editor). Rout stores the return (0DH) in the location pointed to by HL, then checks for a command match.

At the bottom of the program is a table of commands (TABLE). Each command is followed by a 0 byte; the last command in the table ends with two 0 bytes. A command number counter, the B register, is initially zeroed. The first entry in the command table is compared character by character to the characters in the line input buffer. If there is no match, the command number counter is incremented and the next entry in the command table is checked. This continues until the table is depleted or a match is found.

If the table is depleted, everything returns to the line input routine, where the Level II monitor processes it as a normal input line. If a match was found, the program finds the service routine corresponding to the matched command. This is accomplished with the command number counter and ADRTBL, a table containing the addresses of the command service routines. The addresses must be in ADRTBL in the same order as the corresponding command in TABLE; there must be exactly one entry in ADRTBL for each entry in TABLE.

Since addresses are each two bytes, the command number counter is multiplied by two (accomplished by a shift left); the result is the displacement from the beginning of ADRTBL to the command service routine address. This displacement is added to the address of ADRTBL and the result is placed in HL. Finally, a jump gives control to the command service routine.

Caution: If the command service routine intends to return to the Level II monitor without returning the current line in the input buffer, it must end with JP OUT1. OUT1 clears the buffer so the Level II monitor sees a Return entered but no other characters. If the service routine wishes to return the contents of the unchanged input buffer to the Level II monitor, it should end with a JP OUT2.

Modified Buffer Contents

You may change the contents of the input buffer and return the new contents to the Level II monitor. This can be done very easily; see examples in the CMD4 and CMD5 routines in Listing 1. CMD4 changes Lsit to List and returns the modified buffer to the Level II monitor. (I often accidentally enter Lsit when I wish to list a program.) The Level II monitor will interpret both Lsit and List as List.

The CMD5 routine changes the letter L into the word List. List a program by Entering the letter L.

When the line input routine requests a character, Rout is called. Rout then calls the real keyboard driver routine to get a character from the keyboard. Rout checks the characters for a carriage return (Enter) and then match with its command table. If a Return was not entered, the character returns to the line input routine without further processing.

If you use a keyboard debounce routine (KBFIX) enter it in the normal manner, before loading the command interpreter routine. This allows Cmdint to use the keyboard routine, while maintaining proper operation. ■

Mr. Alford studies Computer Engineering at the University of Michigan, Ann Arbor part time. He also works full-time as a system support engineer for ICM Systems, Inc., in Ann Arbor.

Program continued

```
RD. *
                00290 ;* IF A RETURN IS ENTERED IT FIRST CHECKS TO
    *           00300 ;* SEE IF THE INPUT IS FROM A RUNNING BASIC
    *           00310 ;* PROGRAM.  IF IT IS, THE LINE IS RETURNED
    *           00320 ;* WITHOUT FURTHER PROCESSING.  IF THE LINE
    *           00330 ;* IS INPUT IS FROM COMMAND MODE, THE ENTERE
D   *           00340 ;* COMMAND IS CHECKED TO SEE IF IT MATCHES O
NE  *           00350 ;* OF THE COMMANDS IN THE COMMAND TABLE.  IF
    *           00360 ;* IT DOES, THE ROUTINE CORRESPONDING TO THE
    *           00370 ;* COMMAND IS EXECUTED AND CONTROL IS LATER
    *           00380 ;* RETURNED WITH THE BUFFER CLEARED.  IF NO
    *           00390 ;* MATCHING COMMAND IS ENTERED, THE INPUT
    *           00400 ;* LINE IS RETURNED IN ITS ORIGINAL CONDITIO
N.  *           00410 ;*****************************************
*****
700F 211770     00420 ROUT    LD      HL,NXTINS       ;PREP TO CAL
L INPUT ROUT
7012 E5         00430         PUSH    HL              ;PUT RETN AD
DR ON STACK
7013 2A4440     00440         LD      HL,(STROUT)     ;GET INPUT R
OUT ADDR
7016 E9         00450         JP      (HL)            ;CALL ROUTIN
E
7017 FE0D       00460 NXTINS  CP      RETURN          ;RETURN ENTE
RED YET?
7019 C0         00470         RET     NZ              ;NO, RETURN
TO CALL
701A 3AA240     00480         LD      A,(CHKBAS)      ;IS LINE FRO
M BASIC PROG?
701D FEFF       00490         CP      0FFH
701F C28B70     00500         JP      NZ,OUT2         ;YES, RETURN

7022 3AA340     00510         LD      A,(CHKBAS+1)
7025 FEFF       00520         CP      0FFH
7027 C28B70     00530         JP      NZ,OUT2         ;YES, RETURN

702A 3E0D       00540         LD      A,RETURN        ;NOT A BASIC
 PROGRM
```

Program continues

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Program continued

```
702C ED734640 00550          LD      (SPTEMP),SP      ;SAVE STACK
PTR
7030 DD2A4640 00560          LD      IX,(SPTEMP)      ;PREP TO IND
EX FROM SP
7034 DD6E06   00570          LD      L,(IX+6)         ;GET CUR. BU
FFER PTR
7037 DD6607   00580          LD      H,(IX+7)
703A 7E       00590          LD      A,(HL)
703B 324840   00600          LD      (SAVCHR),A       ;TEMP. SAVE
CHAR.
703E 3E0D     00610          LD      A,0DH
7040 77       00620          LD      (HL),A           ;STORE RETN
CHAR IN BUF
7041 11E570   00630          LD      DE,TABLE         ;CHECK CMD T
ABLE FOR CMD
7044 0600     00640          LD      B,0              ;B REG IS CM
D # COUNTER
7046 2AA740   00650 LOOP1    LD      HL,(BUFFER)      ;GET ADDR OF
 BUFFER
7049 1A       00660 LOOP     LD      A,(DE)           ;GET CHAR FR
OM CMD TABLE
704A BE       00670          CP      (HL)             ;EQU TO CHAR
 IN BUF?
704B 2004     00680          JR      NZ,NOPE          ;NO, SEE IF
END OF CMD
704D 13       00690          INC     DE               ;YES, CHK NE
XT CHAR
704E 23       00700          INC     HL
704F 18F8     00710          JR      LOOP
              00720 ;
7051 B7       00730 NOPE     OR      A                ;IS CHR ZERO
, END OF CMD?
7052 2013     00740          JR      NZ,DONE          ;NO, CHECK N
EXT CMD
7054 7E       00750          LD      A,(HL)           ;IS CHAR IN
BUF A RETN?
7055 FE0D     00760          CP      RETURN
7057 200E     00770          JR      NZ,DONE          ;NO, CHK NEX
T CMD
7059 CB20     00780          SLA     B                ;MULT. CMD #
 CTR BY 2
705B 48       00790          LD      C,B              ;PREP TO FIN
D ROUT ADDR
705C 0600     00800          LD      B,0              ;ADD DISPL T
O ADDR TABLE
705E 210371   00810          LD      HL,ADRTBL        ;GET ADDR OF
 ADDR TABLE
7061 09       00820          ADD     HL,BC            ;PT TO ADDR
OF CMD ROUT
7062 5E       00830          LD      E,(HL)           ;PUT ADDR IN
 DE
7063 23       00840          INC     HL
7064 56       00850          LD      D,(HL)
7065 EB       00860          EX      DE,HL            ;PUT ADDR IN
 HL
7066 E9       00870          JP      (HL)             ;GO TO ROUTI
NE
              00880 ;
7067 1A       00890 DONE     LD      A,(DE)           ;FIND BEG OF
 NEXT CMD
7068 B7       00900          OR      A                ;ZERO?
7069 2803     00910          JR      Z,NXTZ           ;YES, CONT
706B 13       00920          INC     DE               ;CHK NXT BYT
E
706C 18F9     00930          JR      DONE
706E 13       00940 NXTZ     INC     DE               ;PT TO NEXT
BYTE
706F 04       00950          INC     B                ;INC CMD # C
OUNTER
7070 1A       00960          LD      A,(DE)           ;ANY MORE CO
MMANDS?
7071 B7       00970          OR      A
7072 20D2     00980          JR      NZ,LOOP1         ;YES, CHECK
CMD
7074 1815     00990          JR      OUT2             ;NO MOR CMD,
 RETRN AS IS
              01000 ;*****************************************
****
              01010 ;* A JUMP TO OUT1 MUST BE USED AT THE END OF
   *
              01020 ;* EVERY COMMAND SERVICE ROUTINE.  THE OUT1
   *
              01030 ;* ROUTINE EFFECTIVELY CLEARS THE INPUT BUFF
ER *
              01040 ;* SO THAT THE LEVEL II COMMAND INTERPRETER
   *
              01050 ;* WILL NOT GIVE A SYNTAX ERROR FOR THE
   *
              01060 ;* COMMAND.  ALL OF THE NECESSARY POINTERS
   *
              01070 ;* ARE CHANGED BY CHANGING THE APPROPRIATE
   *
              01080 ;* LOCATIONS ON THE STACK.
   *
              01090 ;*****************************************
****
7076 DD2A4640 01100 OUT1     LD      IX,(SPTEMP)      ;GET STACK P
TR ADDR
707A DD7E08   01110          LD      A,(IX+8)         ;SET # OF CH

RS TO ZERO
707D DD7709   01120          LD      (IX+9),A
7080 2AA740   01130          LD      HL,(BUFFER)      ;GET BUFFER
ADDRESS
7083 DD7506   01140          LD      (IX+6),L         ;PUT CHR PTR
 TO BG OF BUF
7086 DD7407   01150          LD      (IX+7).H
7089 180E     01160          JR      OUT3
708B DD2A4640 01170 OUT2     LD      IX,(SPTEMP)      ;LOAD SP
708F DD6E06   01180          LD      L,(IX+6)         ;PREP TO RST
OR SAVED CHAR
7092 DD6607   01190          LD      H,(IX+7)
7095 3A4840   01200          LD      A,(SAVCHR)       ;GET CHAR
7098 77       01210          LD      (HL),A           ;REPLACE
7099 3E0D     01220 OUT3     LD      A,RETURN         ;RETURN A RE
```

Program continues

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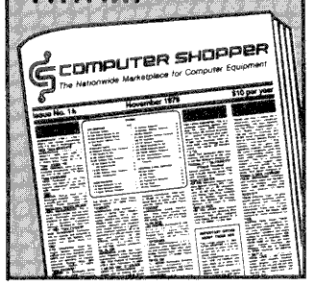

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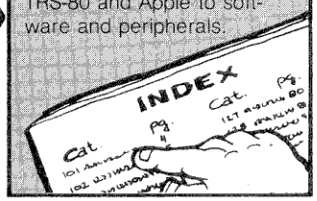

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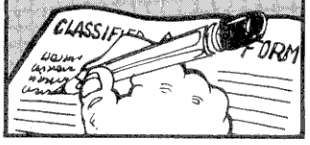

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Program continued

```
TURN
709B C9          01230          RET
                 01240 ;
                 01250 ;*****************************************
**********
                 01260 ;* THESE ROUTINES, CMD1 THROUGH CMD5, ARE
          *
                 01270 ;* MERELY TO SHOW SAMPLE USE OF COMMAND
          *
                 01280 ;* SERVICE ROUTINES.  THESE HERE DO NOTHING
          *
                 01290 ;* MORE THAN MERELY PRINT MESSAGES, EXCEPT C
MD4       *
                 01300 ;* WHICH CHANGES THE 'LSIT' COMMAND TO 'LIST
'.        *
                 01310 ;* IN "REAL LIFE" ANY ROUTINE MAY BE USED IN
          *
                 01320 ;* PLACE OF THESE TO PERFORM ANY DESIRED FUC
TION.     *
                 01330 ;* THERE DOES NEED TO BE A ROUTINE FOR EVERY
 COMMAND *
                 01340 ;* IN THE COMMAND TABLE, BUT TWO OR MORE COM
MANDS     *
                 01350 ;* CAN USE THE SAME ROUTINE.  ALL ROUTINES M
UST       *
                 01360 ;* END WITH A 'JP OUT1' IN ORDER TO RETURN T
O BASIC   *
                 01370 ;* IN THE PROPER WAY, UNLESS THE RETURN IS I
NTENDED   *
                 01380 ;* TO RETURN THE CONTENTS OF THE INPUT BUFFE
R TO THE  *
                 01390 ;* CALLING ROUTINE, AS IS THE CASE OF THE CM
D4        *
                 01400 ;* ROUTINE BELOW - WHICH MUST USE A 'JP OUT2
'.        *
                 01410 ;*****************************************
**********
                 01420 ;
709C 210D71      01430 CMD1     LD      HL,TRMMSG        ;PRINT TERMI
NAL MESSAGE
709F CDA728      01440          CALL    PRMSG
70A2 C37670      01450          JP      OUT1
                 01460 ;
70A5 212C71      01470 CMD2     LD      HL,MONMSG        ;PRINT MONIT
OR MESSAGE
70A8 CDA728      01480          CALL    PRMSG
70AB C37670      01490          JP      OUT1
                 01500 ;
70AE 214871      01510 CMD3     LD      HL,TSTMSG        ;PRINT TEST
MESSAGE
70B1 CDA728      01520          CALL    PRMSG
70B4 C37670      01530          JP      OUT1
                 01540 ;
70B7 2AA740      01550 CMD4     LD      HL,(BUFFER)
70BA 23          01560          INC     HL
70BB 3649        01570          LD      (HL),'I'
70BD 23          01580          INC     HL
70BE 3653        01590          LD      (HL),'S'
70C0 C38B70      01600          JP      OUT2
                 01610 ;
70C3 2AA740      01620 CMD5     LD      HL,(BUFFER)
70C6 23          01630          INC     HL
70C7 3649        01640          LD      (HL),'I'
70C9 23          01650          INC     HL
70CA 3653        01660          LD      (HL),'S'
70CC 23          01670          INC     HL
70CD 3654        01680          LD      (HL),'T'
70CF 23          01690          INC     HL
70D0 DD2A4640    01700          LD      IX,(SPTEMP)
70D4 DD7506      01710          LD      (IX+6),L
70D7 DD7407      01720          LD      (IX+7),H
70DA DD7E08      01730          LD      A,(IX+8)
70DD D604        01740          SUB     4
70DF DD7709      01750          LD      (IX+9),A
70E2 C39970      01760          JP      OUT3
                 01770 ;
70E5 54          01780 TABLE    DEFM    'TERMINAL'       ;COMMAND 1
70ED 00          01790          DEFB    0
70EE 4D          01800          DEFM    'MONITOR'        ;COMMAND 2
70F5 00          01810          DEFB    0
70F6 54          01820          DEFM    'TEST'           ;COMMAND 3
70FA 00          01830          DEFB    0
70FB 4C          01840          DEFM    'LSIT'           ;COMMAND 4
70FF 00          01850          DEFB    0
7100 4C          01860          DEFM    'L'              ;COMMAND 5
7101 00          01870          DEFB    0
7102 00          01880          DEFB    0                ;END OF COMM
ANDS
                 01890 ;
7103 9C70        01900 ADRTBL   DEFW    CMD1             ;ADDR OF CMD
1 ROUT
7105 A570        01910          DEFW    CMD2             ;ADDR OF CMD
2 ROUT
7107 AE70        01920          DEFW    CMD3             ;ADDR OF CMD
3 ROUT
7109 B770        01930          DEFW    CMD4             ;ADDR OF CMD
4 ROUT
710B C370        01940          DEFW    CMD5             ;ADDR OF CMD
5 ROUT
                 01950 ;
710D 0D          01960 TRMMSG   DEFB    0DH
710E 59          01970          DEFM    'YOU ARE NOW IN TERMINAL MOD
E"
712B 00          01980          DEFB    0
712C 0D          01990 MONMSG   DEFB    0DH
712D 59          02000          DEFM    'YOU ARE NOW IN THE MONITOR'

7147 00          02010          DEFB    0
7148 0D          02020 TSTMSG   DEFB    0DH
7149 54          02030          DEFM    'THIS IS A TEST'
7157 00          02040          DEFB    0
7158 0D          02050 HLPMSG   DEFB    0DH
7159 54          02060          DEFM    'THIS IS THE HELP ROUTINE'
7171 00          02070          DEFB    0
7000             02080          END     CMDINT
00000 TOTAL ERRORS
```

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Model III Master Directory

Wilbur A. Muehlig, M.D.
726 N. 91 Plaza, #305
Omaha, NE 68114

My search for a master directory program for my TRS-80 was frustrating. One I found required two disk drives, but I only had one. Another called for 48K memory but I had only 32K. I sold my Model I and got a Model III. Soon after, I saw an advertisement for a Model III directory program which was also unsatisfactory for my purposes.

Commercial programs use special methods to read disk directories. Realizing this is needed only once to make a disk file of program names and disk numbers, I decided to write my own program in Basic, using the alphabetic sort supplied with Model III TRSDOS. You must enter a list of your programs, but deleting, correcting or adding programs is easily done.

```
                                        MENU

        1-START, ADD TO, OR SEE THE FILE
        2-LOAD FILE FROM DISK
        3-SAVE FILE TO DISK
        4-CORRECT AN ENTRY
        5-DELETE AN ENTRY
        6-MAKE A HARD COPY
        7-TOGGLE SORT ALPHA <——> NUMERICAL
        8-SEARCH
        9-LEAVE THE PROGRAM

      CHOOSE A NUMBER? 7

      CHOOSE:
        1-ALPHABETICAL SORT TO DISK # SORT
        2-DISK # SORT TO ALPHABETICAL

                                        NUMBER?
```

Fig. 1. Program Menu

```
 1 AAA      76K   31
 2 AAB      53K   32
 3 AAC      79K   33
 4 AAD     119K   34
 5 AAE     100K   35
 6 AAF     125K   36
 7 AAG     172K   40
 8 AAH      69K   41
 9 AAI       3K   42
10 AAJ     119K   43
11 AAK     132K   44
12 ABLAST         34
13 ADD            31
14 ADD3           34
15 ADVENT/D1      43
PRESS ENTER TO CONTINUE, S FOR MENU, R FOR PREVIOUS PAGE?
```

Fig. 2. Example of Alphabetical Sort

The Hardware

The program is written for a 32K Model III with one disk drive. Use TRSDOS with the machine language sort or a DOS with a similar sort for the index program; all other disks may use any DOS. The program runs on a Model I if you insert an alphabetic sorting program at line 550 (with a GOSUB). A printer is not essential but a printed index is a great convenience.

32K should handle at least 600 programs. The program itself is about 6K, 6.5K with remarks, and when running uses an additional 13K.

The Program

Menu item 1 (see Fig. 1) includes file entries, alphabetic sorting and reviewing the list.

Print Using statements keep video and hard copy vertically aligned. Only 16 spaces are planned, 12 for the file name, a blank, and three for the disk number (FILENAME/EXT ###). The file name may be as short as you like, but you should fill in the extra spaces with blanks. If the entry does not have 16 spaces, the program will reject it and repeat the same index number. Place the disk number as far to the right as possible; you should place a single number in the 16th position. If you include more information, such as passwords or how many K in each program, change the Print Using statements in lines 570 and 1030, change lines 515 and 516, decrease the number of columns printed on a page (line 1040), and make the numeral in line 1270 equal to the total length of the Print Using format.

Remember to load any previous entries from disk before adding new entries. When you use menu option 1 to review the entries, the scrolling stops after every 15 lines. The sorting has already been done. You can stop the listing while it is moving by pressing S. Enter S when the scrolling has stopped to return to Menu. Enter R to back up the video display to the preceding page.

If you wish to include the amount of free space on each disk make your entries as follows: AAA ###K ###, where the

The Key Box

Disk Basic
Model III
32K RAM
TRSDOS
1 Disk Drive
Printer (optional)

first ### is the number of K on the disk and the second is the disk number. The program sorts these entries to come before the program files. If they all start with AAA, the program arranges them with the lowest number of K first. A better idea is to use AAB, AAC, etc. for increasing disk numbers so they will be sorted by disk number (Fig. 2).

If you prefer, you may list grans. Model III grans are converted to K by multiplying by 768.

The index number, which appears to the left of the file name, is needed to correct an entry (menu option 4) or delete an entry (menu option 5). You can obtain the entry number by using Search (menu option 8). Both the correct and delete functions print the entry for you to see before proceeding. The delete function rearranges the entries so a blank is not left.

Printout (menu option 6) is planned for three columns of 54 lines, a total of 162 programs on a page. If your printer has a better way of setting the margin than Tab, change lines 1000 and 1040.

The sort function (menu option 7) gives two choices. The first places the disk numbers in front of the file names so the sort will be by disks. The programs on each disk will be in alphabetical order. You may cut up a printout of this and paste it to your disk jackets. (The Model III sort does not do numerical sorts, but the disk numbers are part of the string.) The second choice restores the entries to their original form.

You can use any part of the file name or disk number and as few as two characters in the search function (menu option 8). Using longer segments yields more accurate program location. Misspelling results in failure. If you do not want the first program found, press Enter to continue searching. Enter M to return to Menu. You can use the search function to locate programs for correction or deletion; to locate programs with the same extension, such as /CMD; and in place of a printed alphabetical list. If you don't have a printer, this feature is helpful; paging through the video alphabetical list is tedious.

The final menu item reminds you to save the file to disk if you have not done so. It also closes the file in case an error has left it open. ■

Dr. Muehlig is a Retired neurosurgeon. He is also the author of several articles regarding the TRS-80.

Program Listing

```
0 '*** A MASTER DIRECTORY PROGRAM  ***
1 '***  FOR THE TRS-80 MODEL III   ***
2 '***   WILBUR A. MUEHLIG, M.D.    ***
3 '***   726 N. 91 PLAZA, # 305,    ***
4 '***   OMAHA, NEBR.  68114        ***
50 CLEAR10000:DEFINTX,B:DEFSTRA:DIMA(1000):X=0
60 CLS:PRINT@470,"MASTER DISK INDEX":FORZ=1TO700:NEXT
70 CLS:PRINT:PRINT:PRINT:PRINT:PRINT
80 INPUT"Do you want instructions (Y/N)";I$
90 IF I$="Y" GOTO 1500
100 CLS:PRINT:REM * USE DOWN ARROW TO ALIGN ITEMS WHEN TYPING
                  * IN THE NEXT TWO LINES.
110 PRINT"                          MENU

                 1-START, ADD TO, OR SEE THE FILE
                 2-LOAD FILE FROM DISK
                 3-SAVE FILE TO DISK
                 4-CORRECT AN ENTRY"
120 PRINT"                    5-DELETE AN ENTRY
                 6-MAKE A HARD COPY
                 7-TOGGLE SORT ALPHA <--> NUMERICAL
                 8-SEARCH
                 9-LEAVE THE PROGRAM"
130 PRINT:INPUT"            CHOOSE A NUMBER";Z
140 ON Z GOTO 500,600,700,800,900,1000,1200,1300,1400
500 X=X+1:CLS:PRINT:PRINT"WHEN FINISHED WITH INPUTS OR TO SEE THE
FILE, PRESS ENTER AN              EXTRA TIME. TO STOP THE FILE PRI
NTING, PRESS 'S'.":PRINT:PRINT"EACH ENTRY MUST BE 16 SPACES LONG."
:PRINT
510 PRINTX;:INPUT"PROGRAM FILE NAME AND DISK #";A(X)
512 IF A(X)=""GOTO 550
515 IF LEN(A(X))<16PRINT"                                          TO
O SHORT! TRY AGAIN.":GOTO 510
516 IF LEN(A(X))>16PRINT"                                          TO
O LONG! TRY AGAIN.":GOTO 510
530 X=X+1
540 GOTO 510
545 REM * REMOVE THE X THAT IS NULL AND CALL THE SORT PROGRAM
550 X=X-1:CMD"O",X,A(1)
555 CLS
560 FOR B = 1 TO X
570 PRINTUSING"#### %                  %";B;A(B)
575 IF INKEY$="S" GOTO 100:REM * NOT ESSENTIAL!
580 IF B/15 = INT(B/15) INPUT"PRESS ENTER TO CONTINUE, S FOR MENU,
 R FOR PREVIOUS PAGE";Z9$:CLS
585 IF Z9$="S"CLS:Z9$="":GOTO100
        REM * IF YOU DON'T 'NULL' Z9$, NEXT TIME THROUGH *
            * PRESSING ENTER WILL SEND YOU TO THE MENU    *
586 IF Z9$="R" THEN Z9$="":B=B-30:REM * A NICE TOUCH
590 NEXT
595 INPUT"PRESS ENTER TO CONTINUE";Z9:GOTO100
600 ON ERROR GOTO 1450
605 PRINT:PRINT"LOADING FILE FROM DISK....."
610 OPEN"I",1,"IND/FIL"
620 INPUT#1,X:REM * X IS THE TOTAL NUMBER OF ITEMS
630 FOR B = 1 TO X
640 INPUT#1,A(B)
650 NEXT:CLOSE
660 GOTO 100
700 IF A(1)=""THEN PRINT"FILE EMPTY":INPUT"PRESS ENTER";Z:GOTO 100
710 PRINT:PRINT"SAVING FILE TO DISK....."
720 OPEN"O",1,"IND/FIL"
730 PRINT#1,X
740 FOR B = 1 TO X
750 PRINT#1,A(B)
760 NEXT:CLOSE
780 GOTO 100
800 CLS:PRINT:PRINT:PRINT:PRINT:PRINT
820 PRINT:INPUT"WHICH NUMBER DO YOU WISH TO CORRECT";B
840 PRINT:PRINTB;A(B)
860 PRINT:INPUT"TYPE CORRECT ENTRY. IF OK AS IS, PRESS ENTER";A(B)
870 GOTO100
900 CLS:PRINT:PRINT:PRINT:PRINT:PRINT:INPUT"WHICH NUMBER DO YOU WA
NT TO DELETE";B
912 PRINT:PRINTB;A(B)
913 PRINT:INPUT"IS THIS THE NUMBER YOU WANT TO DELETE (Y/N)";Z9$
915 IF Z9$="Y" GOTO 920
917 IF Z9$="N" GOTO 100
920 A(B)=" "
930 FOR B = B+1 TO X:A(B-1)=A(B):NEXT
935 A(X)="":X=X-1
950 PRINT:PRINT"ENTRY DELETED":FOR Z=1 TO 300:NEXT:GOTO100
1000 CLS:PRINT:PRINT:PRINT:PRINT:INPUT"IS THE PRINTER ON? WHAT MAR
GIN DO YOU WANT (TRY 6)";T
1010 LPRINTTAB(30+T)"MASTER INDEX"
1015 LPRINTTAB(30+T)"============":LPRINT" "
1020 FOR B=1 TO X
1030 LPRINTTAB(T)USING"#### %                  %";B;A(B)
1040 IF B/54=INT(B/54)PRINT:PRINT"REPOSITION PAPER AND CHANGE MARG
IN TO NEXT COLUMN.":INPUT"     (TRY ADDING 25)";T
1050 NEXT
1060 GOTO100
1200 CLS:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT"CHOOSE:
            1-ALPHABETICAL SORT TO DISK # SORT
            2-DISK # SORT TO ALPHABETICAL"
1205 PRINT:INPUT"                          NUMBER";N
1207 ON N GOTO 1209,1250
1209 PRINT:PRINT"PUTTING DISK # BEFORE FILE NAME....."
1210 FOR B=1 TO X
1220 A(B)=RIGHT$(A(B),3)+" "+A(B):
        REM * A(B) IS STILL INTACT BUT PRINT USING *
            * WILL CUT OFF THE DISK NUMBERS ON THE *
            * RIGHT END.
1230 NEXT
1240 GOTO100
1250 PRINT:PRINT"PUTTING FILE NAME BEFORE DISK #....."
1260 FOR B=1 TO X
1270 A(B)=RIGHT$(A(B),16):REM * GIVING US THE ORIGINAL *
                              * A(B) BACK
1280 NEXT
1290 GOTO 100
1300 CLS:PRINT:PRINT:PRINT:PRINT:PRINT
1310 INPUT"WHAT IS THE FILE NAME OR PART OF FILE NAME

            YOU WISH TO SEARCH FOR";C$:REM * USE DOWN ARROW *
1320 FOR B = 1 TO X
1330 IF INSTR(A(B),C$)>0 PRINT: PRINTB;A(B):PRINT:INPUT"PRESS ENTE
R TO CONTINUE, 'M' FOR MENU";J$
1332 IF J$="M" THEN J$="":GOTO100
1340 NEXT
1345 PRINT:PRINTC$;:INPUT" NOT FOUND. PRESS ENTER";Z:GOTO 100
1350 RETURN
1400 INPUT"DID YOU SAVE FILE TO DISK (Y/N)";Z9$
1410 IF Z9$="Y"GOTO 1430
1420 IF Z9$="N"GOTO 100
1430 PRINT"OK!":CLOSE
1440 END
1450 PRINT:INPUT"ERROR! NO FILE ON DISK OR OTHER. PRESS ENTER FOR
MENU";L:GOTO 100
1500 CLS:PRINT:PRINT@26,"INSTRUCTIONS":PRINT
1510 PRINT"  Make entries with MENU item #1. They should be limite
d to"
1520 PRINT"16 spaces, 12 for the file name, a blank, and 3 spaces
for the"
1530 PRINT"disk number, e.g., FILENAME/EXT ###. Spaces not used fo
r"
1535 PRINT"characters should be filled with blanks. Place the numb
er"
1540 PRINT"as far to the right as possible in the 16 spaces, i.e.,
 a"
1550 PRINT"single number would go in the 16th space. PRINT USING"
1560 PRINT"statements are used in lines 570 and 1030 to give even
print-"
1570 PRINT"outs on video and paper. The length is limited in order
 to get"
1580 PRINT"three columns on 8 1/2 x 11 paper. If you need more roo
m for"
1590 PRINT"your file names, the PRINT USING statements can be chan
ged."
1600 PRINT:INPUT"PRESS ENTER";Z:CLS
```

Program continues

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Program continued

```
1610 PRINT"  When additional entries are to be made, always load p
revious"
1620 PRINT"entries from disk first.":PRINT
1640 PRINT"  The entries are sorted alphabetically as soon as they
 are"
1650 PRINT"complete. They may be reviewed by using MENU item 1. Th
e review"
1660 PRINT"may be stopped while the screen is being printed by pre
ssing"
1670 PRINT"'S'. The previous page may be seen by pressing 'R'. It
is"
1675 PRINT"a good idea to save the file to two different disks as
soon"
1680 PRINT"as your entries are complete."
1685 PRINT
1690 PRINT"  The numbers to the left of the file names are index n
umbers"
1700 PRINT"to be used in making corrections or deletions. If you a
re"
1710 PRINT"making several deletions, do them in descending order,
since"
1720 PRINT"the numbers above each deletion will be changed."
1730 PRINT:INPUT"PRESS ENTER";Z:CLS:PRINT:PRINT
1740 PRINT"  The hard copy suggestions given in the program are fo
r lines"
1750 PRINT"of 10 CPI and will give three columns of 54 entries eac
h"
1760 PRINT"on 8 1/2 x 11 inch paper.":PRINT
1770 PRINT"  TOGGLE SORT ALPHA <--> NUMERICAL gives two choices. T
he first"
1780 PRINT"puts the disk number before the file name and the secon
d"
1790 PRINT"reverses this. The second choice is not essential but i
s fun"
1795 PRINT"to play with and makes a nice demonstration of your com
puter."
1800 PRINT"The sort by disk numbers will make a hard copy that can
 be cut"
1805 PRINT"up for disk jacket labels.":PRINT
1807 PRINT:INPUT"PRESS ENTER";Z:CLS:PRINT:PRINT:PRINT
1810 PRINT"  The SEARCH choice will find any group of two or more"
1820 PRINT"characters occurring in the list of entries. It prints
out"
1830 PRINT"the entry, then when ENTER is pressed, searches through
 the"
1840 PRINT"rest of the entries to find additonal occurrences."
1850 PRINT
1860 PRINT"  If you press BREAK and leave the program, type GOTO 1
00 to"
1870 PRINT"return to the MENU without losing the data file."
1880 PRINT:INPUT"PRESS ENTER";Z:CLS:GOTO 100
```

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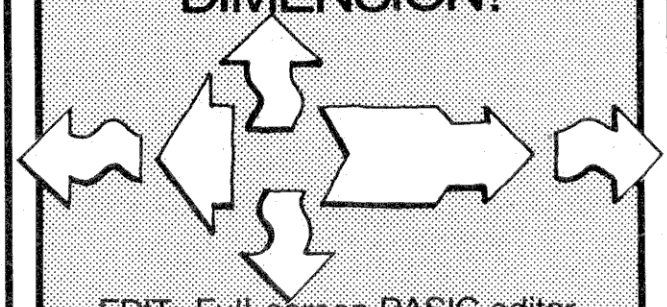

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[Reprint of June 1980 Review, *80 Microcomputing*]

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by Carl A. Kollar

I guess I don't have to tell any TRS-80 owners how frustrating the cassette system that comes with the computer can be. Even with the factory mod that's available, the annoyance of loading and checking programs becomes just barely tolerable.

If you're like me, after you've just plunked down a chunk of money for a Level II 16K machine, "you ain't got nuttin left" for even one disk drive at 500 bucks apiece. So you suffer.

A reasonable alternative is the Exatron Stringy Floppy (ESF). This will cost you about 250 bucks and totally eliminates your loading and saving problems, automatically and fast. I've had one of these for about six months and love it!

But, if the price is still too steep, have I got a device for you!

The Device

The February 1980 issue of *Microcomputing* had an ad that intrigued the hell out of me. It was a high-speed cassette system by JPC Products acclaimed as a "poor man's floppy." It made all sorts of seemingly ridiculous claims such as "loads five times faster," "stores 50,000 bytes on a 10-minute cassette," "less than one bad load in a million bytes with the volume control anywhere between one and eight."

All this for a measly [90] bucks? How could this be? A call to Albuquerque answered a few questions: Yes, it had its own power supply, and, it stored programs five times faster because it utilized higher density data. The computer outputs the information at a higher rate out of the rear keyboard connector.

The ad had even claimed anyone could build it even if you have never soldered before. JPC would make it work, if you couldn't—for free. I was sold. I placed my order, and it arrived about two months later (parts shortage).

I work in electronics, so I found the unit exceptionally easy to build. It took about an hour. The manual is superb. (That's better than great.) It was clear, concise and exact with no ambiguities. Important parts placements are stressed (polarity markings on electrolytics, bands on diodes, etc.).

JPC was right! With these instructions, you couldn't go wrong. The board quality is excellent. It is double-sided and parts locations are clearly marked on the component side of the board. There are no jumper wires to install. JPC utilizes PC traces and plated-through holes for connections to traces on the other side of the board.

Also, there are absolutely no adjustments or settings to bother with.

The documentation is a sheaf of 8½ × 11 papers stapled together. It is written in the nicest format I've seen in a while. Each command and/or subjects is covered on its own sheet in large type. All explanations are in easy to read English—not computerese.

Commands and Features

SAVE"filename": Saves your BASIC program on cassette.
LOAD: Reads the next BASIC program from the cassette.
LOAD"filename": Searches for and loads the specified file from cassette.
LOAD? and LOAD?"filename": Reads file from cassette, and compares contents to memory.
LOADN: Prints a list of all the programs on a cassette, until interrupted by the "break" key.
LOADN"filename": Same as above except the tape will stop at the end of the program named.
KILL: Removes the file manager program from memory so that the extra memory can be used by large programs.
RSET: Allows the operator to rewind and position the tape on tape recorders that have these functions tied to the motor control jack.
RUN"filename": TC-8 searches for a specified program and runs it immediately.
PUT"filename": Same as SAVE "filename", except it is for use with system tapes.
GET: Same as LOAD, except it is for use with system tapes.
GET"filename": Same as LOAD "filename", except it is for use with system tapes.
GET? and GET?"filename": Same as LOAD? and LOAD?"filename", except it is for use with system tapes.
GETN and GETN"filename": Same as LOADN and LOADN"filename", except it is for use with system tapes.
OPEN: Required before cassette input or output of a data file can be attempted.
CLOSE: Required to end a cassette data file.
PRINT#: Allows numerical or string data to be output to a cassette file.
INPUT#: Allows numerical or string data to be input from a cassette file.

I haven't counted them, so I don't know about the "one load in a million bytes" claim, but my son, Anthony (age 11), loaded about 30 of his programs from his Radio Shack format tape to a new TC-8 format tape. He's run them all and found no bad loads.

Unlike the standard tape system, you can position your tape anywhere before the program you want and not have to look for a blank spot between programs. The TC-8 patiently waits for the program you want and then starts loading without getting confused by the portion of the previous program you just fed it.

Try that on your regular cassette system; you'll wear out the reset button. ■

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Unfortunately, with Model I TRSDOS the operator has to go through many operations before using a typical Basic program. In one particular application it was necessary to: turn on the micro and get TRSDOS; load a machine language program for lowercase characters; load Basic; answer memory and file questions; then, load and run the Basic program. This can be quite intimidating to a non-technical user.

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Programming Out the Fuss

We wrote a short machine-language program called Start to go through most of the steps automatically with a minimum of fuss. When this program is called by the Auto command of TRSDOS, it will load TRSDOS and Basic, answer the memory and file questions, and then run a Basic program called AIDS3. This is just one example. We will show how to modify it for other uses. Figure 1 contains the Start program and explains how to save it to disk.

In Fig. 1 Start loads at hex location 6B00. This can be changed as you desire. Refer to *TRSDOS & Disk Basic Reference Manual* for more information on using Debug and TapeDisk to enter machine language programs into memory and then save them to disk.

In an appendix, the *TRSDOS & Disk Basic Reference Manual* lists decimal/hexadecimal codes. Use these codes to change the Start program for other purposes. In Fig. 1, starting at location 6B2C, are the codes 42 41 53 49 43 which stand for the letters Basic. The next three codes are 0D 0D 0D which are equivalent to three Enter strokes from the keyboard. These codes load Basic and answer the memory and files questions with the default values. If high memory has to be protected or if other than three files must be used, these codes can be modified.

Starting in location 6B34 are the codes 52 55 4E 22 41 49 44 53 33 22. These codes stand for the letters RUN"AIDS3". (AIDS3 is a data management program sold by Meta Technologies. We used it to construct a mailing list file.) Any other Basic program can be entered here by using the appropriate codes.

After you have modified Start to suit your purposes, change the TapeDisk entry (shown in direction 10 of Fig. 1) to show the location of the end of your program. In our example, the first location was 6B00, the last location was 6B3E, and the entry point to the program was 6B00. With changes, the end will

1. From TRSDOS type Debug and hit Enter.
2. Hit the Break key.
3. Type D6B00 and hit Space bar.
4. Type M6B00 and hit Space bar.
5. Enter the machine code as shown, hitting the Space bar after every double digit.

6B00 = >	21	0F	6B	22	16	40	21	2C	6B	22	2A	6B	C3	2D	40	E5
6B10 = >	2A	2A	6B	7E	FE	0A	CA	1F	6B	23	22	2A	6B	E1	C9	21
6B20 = >	E3	03	22	16	40	3E	0D	C3	1D	6B	20	20	42	41	53	49
6B30 = >	43	0D	0D	0D	52	55	4E	22	41	49	44	53	33	22	0A	

6. Hit Enter.
7. Type G402D and hit Enter.
8. Type Debug (OFF) and hit Enter.
9. Type TapeDisk and hit Enter.
10. Type F START/CMD:0 6B00 6B3E 6B00 and hit Enter.
11. Type E and hit Enter.
12. Back DOS Ready type in Auto Start and hit Enter.

Figure 1

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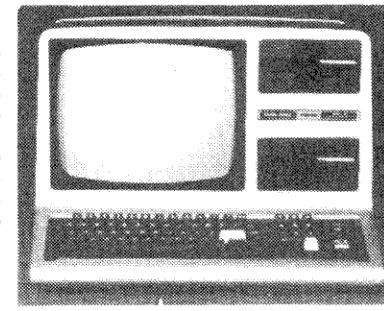

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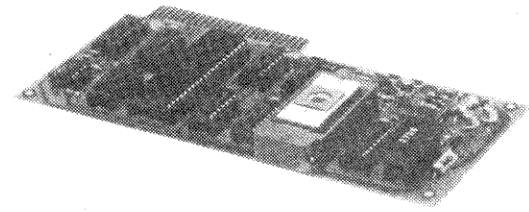

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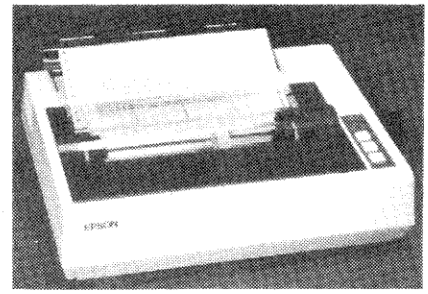

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probably be different than 6B3E.

It is not necessary to use Start with the Auto command. If you have several Basic programs on one disk, you could modify and rename Start for each use. Examples might be: GAME1, MATH2, Recipes. Someone who wanted to play GAME1 would then only have to insert the proper disk, turn on the computer, and type GAME1 Enter to get going.

If you have a lowercase modification installed in your Model I and use Radio Shack's ULCDVR/CMD program, be careful. This program will defeat the Start program. ULCDVR converts all uppercase letters to lowercase when it starts. If it precedes the entry "BASIC", the computer will see "basic" and default back to TRSDOS. We spent many hours trying to work around this problem but could find no easy solution. Since AIDS3 and some other Basic programs can work with lowercase characters, the easiest thing to do is to have ULCDVR load with the Auto command, then use Shift 0 to get to uppercase, and type in Start and hit Enter.

This example is only suggestive of the many possibilities for using Start. With Start a computer user can quite easily make the machine do what he wants. ■

"Unfortunately, with . . . TRSDOS the operator has to go through many operations before using a typical Basic program."

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In addition to the above major features there are many user conveniences. If you want to communicate with large mainframe computers, data banks, personal information services, bulletin boards, another computer across the room or your buddy across town; or if you just want an easier to use smart terminal program, look into TELCOM. If it doesn't do everything you need at a very reasonable price you are welcome to a full refund. And if $39.95 seems too cheap for a smart terminal program, you can send $79.95 instead!

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Concepts of computer modeling.

Sublime Simulations

James Edward Keogh
121 Gordon Street
Ridgefield Park, NJ 07660

A recent television program showed dramatic full color computer drawings of Saturn. When compared to photographs taken by unmanned spacecraft the untrained eye cannot see any differences. These computer drawings are one of the latest applications of computer simulation.

Corporations are turning to computer simulation models to conduct basic design experiments. Testing a design on a computer is less expensive than testing prototypes. Design engineers draw new cars, planes and a host of other major products on computer terminals.

After programming the basic design, an engineer can simulate production conditions. The computer simulation model illustrates the product's weaknesses.

Simulation models can also be fun to play with. You can fly everything from a single engine two-seater airplane to a spacecraft—without leaving the ground. Simulation models used by the armed services for training fighter pilots are finding their way into electronic game amusement centers. For a quarter you can test your skill flying against the enemy—and really feel like you are flying.

"Testing a design on a computer is less expensive than testing prototypes."

At first, the thought of preparing a computer simulation model frightens many programmers. Although developing such a model takes time and requires a well thought out plan of attack, it can be accomplished with your microcomputer.

No magic is involved. Simulation models convert data into illustrations of resulting situations. If you can work out percentages you can develop a simple simulation model and put it to work for you.

How a Simulation Model Works

External factors influence almost everything around us. Stress and airflow affect an aircraft's structure. The flow of customers into a retail store affects a business. If the customer flow increases, the operation should be expanded.

The first step in creating a simulation model is to identify all factors influencing the subject. The number of factors included in the model varies with the simulated object's complexity. An aircraft simulator will have many.

You must list each factor, regardless of its importance, if the model is to achieve any degree of accuracy. Large simulation models of complex systems are cumbersome to develop and debug. Most programmers who design models tackle no more than is practical. They break larger systems such as an aircraft into subsystems such as the frame or wing design. The list of factors becomes more manageable.

After you identify the factors you must measure their relationship with the subject. I will apply the modeling steps to a simple but practical problem—should a gas station owner install a third gas pump?

The initial step is to determine factors influencing the subject. In this case, I will develop a model of the business subsystem in the problem.

The factors I must consider are the time of day; the number of cars; the time it takes to service a car; and the number of cars using each pump. When I combine these factors I will have a subsystem of customer flow at the pumps. This is the segment of the business I need to simulate.

The second step is to find the relationship of the factors to the system. I must take measurements to break the relationship down into numbers. For example, a window glass will break if a certain pressure or weight is placed against it. Pressure or weight is a factor in window glass design. The engineer can measure—by trial and error—how much pressure the glass can withstand before it breaks. This information expresses the relationship between a pressure or weight to a

window glass.

Before I can develop a simulation model of the gas station I must measure the flow of cars for each pump at each time of day and for each day of the week. After several weeks of measuring, I will know an average service time, and the number of cars per hour serviced at a particular gas pump.

In my simulation model I use a math relationship involving percentages. Let's say that 30 percent of the time both gas pumps were in operation. Only one pump was in use another 30 percent of the time and 30 percent of the time no pump was in use. Three cars were in the station 10 percent of the time.

I also need to know from my study how frequently customers arrive. Suppose a new customer arrives every 15 minutes on the average. There will be times when a customer may not arrive for over an hour and other times when customers will arrive every five minutes.

In some systems the relationships cannot be easily identified by percentages. More detailed models require regression analysis and other statistical methods.

In the gas station model I assume that customers arrive at random. I will use the random number generator for the range zero to 100.

The next step is to assign a meaning to the random numbers. Numbers 0–29 mean that no cars are in the station. Numbers 30–59 mean one car has arrived. Numbers 60–89 mean two cars have arrived. Numbers 90–100 mean three cars have arrived at the station. The numbers reflect the percentages of occurrences that actually took place.

Traffic flow measurements show that a car arrives every 15 minutes at the gas station. To simulate the arrivals of cars I need a clock to activate the random number generator within the program. In the model 15 minutes do not have to pass before the next car enters the gas station. You can use a few seconds as long as you remember the time represents 15 minutes.

A different clock must time the servicing of each car. For this example it takes five minutes to service each car. As with timing the arrival of cars, it is not necessary to use five minutes on the computer clock. However, the times representing the 15 minute arrivals and five minute servicing must be proportional. The clock in the simulation model might have a ratio of one minute equals one second. My model uses 15 seconds and 5 seconds to represent actual times.

"More detailed models require . . . other statistical methods."

Displaying Results

Simulation models allow you to understand and manipulate complex situations easily. Illustrations best communicate this understanding.

The computer pictures of Saturn illustrate this concept. The computer received data measurements from the spacecraft. Raw measurements might have been meaningful to a few scientists, but these numbers have no meaning for most of us. A programmer instructed the computer to make sense out of the numbers. The computer assigned shades of various colors to represent each set of measurements and then displayed the colors for an easy-to-understand image of Saturn.

When you come to the display portion of your simulation model, pretend you're an artist. How can the simulation model graphically display the data? The best approach, although not always practical, is to illustrate the model as close to reality as possible.

The gas station simulation should illustrate cars arriving and stopping at the pump; the gas station attendant servicing the car; and cars leaving the gas station. Do not forget to illustrate the most important item—the gas station!

You can use detailed illustrations or a simple square to represent the cars, pumps, and so on. The method you use depends on your skills as a programmer and artist. For the gas station model I use rectangles to represent all factors.

I draw the gas station first. The arrival clock begins next and activates the random number generator. After the computer determines the number of cars, it draws the cars and drives them into the gas station. The second clock determines when the computer drives the car out of the station.

One of the major objectives of a simulation model is to permit the user to manipulate the model. How will the situation react if factors change? For example, what happens if an aircraft encounters a head wind of 15 knots? The user inputs this change and the model illustrates the effect.

When you design a simulation model you must consider what factors will vary during a run. Pose these measurements as questions to the user.

In the gas station model the user can change the arrival times of cars and the percentage breakdown of the station's business. Measured data already in the model becomes default measurements if the user does not input a new arrival time or change the volume of cars.

Before the computer draws the gas station, it asks the user to input the variables. Input variables need not come at the beginning of the program: They can come anywhere before the calculation stage. For example, the computer could draw the gas station and then ask for the variables.

Why would a gas station owner need a computer simulation model? He can briefly analyze the raw data to come to a decision.

A computer model permits experimentation. Where it might take several hours to recalculate the performance for each factor changed, the computer simulation model provides results within seconds. ■

Announcing:

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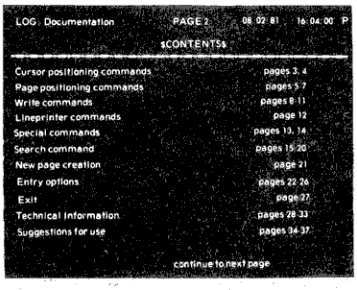

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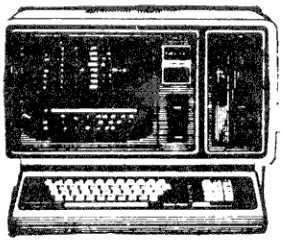

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A strange visit to the weird world of the TRX-80.

Vexed by the Void

Randy M. Resnick
17 rue Jean Giraudoux
75116 Paris, France

TO: Fleet Command
FROM: Expedition Leader Dulo Par
RE: Planet 02, system 1021, Version 21.2

Day 21011201:

Forgive the delay, Commander Xake, but we hit a snag in our exploration of the second large continent. Now that the waters have drained from the southwestern coast, our progress continues. Just as we discovered the purpose of the millions of "automobiles," we will soon have the key to the mystery of the "TRX-80"— devices we have found everywhere. (Note: We do not yet understand the use of the number "80." These beings used at least 10 number bases and somehow knew which was used in a particular case without being told.) I am convinced these devices were important to the beings, because they had to actually get out of their "cars" to visit the TRX-80.

The discovery of a race living inside moving chambers made of metal and rubber, equipped with lights and noisemaking equipment, is indeed one of our greatest accomplishments. Our understanding of this phenomenon was made easy by the many films and books we found that refer to the "automobile."

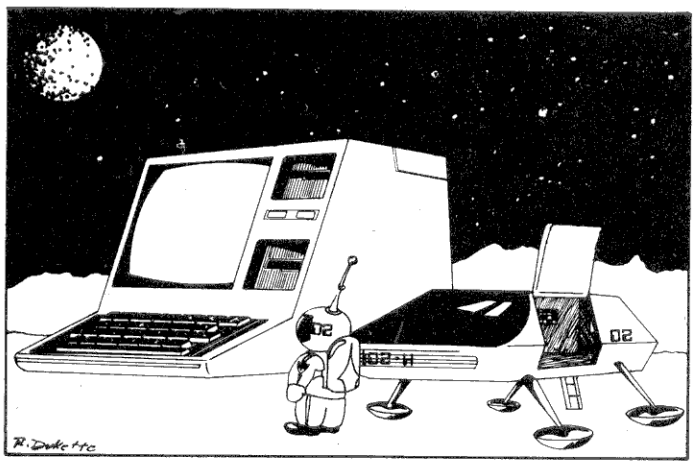
Unfortunately, until now we found no documentation whatsoever on the TRX-80 (not even at the numerous places where their owners obtained them). We suspected religious significance. Indeed, the printed references we found showed images of beings seated before the objects, presumably for worship.

Then came a breakthrough! Certain great thinkers did write and distribute secret words of inspiration to the believers. Deep under the surface of the planet we found a collection of these tomes. After carefully analyzing the writings we confidently propose the following theories about this cult:

00. Their main spiritual goal was to communicate with the all-powerful being that controlled their universe, called an "X80." Evidence indicates the X80, or "Holy CPU," was very just and listened when properly addressed. It, however, never retained what was said from one day to the next.

01. Several stages of enlightenment, or "Levels," were practiced by the believers. They were under constant pressure to "upgrade" or "add peripherals," indicated by many public notices in books for the devout. One of these books (BXTE) consisted almost entirely of these "advertisement" notices.

02. Much time was spent studying the works of MICROXOFT, apparently a prophet able to converse fluently in the holy tongue of the X80. While one of the books we found contains a long list of sermons (called "routines") by MICROXOFT, it is in a tongue other than that of the beings themselves; it is not known whether they actually understood what they were studying. A self-proclaimed oracle known as KITXZ devoted his entire life to predicting the actions of the holy CPU.



10. As new devotees joined the ranks, they communicated with the CPU through an interpreter, usually a disciple of MICROXOFT who lived in a "ROM." How the beings themselves understood the vague messages of the interpreter is not known. At the first Level, the interpreter responded with one of 10 different questions, just like our philosophers!

11. The beings sometimes mastered the tongue of the sect called the "Assemblers," the leader of which was named BARDXN. After standing in an assembly line, they were able to address the X80 very precisely. Others invoked a monitor such as the famous T-XUG, but T-XUG performed poorly unless it was "high." If the believer made a slight grammatical error in addressing it, the X80 would disappear or "hang-up," or worse, it would "glitch" or "put out garbage." This last reference perplexes us greatly, for we previously understood that garbage was created just for that purpose—to be put out.

12. In another sect of the original doctrine, the DOX is a central figure. There are many variations on this name, but the only clear reference indicates that "TRXDOX" was their equivalent of our "evil one," and was considered the source of many of their problems. It appears that other DOX figures eventually became powerful enough to overcome the influence of TRXDOX.

20. One enigma is the frequent reference to "XANDY CORP," presumed to be a major force. It

is unclear whether it was good or evil, because while XANDY was often consulted for help, it rarely answered the queries of the faithful hordes, and was seldom mentioned in kindly terms. Also, according to our translations, XANDY is supposed to have put a "hex" in the TRX-80. A "newsletter" was said to have been created by XANDY for the faithful, but the writings of the wise men state this was a myth.

21. Hundreds of wars were fought simultaneously within the cult. Soldiers were beseeched to sign up to fight the enemy. They were promised real-time action and adventure. While none of these wars ever ended or had any effect on the lives of their time, new wars continually started. Our military experts soon will issue their own report.

22. We know magnetism played a considerable role in the practices of these people. They feared magnetism could profane the sacred scrolls. (Scrolling, it seems, was a major activity of the TRX-80.) Legend states that the evil TRXDOX was once punished by being subjected to a magnetic field. From that time on, he took revenge by cruelly destroying the records every good DOX needed to be useful.

In conclusion, Commander, I hope you are as pleased as I am with the results of this expedition. There is one thing we need to continue our research here, however. Please see the enclosed requisition for a new computer. Ours became unusable, due to a problem that started just after we landed here. It is impossible to enter data because each xeystroke creates a double-image on the xideo. We are unable to correct this, even with our best de-xeybounce software.

Respectfully,
Dulo Par ■

Randy is an amateur radio operator, musician, and is currently in Paris at work on laser graphic systems.

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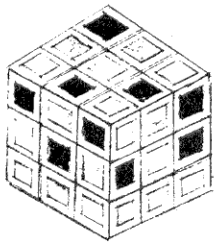

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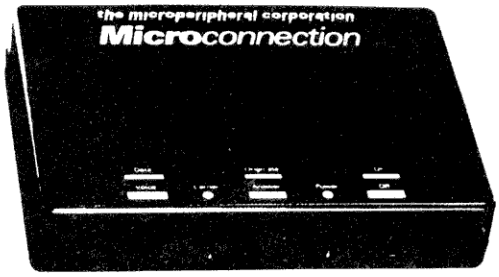

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Is there a computer career in your future?

Technological Destiny—Part I

Gary Dilllio
1109 Madison Avenue
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At work, does your mind drift to your computer at home, alone and unplugged, helpless without you to guide it? Have you ever rushed home from work anxious to try out a new program? Do you sometimes think a job as a Programmer, Computer Specialist or Computer System Analyst might be interesting?

At the risk of sounding like an advertisement, if you answered yes to any of the questions, maybe the computer field is for you. The pay is good and opportunity abounds. Entry level positions require a knowledge of Basic, Cobol and Fortran languages. A familiarity with Automatic Data Processing (ADP) is also required.

This article is the first of a series. Even if you have no intentions for a computer career, the concepts explained will help you better understand your computer.

ADP or EDP

Computer professionals define their field as either ADP or EDP. The DP stands for Data Processing. A indicates Automatic and the E is for Electronic. There is no real difference between the two. For the purpose of consistency, I will use EDP.

Computer Components

A computer can be broken down to three types of components: input, process and output.

Computer instructions are called programs. A program tells the computer what to do with the information it is going to receive. This information is called data. The input component accepts programs and data.

The process component operates on the data according to the program's prescribed step-by-step instructions.

Processed data is communicated by the computer to the operator via the output component.

Input or output devices have to be able to convert from the machine's language to human language. Some devices can only be used for input and some are limited to output. Others communicate both input and output. I/O devices, usually separate from the Computer Processor, are referred to as peripherals.

The TRS-80 Model I keyboard is an input-only peripheral. The video screen is output-only, and the cassette recorder is both an input and output device. The cassette player/recorder is a true I/O device on the Model I.

The processor is usually referred to as a CPU (Central Processing Unit). The CPU is a multifaceted network of electronic devices and integrated circuits that receive input, project output and control the operations of all peripheral equipment. It is the heart of any computer. All the components linking with the CPU would be worthless without it.

Internal Storage: Core vs Memory

The CPU stores a program and data in an area called on-line memory. On-line memory refers to the storage capacity available to the CPU. Memory storage off-line refers to I/O device storage. On-line storage of CPU memory capacity is measured in K, or Kilobytes. A byte is the amount of storage necessary to store one character. A byte is made up of a number of bits (*bi*nary digi*ts*). In the TRS-80, 8 bits equal 1 byte. A kilobyte, or 1K, is equal to 1024 bytes. A TRS-80 4K Model I has 4096 bytes of memory on-line to the CPU.

TRS-80 CPU memory is divided into two sections: ROM (Read Only Memory) and RAM (Random Access Memory). ROM memory cannot be changed as it contains the operating system. The operating system is the master program instructing the CPU for peripheral utilization. This master program is often called the Executive Program.

RAM memory is for program and data storage. The memory associated with the TRS-80 (4K, 16K, or 32K) is RAM memory.

I/O Devices

Obviously, each computer function I mentioned needs further, more detailed explanation to be comprehensively understood. The remainder of this first part of the series will deal with the various devices used for I/O computer operations.

In the late 1880's, Herman Hollerith, a statistician for the Bureau of Census, developed an optically read punched card for data tabulation. Each column has a punch or punches, to represent a character. There are usually 80 columns per card. A card reader converts the punched representation into bytes or characters. By using a card punch, cards can also be used as output. The cards are easily altered and inexpensive. Compared to other I/O devices punched cards are very slow.

Each card has an 80 character limitation. Paper tape is like punched cards. It is a continuous form of punched holes to be read as input or produced as output. Paper tape is less expensive than cards but cannot be altered as easily. Because it is continuous, there is no 80 character limitation. Records cannot get out of sequence as they can on punched card systems. Paper tape is also slow. Its usual transfer rate is less than 800 characters per second; unlike punched cards it is not common in industry today.

Magnetic tape, such as cassette tape, is the most widely used I/O media. Tapes are written and read sequentially and are referred to as Sequential Access Media. Sequential access means the records on tape are read in sequence.

Large computer systems use iron oxide tape on reels measuring ½ inch by 2400 feet. Tapes are read and written much faster than cards but slower than disks. Tape is relatively inexpensive and compact. One reel stores millions of characters. The main disadvantages are the difficulty to change and rearrange data and, unlike cards and paper tape, the unreadability by humans.

Disks come in many sizes and varieties. Most common on microcomputers is the 5¼ or 8 inch floppy disk. Floppy disks (so called because of their pliability) resemble 45 RPM records. They are protected by a permanent paper cover. Most large data processing installations use a rigid group of disks stacked on top of one another and spaced by a spindle called a disk pack. The disks are coated with an iron oxide material on both the bottom and the top. Data can be recorded on all surfaces of the disk pack except the very top and very bottom. The disk access arm has two read/write heads, one for the top and one for the bottom. A disk records information on circular tracks. Disks are used for input and output.

The major advantages of the disk are speed and its ability to handle Random Access files. A Random Access technique means the ability to select a specific record without reading through previous records. The major disadvantage of disk is its relatively high cost.

DEVICE	INPUT	OUTPUT	SPEED	COMMONALITY	EXPENSE	ACCESS
PUNCHED CARDS	YES	YES	SLOW	LESS COMMON	INEXPENSIVE	SEQUENTIAL
PAPER TAPE	YES	YES	SLOW	RARE	INEXPENSIVE	SEQUENTIAL
MAGNETIC TAPE	YES	YES	MEDIUM	COMMON	INEXPENSIVE	SEQUENTIAL
DISK	YES	YES	FAST	COMMON	COSTLY	RANDOM
OCR	YES	NOT USUALLY	SLOW	RARE	COSTLY	SEQUENTIAL
MICR	YES	NOT USUALLY	SLOW	RARE	COSTLY	SEQUENTIAL
PRINTERS	NO	YES	SLOW	COMMON	COSTLY	------
COM	NO	YES	FAST	COMMON	COSTLY	------
CRT	NO	YES	MEDIUM	COMMON	INEXPENSIVE	------

Table 1

OCR represents Optical Character Recognition. With OCR humans and machines can read the characters. Human readable characters are optically scanned by the computer and interpreted into machine readable code. Obviously, this saves time and money by eliminating data conversion efforts. OCR input is usually typewritten on special forms. The computer uses a photo-electric cell to optically scan each character and convert it into machine-readable code. The major disadvantage of OCR equipment is cost. MICR (Magnetic Ink Character Recognition) is similar to OCR except characters to be read are magnetically coded. MICR is primarily used by the banking industry. Like OCR it is very expensive.

The most common form of output is printed. Printers and plotters print alphabetic, numeric or pictorial information in a variety of fonts and colors. Industrial printers operate from 200 lines per minute to 50,000 lines per minute. Laser printers, now being tested, will double that figure. Printed output is easy to read and convenient. Storage of printouts often becomes a problem: It is cumbersome and expensive. Computer Output Microfiche, COM, solves the problem by microfilming data output. The computer uses a pencil of light to produce the microfilm at speeds of up to 300 sheets a second. Since each microfiche sheet holds over a hundred pages of computer

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output and a page of computer output can hold 7,128 characters, one second of COM output creates almost 214 million characters. Microfiche is inexpensive to produce, store and maintain.

Another output device is the Cathode Ray Tube or CRT. CRT output is very fast and generally located at the user's site. The amount of data output is limited to reading speed. The CRT has no printout option. The CRT is a television-like device used extensively by microcomputers like the TRS-80 and by industries where the users are not located in the DP facility.

Table 1 charts the I/O devices according to their advantages and disadvantages.

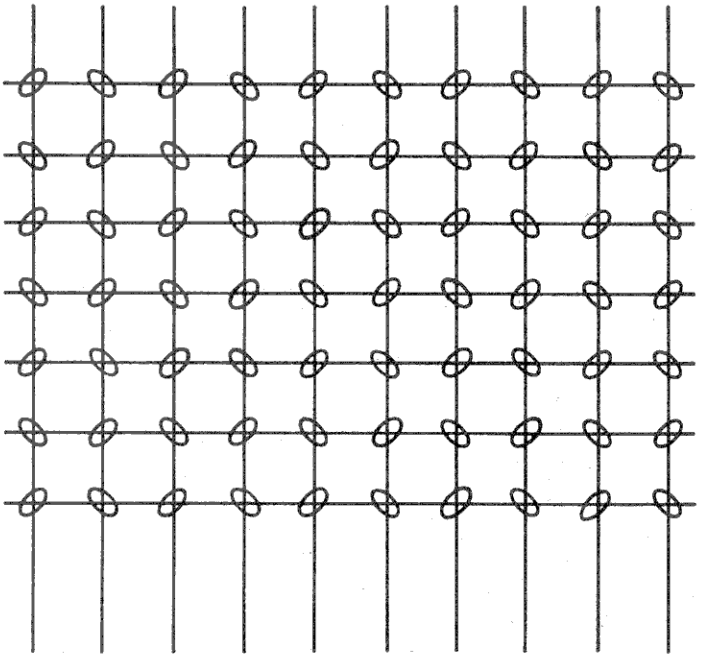

Figure 1

The Central Processing Unit (CPU)

Internally the CPU is divided into three functional units.

The Arithmetic/Logic Unit performs all arithmetic calculations and any comparisons.

The Control Unit is a combination traffic cop, orchestra conductor and manager. It activates all equipment, controls the input data reads and output data writes, and tells the Arithmetic/Logic Unit when to calculate or compare.

An Internal Memory Unit makes up the third part of the CPU. Memory within the CPU is usually called Core Storage. Although new advances in computers use non-core storage methodology, the term Core Storage is still widely used. Figure 1 illustrates typical Core Storage. Donut shaped rings, called cores, are strung on wires forming a grid called a Core Plan. Magnetizing a ring in a clockwise direction represents a binary 1, counterclockwise represents 0. Computer size is usually designated in terms of the number of addressable storage locations of internal memory. Operations performed in Core Storage are so fast they are usually measured in millionths or billionths of a second. ■

Gary Dilllio is a Computer Systems Analyst for the Department of the Navy. In past roles, as a Senior Programmer and Computer Specialist-Auditor, he has worked on a variety of computer systems throughout the world.

Eds. Note—This article is the first of a five-part series. Next month: Data Processing.

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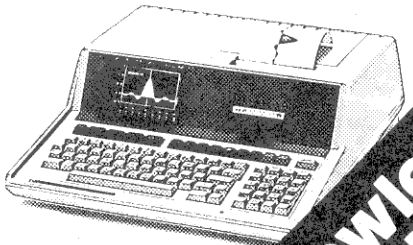

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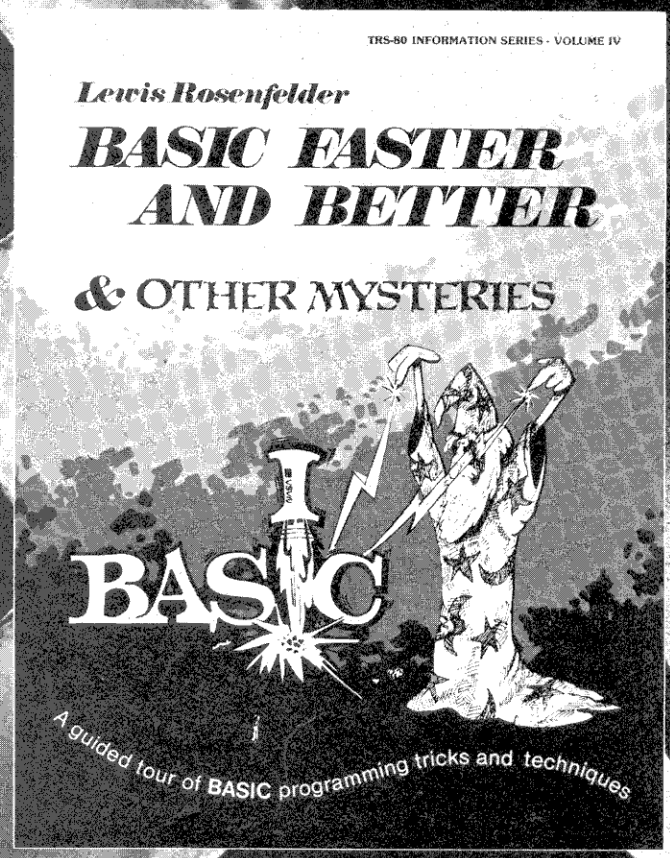

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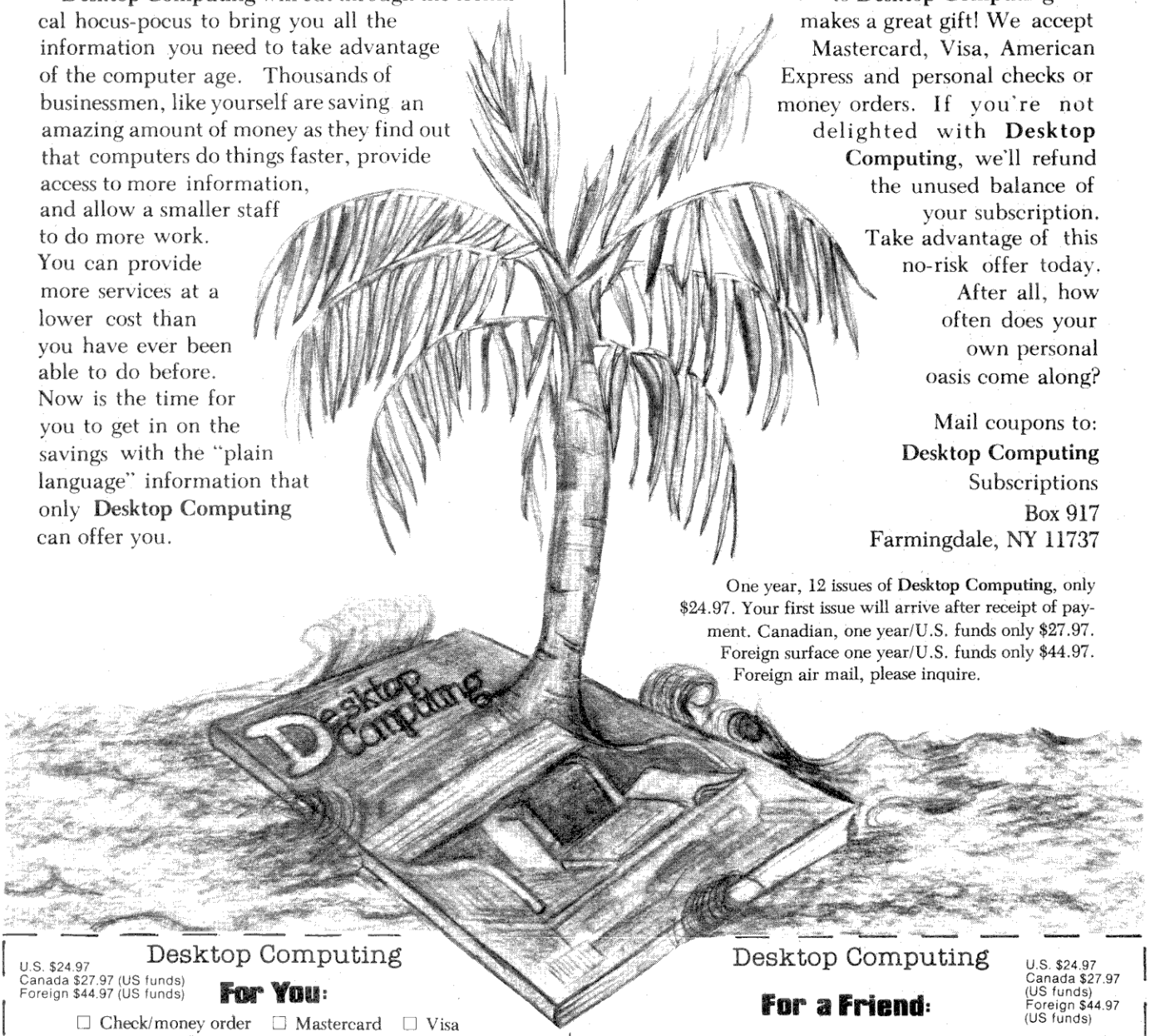

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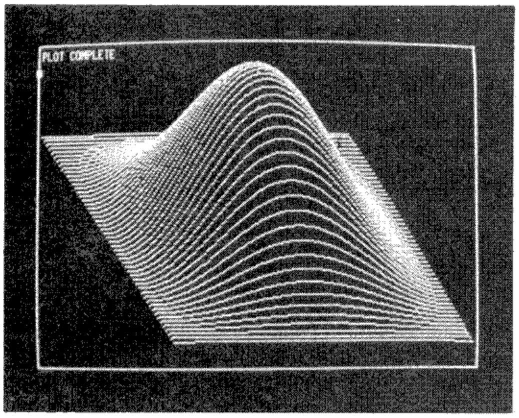

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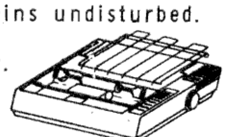

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21 REM ** TITLE PAGE & INSTRUCTIONS
30 PRINTCHR$(23):PRINT:PRINT"   **** SHOPPING LIST ****"
40 PRINT"       BY  J. A. KRAYNAK"
50 PRINT:PRINT:PRINT:PRINT"DO YOU NEED INSTRUCTIONS (Y/N)";
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70 CLS:PRINT:PRINT:PRINT"    FIVE LISTS OF GROCERIES WILL APPEAR ON THE SCREEN,
ONE"
80 PRINT"AT A TIME OF COURSE,  WITH A BLINKING CURSOR ( ) NEXT TO THE"
90 PRINT"FIRST ITEM ON THE LIST.  IF YOU DESIRE THAT ITEM TO BE ON YOUR"
100 PRINT"PRINTED SHOPPING LIST - PRESS THE 'Y' KEY.  IF NOT - PRESS THE"
110 PRINT"'N' KEY & THE CURSOR WILL MOVE ON TO THE NEXT ITEM.":PRINT
120 PRINT"     AN '*' WILL APPEAR TO THE LEFT OF THE ITEMS SELECTED.  TO"
130 PRINT"MOVE TO THE NEXT 'PAGE' PRESS THE '@' KEY.  YOU CANNOT GO"
140 PRINT"BACKWARDS...IF YOU FORGET AN ITEM - DON'T FRET - AFTER"
150 PRINT"RUNNING THE ENTIRE LIST YOU WILL BE ABLE TO ADD ITEMS NOT"
160 PRINT"LISTED OR FORGOTTEN; BEFORE THE PRINT-OUT OCCURS."
170 PRINT@15*64,"                 * PRESS SPACE BAR TO CONTINUE *";
171 REM ** INSTRUCTIONS BLINKING CURSOR ROUTINE
180 KL$=CHR$(143)
190 LK$=" "
200 PRINT@3*64+46,KL$;:FORDD=1TO10:NEXTDD
210 AA$=INKEY$:PRINT@3*64+46,LK$;:FORDD=1TO10:NEXTDD:IF AA$=" "THEN220ELSE200
220 H=0:K=-1:O=0:F=0:P=0:Q=0:R=0:S=0
230 DIM LT(45),LT$(250),ST$(250),LST(45),LST$(45),NL$(250),A$(50),B$(50),C$(50),
D$(50),E$(50),MS$(20)
240 CLS:PRINTCHR$(23):PRINT:PRINT:PRINT:PRINT:PRINT:PRINT"    **** LOADING DATA
****"
241 REM ** LOAD SCREEN WITH 45 ITEMS
250 FOR Y=1 TO 45:READ LT(Y):NEXT Y
260 FOR X=1 TO 45
270 READ LT$(X)
280 IF LT$(X)="*END"THEN GOTO 380
290 NEXT X
300 X=0:Y=0:H=0
310 CLS
311 REM ** SET UP CURSOR AT PROPER POSITION
320 X=X+1:Y=Y+1
330 IF X=46 THEN 830
340 PRINT@LT(Y),LT$(X);
350 ST$(H)=LT$(X)
360 H=H+1
370 GOTO 320
371 REM ** ADD MISC. ITEMS ROUTINE
380 CLS:W=0:PRINT"YOU MAY NOW ADD UP TO 20 ITEMS OF YOUR CHOICE THAT WERE NOT ON
  THE LIST.  AFTER EACH ITEM IS TYPED, PRESS <ENTER>.  WHEN FIN-  ISHED...TYPE '
END' FOLLOWED BY PRESSING <ENTER>."
390 PRINT:FOR I=1TO20
400 PRINT"ITEM #";I;"  ";
410 INPUT MS$(I)
420 IF MS$(I)="END"THEN 460
430 W=W+1
431 REM ** PREVENT INSTRUCTIONS FROM SCROLLING OFF SCREEN
440 IF I=11THENPRINT@4*64,CHR$(31);
450 NEXT I
460 CLS:PRINT"READY PRINTER"
470 PRINT"HIT ENTER WHEN READY"
480 A$=INKEY$: IF A$=""THEN 480
481 REM ** PRINT OUT
490 U=PEEK(14312)
500 IF U=63 GOTO 530 ELSE GOTO 510
510 PRINT@7*64,"******* PRINTER NOT READY....CORRECT & PROCEED *******"
520 FOR GG=1 TO 800:NEXT GG:CLS:GOTO460
530 CLS
```

Program continues

The only fancy part of the program is the blinking cursor routine in the instruction and selection portions. This is accomplished in lines 180-210 and 830-890. Exact spacing is important in lines 70-80 of the instructions. The blinking cursor should appear within the ( ), near the end of line 80.

Change the Data statements (lines 990-1550) to suit your particular needs. Change the periods in line 1540 according to the Remark statement in line 1535 if additions or deletions take place. Swaps will not affect line 1540. As written, 16 additional items can be permanently added to the program by deleting line 1540.

After completing the five page listing, you can add up to 20 other items. Line 440 prevents the top screen instructions from scrolling if more than 11 items are added. Terminate this section by typing End and hitting Enter. Lines 490-510 check the printer status; alter them for compatibility with your printer or delete them entirely. I use a Line Printer IV (Centronics 737). The subroutine beginning at line 1560 handles the tab print positions.

The program, approximately five grans in length, runs in Level II and Disk Basic. My wife uses the program weekly. ■

Program continued

```
540 LPRINT" ":LPRINT" ":LPRINT"              ******************* SHOPPING LIST **
*****************":LPRINT" ":LPRINT" ":LPRINT" "
550 NC=-20
560 FOR A=0 TO O-1
570 GOSUB1560
580 LPRINTTAB(NC) A$(A);
590 NEXT A
600 FOR A=0 TO P-1
610 GOSUB1560
620 LPRINTTAB(NC) B$(A);
630 NEXT A
640 FOR A=0 TO Q-1
650 GOSUB1560
660 LPRINTTAB(NC) C$(A);
670 NEXT A
680 FOR A=0 TO R-1
690 GOSUB1560
700 LPRINTTAB(NC) D$(A);
710 NEXT A
720 FOR A=0 TO S-1
730 GOSUB1560
740 LPRINTTAB(NC) E$(A);
750 NEXT A
760 FOR A=1 TO W
770 GOSUB1560
780 LPRINTTAB(NC) MS$(A);
790 NEXT A
800 LPRINT" ":LPRINT" ":LPRINT"              ******************** END OF LIST ***
*****************"
810 LPRINT" ":LPRINT" ":LPRINT" ":LPRINT" "
820 END
830 REM ** BLINKING CURSOR ROUTINE
840 C$=CHR$(143)
850 J$=" "
855 PRINT@15*64+5,"::::::::::::::PRESS '@' KEY FOR NEXT PAGE::::::::::::::";
860 FOR I=1 TO 45
870 PRINT@LT(I)-2,C$;
880 FOR DD=1TO5:NEXTDD
890 JK$=INKEY$:PRINT@LT(I)-2,J$;:FORDD=1TO5:NEXTDD:IFJK$="@"THEN960ELSEIFJK$="Y"
THENPRINT@LT(I)-2,"*";:K=K+1:GOTO900ELSEIFJK$="N"THENPRINT@LT(I)-2," ";:K=K+1:GO
TO950ELSE870
900 IF F=0 THEN A$(O)=ST$(K):O=O+1
910 IF F=1 THEN B$(P)=ST$(K):P=P+1
920 IF F=2 THEN C$(Q)=ST$(K):Q=Q+1
930 IF F=3 THEN D$(R)=ST$(K):R=R+1
940 IF F=4 THEN E$(S)=ST$(K):S=S+1
950 NEXT I
960 F=F+1:K=-1:GOTO260
961 REM ** SET UP SCREEN PRINT POSITIONS
970 DATA 5,25,44,69,89,108,133,153,172,197,217,236,261,281,300,325,345,364,389,4
09
980 DATA 428,453,473,492,517,537,556,581,601,620,645,665,684,709,729,748,773,793
,812,837,857,876,901,921,940
989 REM ** GROCERY ITEM LISTS . . 45 ITEMS PER 'PAGE'
990 DATA CANTALOUPES,MUSHROOMS,APPLES,CELERY
1000 DATA CARROTS,PEARS,LETTUCE,CUCUMBERS
1010 DATA TOMATOES,MARZETTI DRESSING,GREEN PEPPERS
1020 DATA BANANAS,POTATOES,CORN,CABBAGE
1030 DATA ONIONS,GRAPEFRUIT,GRAPES
1040 DATA ORANGE JUICE,DRY YEAST,EGGS,BUTTER
1050 DATA MARGERINE,MILK,CHEESE(SLICES)
1060 DATA CHEESE(PIZZA),MAYONNAISE,SALAD DRESSING
1070 DATA PICKLES(DILL),PICKLES(SLICES),MUSTARD
1080 DATA KETCHUP,PEANUT BUTTER,JELLY
1090 DATA RELISH,HOT SAUCE
1100 DATA SUB BUNS,DINNER ROLLS,FRENCH BREAD
1110 DATA ITALIAN BREAD,PIE,CAKE,DONUTS
1120 DATA POTATOE SALAD,MACARONI SALAD,KIELBASA
1130 DATA LUNCHEON MEAT,BALOGNA,KIELBASA LOAF
1140 DATA PIZZA LOAF,SALAMI
1150 DATA PEPSI,DIET PEPSI,7-UP,GINGERALE
1160 DATA DR PEPPER,R C COLA,POP,ROOTBEER
1170 DATA PEANUTS,WALNUTS,PLAIN CHIPS,RIPPLED CHIPS
1180 DATA PRETZELS,POPCORN,CORN CHIPS
1190 DATA CORN CURLS,DORITOS
1200 DATA MUSHROOMS,SAUERKRAUT,PEAS,CARROTS,GREEN BEANS
1210 DATA CORN,CHILI BEANS,PORK & BEANS,INSTANT COFFEE
1220 DATA REGULAR COFFEE,TEA BAGS,COCOA MIX,TOMATO SAUCE
1230 DATA TOMATO PUREE,TOMATO PASTE,TOMATOES(WHOLE)
1240 DATA FRUIT COCKTAIL,PINEAPPLES,TOMATO JUICE
1250 DATA DOG FOOD,CAT FOOD,BONZ,DOG YUMMIES,FLEA POWDER
1260 DATA FROSTED FLAKES,CHEERIOS,CORN FLAKES,SHREADED WHEAT
1270 DATA BEEF NOODLE SOUP,TOMATO RICE SOUP,CHICKEN SOUP
1280 DATA TOMATO SOUP,VEGTABLE SOUP,TUNA FISH,SALMON
1290 DATA RICE-A-RONI,RICE,SPAGETTI SAUCE,PIZZA SAUCE
1300 DATA SPAGETTI NOODLES,ELBO MACARONI,EGG NOODLES
1310 DATA RIGATONI,COOKIES,SALTEEN CRACKERS,RITZ CRACKERS
1320 DATA SOAP(FACE),SOAP(SHOWER),MR BUBBLE
1330 DATA CLEANSER,CHEER,WINDEX,VANISH,SOFT SCRUB
1340 DATA MR CLEAN,AIR FRESHNERS,SHOUT,BLEACH,IVORY LIQUID
```

Program continues

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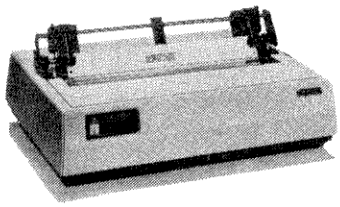

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Program continued

```
1350 DATA BOUNCE,AMMONIA,STARCH,TOP JOB
1360 DATA CAKE MIXES,FLOUR,CRISCO,VEGTABLE OIL,LOG CABIN SYRUP
1370 DATA PANCAKE MIX,SPICES,SALT,PEPPER,SUGAR,AU JUS GRAVY
1380 DATA MEAT LOAF MIX,STROGANOFF MIX,MEAT TENDERIZER,CANDY
1390 DATA MARSHMELLOWS,JELLO,CARNATION MILK,FREEZER WRAP
1400 DATA NAPKINS,GLAD WRAP,ALUMINUM FOIL,TRASH BAGS
1410 DATA GARBAGE BAGS,WAX PAPER,KLEENEX,TOILET PAPER,PAPER TOWELS
1420 DATA CAKE,BREAD,HAMBURG BUNS,HOT DOG BUNS,DINNER ROLLS
1430 DATA BREAD CRUMBS,CROUTONS,STUFFING MIX,SHAKE & BAKE
1440 DATA FISH FILETS,FRENCH FRIES,ONION RINGS,GNOCCHI
1450 DATA WAFFLES,LEMONADE,ORANGE JUICE,TANG
1460 DATA PIEROGIES,PIZZA,STEAK-UMMS,CHOPPED ONION
1470 DATA ICE CREAM,POP SICKLES,ICE CREAM TOPPINGS,COOL WHIP
1480 DATA FROZEN CHICKEN ,ROAST BEEF DINNER,FROZEN TURKEY
1490 DATA FROZEN STRAWBRY,FROZEN MIXED FRUIT
1500 DATA HOT DOGS,BACON,SAUSAGE,FISH,CHICKEN,TURKEY
1510 DATA PEPPER STEAKS,STEAK,ROAST,CHOPPED SERLOIN
1520 DATA HOT SAUSAGE,HAMBURGER,GROUND CHUCK,HAM,PORK CHOPS
1530 DATA SPARE RIBS,CIGARETTES,PIPE TOBACCO,PIPE FILTERS,T V GUIDE
1535 REM ** DELETE A PERIOD '.' IN DATA LINE 1540 FOR EACH NEW    ITEM ADDED OR
ADD PERIOD '.' IN DATA LINE 1540 FOR EACH ITEM    DELETED.
1540 DATA ..,..,..,..,..,..,..,..,..,..,..,..,..,..,..,..,..,..,..,..,..,..,..,..
1550 DATA *END
1560 NC=NC+20
1570 IF NC>60 THEN LPRINTCHR$(13):NC=0
1580 RETURN
1590 'SAVE AS "SHOPPING/JAK"
```


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If you are robbed can you quickly and accurately determine what is stolen? The police will need to know; so will your insurance company if you hope to be compensated for your loss.

My wife and I always intended to take an inventory of our household possessions. We were going to place a copy of that inventory in our safe deposit box at the bank for safekeeping. We did not conduct that inventory, however, until I purchased a TRS-80 Model III.

We now have a complete inventory of our household possessions recorded on computer tape. One copy of the program remains at home, another resides in our safe deposit box. Now, if we should be the victims of a burglary, and if the burglar is considerate enough to overlook my computer, we will be able to determine in a matter of moments exactly what was taken, when it was purchased, and how much we paid for it. In addition, we will be able to give the police an accurate description of the items taken, along with their identifying serial numbers.

Even if my computer is stolen, all is not lost. We will take the tape of the inventory to our friendly Radio Shack store and provide a real-life demonstration of how useful that computer can be.

My home inventory program can be just as useful for establishing the extent of a loss due to a fire or other major or minor catastrophe. In addition, there are times when it is interesting to see exactly just how much you have accumulated over a period of years. You will no doubt be surprised—you may even want to increase the amount of insurance you hold after seeing how much you have spent to obtain all those treasures.

Program Listing

```
100 CLS:PRINT @ 338,"****************************"
105     PRINTTAB(18)"*  HOME INVENTORY PROGRAM  *"
110     PRINTTAB(18)"*  ---- --------- -------  *"
115     PRINTTAB(18)"*            BY            *"
120     PRINTTAB(18)"*      DAVID G. KUHN       *"
125     PRINTTAB(18)"****************************"
130     FOR I=0 TO 1000:NEXT I
135 '** PRINT THE MENU OF OPTIONS
140 CLS:PRINT @ 222,"MENU":PRINTTAB(30)"----":
        PRINTTAB(21)"1 = LIST ALL ITEMS":
        PRINTTAB(21)"2 = LIST BY LOCATION":
        PRINTTAB(21)"3 = ADD AN ITEM TO INVENTORY":
        PRINTTAB(21)"4 = TERMINATE PROGRAM"
145     PRINT:PRINT:
        PRINTTAB(21)"PLEASE CHOOSE BY NUMBER"
150 '** RECORD MENU CHOICE USING INKEY$ AND EXECUTE OPTION
155     K$=INKEY$:IF K$=""THEN 155 ELSE K=VAL(K$)
160     IF K=1 THEN 185
165     IF K=2 THEN 225
170     IF K=3 THEN CLS:GOTO 420
175     IF K=4 THEN CLS:END
180     GOTO 155
185 '** INITIALIZE CUM.VAL.'T', READ, AND LIST ALL ITEMS
```

Program continues

The Program

I wrote the home inventory program (see the Program Listing) before I invested in a printer. I designed it to be used with the bare minimum of equipment. If you have a printer, it is easy to get printouts using the Model III's screen print function, or you can easily modify the inventory program to print what you desire.

When you run the program, it will display a menu of options. You may choose to: list all items included in the inventory; list only those items to be found at a specified location; add items to the inventory; or terminate the program.

Option 2 limits the display of inventoried items to a specified location. You could conduct a room-by-room check for missing items. Program lines 235, 240, and 245 display the appropriate locations and their respective codes. (Substitute locations of your choice for those that I used in the program. Make similar substitutions in lines 310–360, and line 430.)

Adding Items

Add inventory items to the program using Data statements, starting with line 500. Whenever you want to add one or two new items to the inventory select menu Option 3. The program clears the screen and protects the top seven lines of the display from scrolling (line 425). It then displays on those protected lines a copy of your location codes (line 430) and the appropriate format for the new Data statements (line 440). In addition, line 455 lists items already included in the inventory and clearly indicates where the new Data statements should begin.

Scroll protection is lost if you enter more than two Data statements under Option 3 (somehow memory location 16916 gets set back to zero). This means that you lose the display of the location codes and the format for adding new inventory items. This is usually not a significant problem because you normally add only one or two new items at any one time. However, when you want to add a large number of items to the inventory at one sitting, you may find it helpful to prepare and then refer to a card containing the location codes and format. Also, remember to use the Model III's automatic line numbering function.

Should you desire to remove or modify an item in the inventory, take note of the Data statement line number that is displayed along with the other information on that item. You can now easily remove that line from the program or edit it. The Model III's edit function is very convenient for quickly finding and modifying any of the inventory items.■

David G. Kuhn is an Associate Professor of Management in the College of Business at Florida State University.

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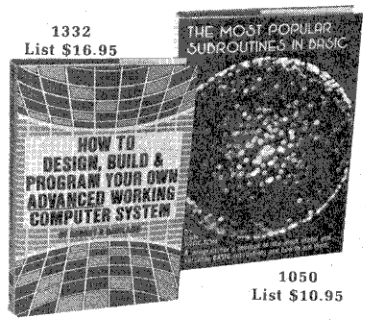

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Program continued

```
190      T=0
195      READ DSN$:IF DSN$="END" THEN 395
200      READ ITEM$,LC,DATE$,MAKE$,CST,ID$
205 CLS:PRINT "ITEM:" TAB(20) ITEM$
210      PRINT:PRINT "LOCATION:" TAB(20);:GOSUB 300
215      GOSUB 365
220      GOTO 195
225 '** PRINT LOCATION CODES
230 CLS:PRINTTAB(24)"LOCATION CODES":
        PRINTTAB(24)"--------------"
235      PRINT " 1 = LIVING ROOM":
         PRINT " 2 = DINNING ROOM":
         PRINT " 3 = KITCHEN":
         PRINT " 4 = FAMILY ROOM"
240      PRINT " 5 = DEN":
         PRINT " 6 = CHILDREN'S ROOM":
         PRINT " 7 = MASTER BEDROOM":
         PRINT " 8 = MASTER BATH"
245      PRINT " 9 = HALL BATH":
         PRINT "10 = GARAGE":
         PRINT "11 = OTHER LOCATIONS"
250      PRINT:PRINTTAB(15)"SELECT LOCATION CODE AND <ENTER>";:
         INPUT NUM
255 '** INITIALIZE CUM.VAL.'T', READ, AND LIST BY LOCATION
260 CLS:T=0
265      READ DSN$:IF DSN$="END" THEN 395
270      READ ITEM$,LC,DATE$,MAKE$,CST,ID$
275      IF LC<>NUM THEN CLS:PRINT@474,"SEARCHING":GOTO 265
280 CLS:PRINT "ITEM:" TAB(20) ITEM$
285      PRINT:PRINT "LOCATION:" TAB(20);:GOSUB 300
290      GOSUB 365
295      GOTO 265
300 '** THIS SUBROUTINE PRINTS THE LOCATION OF AN ITEM
305      ON LC GOTO 310,315,320,325,330,335,340,345,350,355,360
310      PRINT "LIVING ROOM":RETURN
315      PRINT "DINNING ROOM":RETURN
320      PRINT "KITCHEN":RETURN
325      PRINT "FAMILY ROOM":RETURN
330      PRINT "DEN":RETURN
335      PRINT "CHILDREN'S ROOM":RETURN
340      PRINT "MASTER BEDROOM":RETURN
345      PRINT "MASTER BATH":RETURN
350      PRINT "HALL BATH":RETURN
355      PRINT "GARAGE":RETURN
360      PRINT "OTHER LOCATIONS":RETURN
365 '** THIS SUBROUTINE PRINTS DATE$,MAKE$,CST,ID$,DSN$,T
370      PRINT:PRINT "DATE PURCHSED:" TAB(20) DATE$:
         PRINT:PRINT "MAKE:" TAB(20) MAKE$:
         PRINT:PRINT "ORIGINAL COST $:" TAB(19) CST
375      PRINT:PRINT "IDENTIFICATION:" TAB(20) ID$:
         PRINT:PRINT "DATA STATEMENT #:" TAB(20) DSN$;
380      T=T+CST:
         PRINTTAB(35) "CUM. VAL. = $";:
         PRINT USING "#,######.##";T
385      PRINT:PRINTTAB(15)"** PRESS <ENTER> TO CONTINUE ** ";:
         INPUT E$
390      RETURN
395 '** PRINT END OF DATA MESSAGE AND RETURN TO MENU
400 CLS:PRINT "THAT'S ALL THERE IS!":
         PRINT:PRINT:
         PRINT "THE TOTAL CUM. VAL. OF ITEMS REVIEWED = $";:
         PRINT USING "#,######.##";T
405      PRINT:PRINT:PRINT:PRINT:PRINT:RESTORE
410      PRINTTAB(14)"** PRESS <ENTER> TO RETURN TO MENU ** ";:
         INPUT E$
415      GOTO 135
420 '** THE FOLLOWING POKE PROTECTS THE TOP SEVEN LINES AND
         ALLOWS THE LOCATION CODE AND DATA FORMAT TO BE DIS-
         PLAYED
425 CLS:POKE 16916,7
430 PRINT"LOCATION CODE: 1=LIVING RM, 2=DINNING RM, 3=KITCHEN,
         4=FAMILY RM, 5=DEN, 6=CHILDREN'S RM, 7=MASTER BED RM,
         8=MASTER BATH, 9=HALL BATH, 10=GARAGE, 11=OTHER"
435      PRINT
440 PRINT"FORMAT: DATA STATEMENT #, ITEM, LOCATION CODE, DATE,
         MAKE, COST, ID"
445 PRINT "-------------------------------------------------------
---------"
450 '** THE FOLLOWING LISTS THE DATA STATEMENTS AND ALLOWS THE
         USER TO IDENTIFY WHERE TO BEGIN ADDING NEW STATEMENTS
455      LIST 460-
460 '** DATA STATEMENTS SHOULD START ON LINE 500 AND INCREMENT
         BY 1
465 '*******************************************************
500 DATA 500,SOFA,1,SEPTEMBER 1981,XYZ COMPANY,395.95,#12345
501 DATA 501,END TABLE,1,9/81,ABC COMPANY,199.95,#54321
502 DATA 502,OVAL TABLE,2,9-81,ABS COMPANY,399.99,#6789
503 DATA 503,SIX CHAIRS,2,SEPT. 81,ABC COMPANY, 425.00,#9876
504 DATA 504,STOVE,3,SEPT. 81,XYZ COMPANY,350,#121212
505 DATA 505,REFRIGERATOR,3,9/81,XYZ COMPANY,375,#232323
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508 DATA 508,COMPUTER,5,SEPT. 81,HINT!-RS,999,#577577
509 DATA 509,CHAIR,5,9-81,?,15,BROWN WOOD
510 DATA 510,BED,6,SEPTEMBER 1981,BETTER BED INC.,0,#92397
511 DATA 511,DESK,6,9/25/81,FRIENDLY DESK COMPANY,100,#543
512 DATA 512,BED,7,SEPT.81,BETTER BED INC.,155.95,#94558
513 DATA 513,CAR,10,SEPT.81,NEW CAR COMPANY,6499.99,#12843
514 DATA 514,CREDIT CARD,11,SEPT. 1981,EASY CREDIT,0,#932993
1000 '
1005 '
1010 '*******************************************************
1015 '***** THE FOLLOWING DATA STATEMENT MUST BE THE LAST *****
1020 DATA END
```


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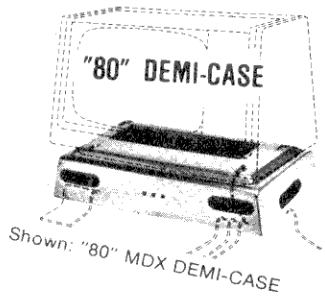

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Five popular, inexpensive printers compared.

Dot Matrix Bargains

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Microcomputers appeared in 1975 and cost three to four times as much then as they cost now, and had fewer features. Many said printer prices would not follow this trend, due to the mechanical nature of printers. However, one can now buy a printer with better quality print and more features for $200–$300 less than a comparable printer two years ago. One can now buy a dot matrix printer which produces (for all practical purposes) typewriter quality for well under $1000.

The dot matrix method has firmly established itself in the inexpensive printer field and, since this method makes many fonts available, is making strides in line printer technology (where whole lines of dots are printed at a time rather than seven or nine single vertical dots).

I have chosen to review five printers, made by Base$_2$, Centronics, Epson, Integral Data Systems and Okidata. All five have been introduced in the last year, are dot matrix, have upper and lowercase, accept 8½-inch (or wider) paper, and are in the $600–$1000 price range. These five printers are among the most sought after and best values in small printers for the hobbyist and small businessman.

I have used each printer for several days and have made a comparison chart highlighting features I think would interest prospective buyers. Included

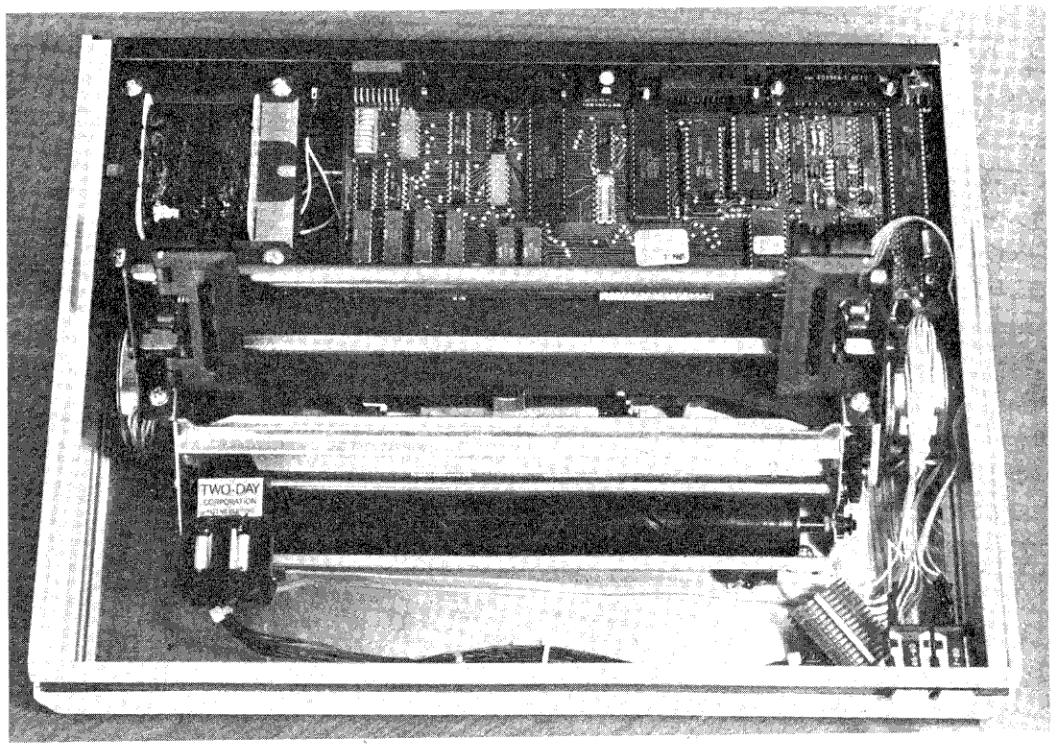

Photo 1. The Base$_2$ 850

BASE 2 850 DEMONSTRATION:

64 Characters per Line

72 Characters per Line

80 Characters per Line

96 Characters per Line

120 Characters per Line

132 Characters per Line

ELONGATION:

32 Characters per Line

36 Characters per Line

40 Characters per Line

48 Characters per Line

60 Characters per Line

66 Characters per Line

Sample 1. Base$_2$ 850 demonstration.

Normal 10 CPI

Normal 10 CPI Elongated

Normal Proportional

Elongated Proportional

Condensed 16.7 CPI

Condensed 16.7 CPI Elongated

Sample 2. Centronics 737 demonstration.

are photos of each printer and print samples showing the variations of characters each can produce.

Facts such as availability, cost at the time of purchase, location and availability of service, etc., will influence your choice. You may be interested in features that can be tested only when you have the printer at your location. I know a businessman that tested a printer and found it unacceptable because his secretary could not load an 8½ by 11-inch sheet of stationery into the printer in less than five seconds.

The Base$_2$ 850

The 850 is made by Base$_2$ Inc., a small California company that has produced some 5000 printers during the past 1½ years. The 850 has been introduced to replace the 800 which had some problems with print head reliability. The new printer has a continuous-duty printer head.

The 850 is unique in that it comes standard with a 2K FIFO buffer, bit graphics, RS-232, 20 ma current loop, IEEE-488, and parallel (Centronics compatible) interfaces. This array of interfaces should match any change in hardware configurations. The 2K FIFO buffer is necessary for graphics, since a full line of data must be sent to the printer before printing begins. The buffer also allows the use of RS-232 at 600 baud without handshaking, for most applications. Another unique feature of the 850 is that paper can be fed into it from the bottom, front or rear. I found the 850 to be the most difficult for paper loading, probably due to the close tolerances used for the friction-feed feature.

This printer should be of particular interest to Apple owners, since it can print hi-res Apple graphics (see samples). A special parallel board from Base$_2$ can copy a high resolution graphics image from screen to paper with a single command. The board also supports Centronics-compatible parallel printers. The color of the 850 matches the Apple color scheme.

The 850 prints an average quality dot matrix character, and offers its best quality in the elongated 132 character per line

Epson MX - 80
Standard

Epson MX - 80
Standard - Emphasized

Epson MX - 80
Standard - Double Strike

Epson MX - 80
Standard - Emphasized - Double Strike

Epson MX - 80
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Double Width

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Sample 3. Epson MX-80 demonstration.

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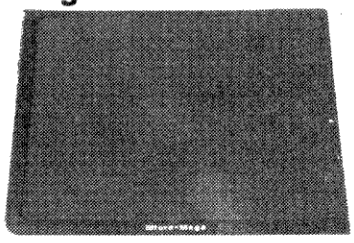

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mode, yielding 66 characters per line. The 850 was the only printer I tested capable of inverse printing. The processing time of the Base$_2$ printer was good, placing it third in this category, but very close to the Epson MX-80. It was not the most quiet in the group, falling behind the Epson, Okidata and Centronics printers. The 850 includes most features as standard and has only one accessory, a roll paper holder (for friction feed) and wire tray combination for $25.

The Centronics 737

This printer also goes by the name of Lineprinter IV by Radio Shack. The 737 tied with the Epson MX-80 as the lightest printer. It was of average noisiness and has the only gear-driven print head of the five. The print head is massive (comparable to that of the IDS 445) and this, plus its not being bi-directional, accounted for the fact that the 737 was the slowest printer I tested. However, it compensates for the slower processing time with its quality. In the proportional mode it has the most professional looking print I have seen in a dot matrix printer. While most characters take up a given width on a printer, in the proportional mode the 737 uses varying widths for the different characters, along with enhancements—particularly on capital letters such as E, N, and P, as shown in the print samples. The result is essentially a typewriter-quality printout.

The proportional mode uses 1185 dots for the 80 character line. It is ideally suited for right justification since spaces the width of dots can be inserted between words and letters. However, the 737 is reportedly not compatible with Scripsit at this time. In addition to the proportional mode, this is the only printer of the five that can print

```
IDS - 445 Paper Tiger at  8.3 Characters/Inch
The Enhanced Mode Looks Like This

IDS - 445 Paper Tiger at  10 Characters/Inch
The Enhanced Mode Looks Like This

IDS - 445 Paper Tiger at  12 Characters/Inch
The Enhanced Mode Looks Like This

IDS - 445 Paper Tiger at  16.5 Characters/Inch
The Enhanced Mode Looks Like This
```

Sample 4. IDS 445 Paper Tiger demonstration.

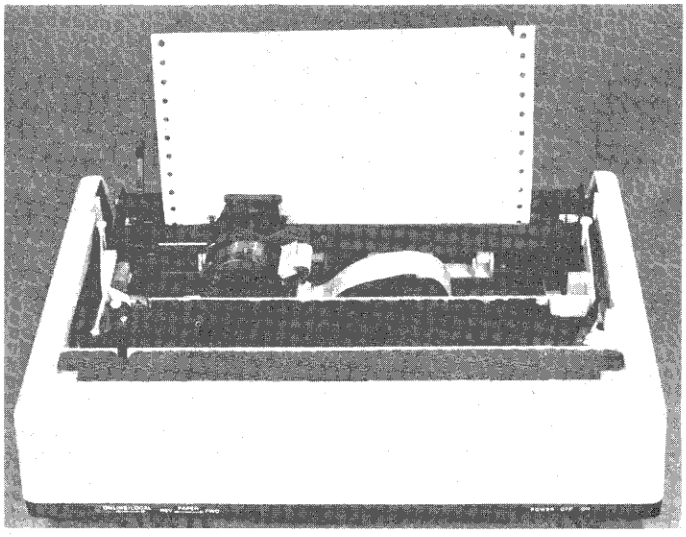


Photo 2. The Centronics 737

QUALITY SOFTWARE FOR TRS-80 COLOR!

ADVENTURES!!!!

For TRS-80, and COLOR-80. These Adventures are written in BASIC, are full featured, fast action, full plotted adventures that take 30-50 hours to play. (Adventures are inter-active fantasies. It's like reading a book except that you are the main character as you give the computer commands like "Look in the Coffin" and "Light the torch.")

Adventures require 16K on COLOR-80 and TRS-80. They sell for $14.95 each.

ESCAPE FROM MARS
(by Rodger Olsen)
This ADVENTURE takes place on the RED PLANET. You'll have to explore a Martian city and deal with possibly hostile aliens to survive this one. A good first adventure.

PYRAMID (by Rodger Olsen)
This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!

TREK ADVENTURE (by Bob Retelle)
This one takes place aboard a familiar starship. The crew has left for good reasons - but they forgot to take you, and now you are in deep trouble.

DEATH SHIP (by Rodger Olsen)
Our first and original ADVENTURE, this one takes place aboard a cruise ship - but it ain't the Love Boat.

VAMPIRE CASTLE (by Mike Bassman)
This is a contest between you and old Drac - and it's getting a little dark outside. $14.95 each.

SPACE SHUTTLE
ONE OR TWO PLAYER HIGH RES GAME — Your mission is to dock with an orbiting space platform — but you may have to land on the planetary surface for refueling first. A real value in a high res real time game. $6.95.

KILLERBOT — (Available in 4K) — Real time action at 20 levels of difficulty as you run, sneak, and dodge your way through a bloody field of Killer Robots. Get across or die! Joysticks or Keyboard controls. TRS-80 COLOR (ANY BASIC 4K or more.). $9.95.

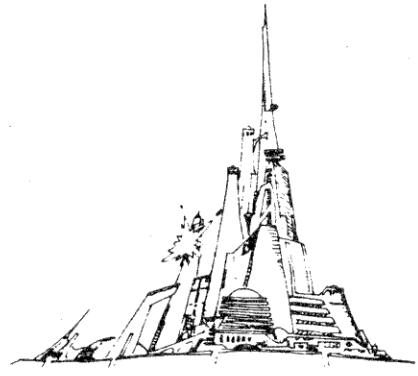
SLASHBALL (Available in 4K) — This one is best described as a thinkers arcade game. It rewards fast reflexes and clear thinking — like nothing you have ever seen before. It is one of our best family games for one or two players. $9.95.

TIMETREK - A REAL TIME, REAL GRAPHICS STARTRECK. See your torpedoes hit and watch your instruments work in real time. No more unrealistic scrolling displays! $14.95.

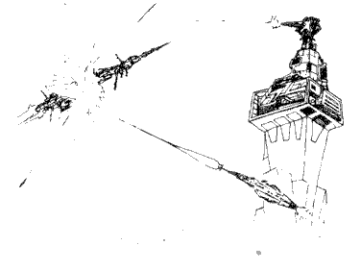
STARFIGHTER - This one man space war game pits you against spacecruisers, battlewagons, and one man fighters, you have the view from your cockpit window, a real time working instrument panel, and your wits. Another real time goody. $9.95

BATTLEFLEET - This grown up version of Battleship is the toughest thinking game available on OSI or 80 computers. There is no luck involved as you seek out the computers hidden fleet. A topographical toughie. $9.95

LABYRINTH — 16K EXTENDED COLOR BASIC — With amazing 3D graphics, you fight your way through a maze facing real time monsters. The graphics are real enogh to cause claustrophobia. The most realistic game that I have ever seen on either system. $14.95.



QUEST - A NEW IDEA IN ADVENTURE GAMES! Different from all the others, Quest is played on a computer generated map of Alesia. Your job is to gather men and supplies by combat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time. 16K COLOR-80 OR TRS-80 ONLY $14.95.



SPACE ZAPPER — Protect your central Star Base from ships that attack from all four sides. Fast reflexes are required as the action speeds up. Great for kids or Dads. This game has high speed high resolution graphics and looks as if it just stepped out of the arcades. — 16K extended or 32K disk. BASIC TRS-80 Color only. $14.95.

Please specify system on all orders

This is only a partial listing of what we have to offer. We have arcade and thinking games, utilities and business programs for the OS1 and TRS-80 Color. We add new programs every week. Send $1.00 for our complete catalog.

AARDVARK - 80

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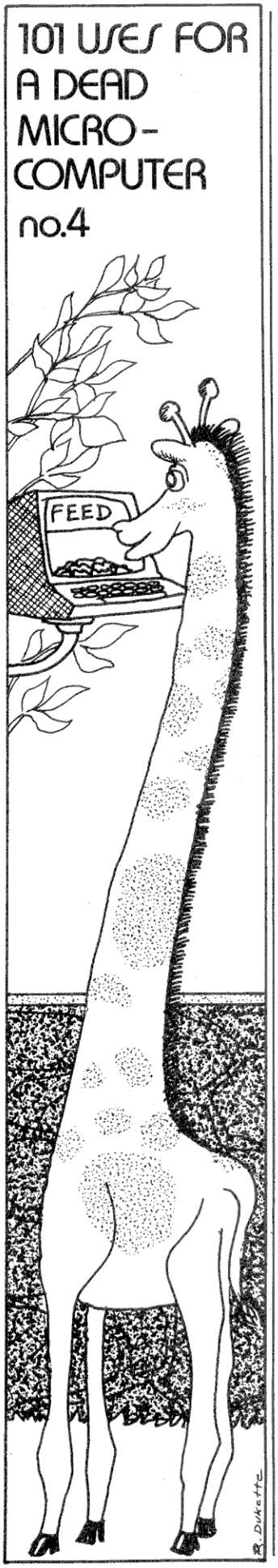

subscripts and superscripts, and do true underlining.

The 737 has friction feed and handles only 9½-inch pinfeed paper. The paper carriage is at the rear of the printer, making the inclusion of tractors impractical. The 737 does not have a paper-out indicator and is missing a hardware top-of-form advance—features I would expect to find on a printer of this price. The 737 is the only printer of the five that offers no form of graphics.

Printer Comparison Chart

	BASE$_2$ 850	CENTRONICS 737
Weight	15 lbs	12 lbs
Size (H × W × D) in.	3 × 15 × 11	5 × 14.5 × 11
List Price	$799, wire tray & paper roller–$25	$995
Standard Interface (if parallel, is Centronics compatible)	Parallel, series (20mA & RS-232), IEEE-488	Parallel
Speed	100 cps at all character densities	50 cps @ 10 cpi
Time to list typical 5.6K Basic program @ 10 cpi	2 min. 20 sec.	4 min. 5 sec.
Bi-directional	Yes (can select uni-directional)	No
Print head life expectancy (characters)	100 million	150 million
Print head drive	Roller Cam	Gear
Descenders	No	Yes
Number of wires in print head	7	9
Number of possible print variations of characters	12 plus inverse printing	6
Print head replacement cost	$50	$172
Densities (characters/line)	64, 72, 80, 96, 120, 132 plus elongated for each	40, 66, 80, 132 monospaced 8.2 to 24.6 cpi in proportional mode depending on text
Graphics	Dot resolution control, 5 densities, 99 dots/in. max. hor. 72 dots/in. max. vert.	None
Slash zeroes	Yes	No
Line spacing	6 lines/in. default. Programmable in half dot increments	6 lines/in.
Maximum paper width	9½ in. fanfold, 8½ in. cut	9½ in. fanfold, 8½ in. cut
Tractors	Yes, to 9½ in.	No, pinfeed 9½ in. paper only
Friction feed	Yes	Yes
Paper loading	Rear, bottom, or front	Rear
Paper tray	Available	No, separator used to divide paper in & out
Paper roll holder	Available	Yes
Copies	Up to 3 part	Up to 3 part
Paper out indicator	No	No
Top of form control	Yes (hardware & software)	Yes (software only)
External controls	Power, on line/off line, form/line feed	Power, on line/off line, Paper FWD/REV
Ribbon	½ in. width, cartridge, 5 million character expectancy	15 yd. zip-pack mobius loop
Noise (on a scale from 1–5 with 1 being most quiet)	4	3
Company address & phone	Base$_2$ Inc. P.O. Box 3548 Fullerton, CA 92631 800-854-7360	Centronics Data Computer Corp. 1 Wall Street Hudson, NH 03051 603-883-0111

The Epson MX-80

The MX-80 is designed to be compatible with the TRS-80 and supports the Model I and III block graphics. The MX-80 can print some graphics that can't be produced on the screen, since it has programmable line spacing. It is the first printer advertised as having a disposable print head which can be replaced for under $30 (well under other print head prices).

The MX-80 tied for being the lightest in the group, came in second for quietness and speed (on a typical 5.6K Basic program), has descenders, is bi-directional, is the least expen-

Printer chart continues

	EPSON MX-80	INTEGRAL DATA SYSTEMS 445	OKIDATA MICROLINE 80
Weight	12 lbs	20 lbs	14 lbs
Size (H × W × D) in.	4.2 × 14.7 × 12	12.5 × 15.75 × 12.5	4.25 × 13.5 × 9.75
List Price	$645; bit graphics, serial interface addl.	$795; add $99 for graphics, paper tray addl.	$800, tractors $140, buffered RS-232, addl.
Standard Interface (if parallel, is Centronics compatible)	Parallel	Parallel & Series	Parallel
Speed	80 cps @ 10 cpi	120 cps @ 10 cpi	80 cps @ 10 cpi
Time to list typical 5.6K Basic program @ 10 CPI	2 min. 19 sec.	2 min. 12 sec.	3 min. 6 sec.
Bi-directional	Yes (logic seeking)	No	No
Print head life expectancy (characters)	50-100 million	300 million	200 million (guaranteed)
Print head drive	Belt	Belt	Belt
Descenders	Yes	No	No
Number of wires in print head	9	7	9
Number of possible print variations of characters	12	8	3
Print head replacement cost	Under $30	$150	$115
Densities (characters/line)	40, 66, 80, 132	66, 80, 96, 132 plus enhanced (elongated) for each	40, 80, 132
Graphics	64 block characters TRS-80 compatible	Optional, Maximum density 72 dots/in. vertical, 64.2 dots/in. horizontal	64 block characters TRS-80 compatible
Slash zeroes	No	No	Yes
Line spacing	6 or 8 lines plus n lines/in. programmable	6 or 8 lines/in.	6 or 8 lines/in.
Maximum paper width	10 in. fanfold	9½ in. fanfold	9½ in. fanfold, 8½ in. cut
Tractors	Yes to 10 in.	Yes to 9½ in.	Optional, to 9 in.; 9½ in. pinfeed standard
Friction feed	No	No	Yes
Paper loading	Rear	Bottom or rear	Rear
Paper tray	No, separator used to divide paper in & out	Available	No
Paper roll holder	Does not apply	Available	Yes
Copies	Up to 3 part	Up to 4 part, more with adjust.	Up to 3 part
Paper out indicator	Yes	Yes	Yes
Top of form control	Yes (hardware & software)	Yes (hardware & software)	Yes (software only)
External controls	Power, LF, FF, On/Off line	Power, On/Off line, Line/form feed, form set	Power, On/Off line
Ribbon	Cartridge, 3 million character expectancy	½ in. cartridge, mobius loop, 6 million character expectancy	Standard ½ in. wide, 2 in. typewriter type
Noise (on a scale from 1-5 with 1 being most quiet)	2	5	1
Company address & phone	Epson America, Inc. 2384 Hawthorne Blvd. Torrance, CA 90505 213-378-2220	Integral Data Systems Milford, NH 03055 603-673-9100	Okidata Corporation 111 Gaither Drive Mt. Laurel, NJ 08057 609-235-2600

See List of Advertisers on page 338

```
10 PRINT"1 - 16.5 Characters/Inch
20 PRINT"2 - 10 Characters/Inch
30 PRINT"3 - 5 Characters/Inch
35 INPUT C
40 IF C<1 OR C>3 THEN 35
50 LPRINTCHR$(27);CHR$(28+C)
60 PRINT"0 - 6 Lines per Inch
70 PRINT"1 - 8 Lines per Inch
80 INPUT L
90 IF L<0 OR L>1 THEN 80
100 LPRINTCHR$(27);CHR$(54+2*L)
```


```
10 PRINT"1 - 16.5 Characters/Inch
20 PRINT"2 - 10 Characters/Inch
30 PRINT"3 - 5 Characters/Inch
35 INPUT C
40 IF C<1 OR C>3 THEN 35
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100 LPRINTCHR$(27);CHR$(54+2*L)
```


```
10  PRINT"1  -  16.5 Characters/Inch
20  PRINT"2  -  10 Characters/Inch
30  PRINT"3  -  5 Characters/Inch
35  INPUT C
40  IF C<1 OR C>3 THEN 35
50  LPRINTCHR$(27);CHR$(28+C)
60  PRINT"0  -  6 Lines per Inch
70  PRINT"1  -  8 Lines per Inch
80  INPUT L
90  IF L<0 OR L>1 THEN 80
100 LPRINTCHR$(27);CHR$(54+2*L)
```

Sample 5. Okidata Microline 80 demonstration.

sive and offers the boldest print option. The MX-80 also has the best documentation, if you get the manual by David Lien rather than the standard manual. Lien's manual does a nice job of presenting the operation of the printer to the beginner.

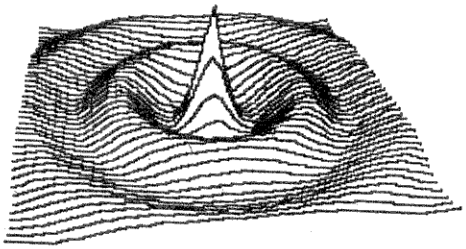
Up to twelve character variations can be produced under software control. Standard width, compressed width and double-width characters can be obtained, and most of these can be spiced up with double strike, emphasized mode or both. In the double strike mode, the line is printed once, then the paper is advanced 1/216th of an inch and the line is printed again in the same direction. This fills in some of the holes in the dot matrix character. However, I think the emphasized mode offers better quality. In this mode each dot is double printed (with a slight shift to the right between strikes) in a single pass so the printer can maintain its bi-directional mode. This offers an excellent print, very close to typewriter quality. In addition to the variations on standard American letters, the MX-80 offers some special Japanese, German, French, English and American characters.

The line feed of the MX-80 is fairly slow and in some applications may slow processing time. I timed the MX-80 on one-inch wide mailing labels (which require many line feeds while being printed) and found it to be 10 percent slower than my Heath H-14, which is not bi-directional.

I have two criticisms of the MX-80. The first is that it is missing the friction feed feature making use of letterhead impossible. However, considering the printer's overall quality and excellent value, a company should be able to get their letterhead printed on fanfold paper (with removable holes). Better yet, the letterhead could be printed with graphics and double-width emphasized print on the paper.

The second criticism is that I have observed characters not being placed exactly vertical from each other on both the MX-80's I have tested. This hap-

72 dots per inch



54 dots per inch

Sample 6. Base$_2$ 850 graphics.

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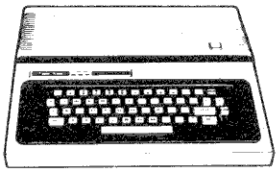
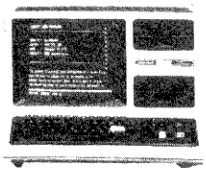
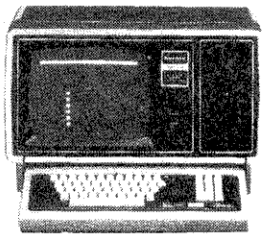


TRS-80® Color Computer With Extended Color BASIC



26 – 1062
Model III 16K RAM
Model III, BASIC
$825.00



26 – 4002
Model II, 64K

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Now my accounting systems run on CP/M as well as TRSDOS.

So they'll work with your micro, no matter which it uses.

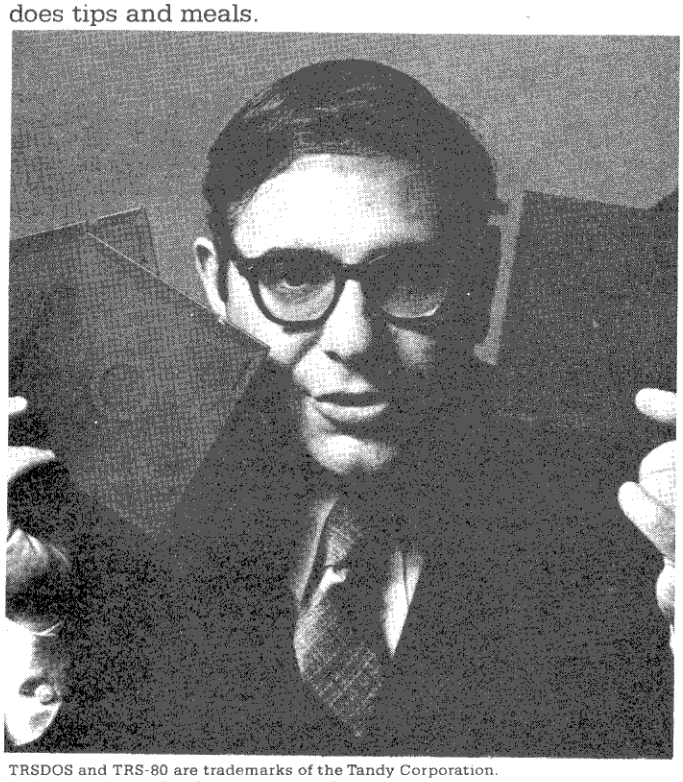
I'm Irwin Taranto, and I originally designed my Model II systems to work with TRSDOS, the operating software Radio Shack supplies with the TRS-80.

I designed them extremely carefully, with features other microcomputer accounting systems don't have. Mine all integrate with the general ledger, and, where it helps, they integrate with each other.

My general ledger system gives year-to-year comparisons, in dollars and percentages. It figures budgets and it even has a report generator.

My accounts receivable systems can do sales analysis by product code and figure in salesmen's commissions. They generate mailing lists by customer code or zip code for up to 2000 customers. You can choose either an open item system or a balance forward system which works on a cash or an accrual basis.

My payroll system can handle up to 600 employees in multiple departments, with any state tax routine (we provide them all). It can make any miscellaneous deductions you ask it to — it even does tips and meals.



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CP/M is a trademark of Digital Research Corporation.

My inventory control system stores up to 5000 items. It can report by vendor, tell you when you're out of stock or when you need to reorder. It can update price or cost automatically, and integrates fully with my invoicing system.

There's a lot more, too. Over the years, I've had thousands of phone conversations with my customers, working out the bugs and kinks and adding desirable features. Everybody talks about "user-oriented" systems, but because of all these phone calls, it really means something when I say it. These may well be the most thoroughly researched small business accounting programs in the world.

They're also the best supported, at least as far as microcomputer systems go. If you have a problem, just call. If your problem is tough enough, I'll get on the phone myself. There's no charge for phone assistance, ever.

All these calls keep me upgrading my systems constantly. If you own one, you're eligible for a standing offer I've made all along: send me your diskette, and I'll send you the latest upgrade for only $25.

Now I've taken another step. More and more owners are switching over to CP/M software these days. It seems to be where the whole microcomputer industry is heading.

That's fine with me, because I've just converted all these accounting systems, and can sell them for the prices I've listed:

General Ledger/Cash Journal	$ 299
Accounts Payable/Purchase Order	349
Open Items Accounts Receivable/Invoicing	349
Balance Forward Accounts Receivable	399
Payroll	299
with Job Costing Option	399
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For mail-order programs, these prices may seem high. But for serious accounting programs, nothing can touch them.

Michael Tannenbaum, the "80 Accountant" in *80 Microcomputing,* just called them "a very impressive product at a very reasonable price."

Our TRS-80 Model I and Model III systems aren't quite as sophisticated. But they're tremendous buys at $99 each ($149 for general ledger).

So call me and take your choice — CP/M or TRSDOS. Same price, same support. My systems are ready and waiting.

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EXCITING NEWS FOR COLOR COMPUTER USERS

FLEX, OS-9 and the Radio Shack Disk System ALL on the SAME Color Computer

Would you believe that you can run FLEX, OS-9 and Radio Shack disk software on the same Color Computer, and all you have to do is change the disk? That's right, just change the disk. If you have a 32K Color Computer with the Radio Shack disk system, all you need to do is make a trivial modification to access the hidden 32K, as described in the Feb. issue of COLOR COMPUTER NEWS and the March issue of '68' Micro. You can get FLEX from us right now. OS-9 will be ready by summer. Please note that this will only work with the Radio Shack disk system and 32K/64K memory chips that RS calls 32K. Maybe they put 64K's in yours, too. If you don't have a copy of the article, send a SASE and we'll send it to you.

Using this system to run FLEX and OS-9 has many advantages. First, it gives you 48K from zero right up to FLEX. This means that *ALL* FLEX compatible software will run with *NO MODIFICATIONS* and *NO PATCHES!* There are no memory conflicts because we moved the screen up above FLEX which leaves the lower 48K free for user programs.

What you end up with is 48K for user programs, 8K for FLEX and another 8K above FLEX for the screens and stuff. We are working on a multi screen format so you can page backward to see what scrolled by and a Hi-Res screen that will enable us to have 24 lines by 42 character display. That's better than an Apple!

We also implemented a full function keyboard, with a control key and escape key. All ASCII codes can now be generated from the Color Computer keyboard!

We also added some bells and whistles to Radio Shack's Disk system when you're running FLEX or OS-9. We are supporting single or double sided, single or double density, 35, 40 and 80 track drives. If you use double sided drives, the maximum is three drives because we use the drive 3 select for side select. When you are running the Radio Shack disk, it will work with the double sided drives but it will only use one side and only 35 tracks. Using 80 track drives is okay, but will not be compatible with standard Radio Shack software. You can also set each drive's stepping rate and drive type. (SS or DS - SD or DD)

In case you don't understand how this works, I'll give you a brief explanation. The Color Computer was designed so that the roms in the system could be turned off under software control. In a normal Color Computer this would only make it go away. However, if you put a program in memory to do something first (like boot in FLEX or OS-9), when you turn off the roms, you will have a full *64K RAM* System with which to run your program (FLEX or OS-9). When the roms are turned off, it is as if you had removed them from the computer. They are gone!

Now, we need the other half of the 64K ram chips to work, and this seems to be the case most of the time, as the article states. Of course, you could also put 64K chips in.

We decided that this was the best way to run FLEX and OS-9 on the Color Computer because it does remove the roms from the memory map and leaves the full 48K for user programs. If you just put in memory for FLEX and use the Basic hooks for I/O, all you have is a little over 30K for user programs. In addition, very few FLEX programs will run without being modified and some won't run very well, if at all (our DATAMAN + for example). Let me state it again. ALL FLEX COMPATIBLE PROGRAMS WILL RUN WITHOUT MODIFICATION!!! and the same goes for OS-9!

It is also the ONLY way OS-9 will run because 30K is just not enough.

Some neat utilities are included.

MOVEROM moves Color Basic from ROM to RAM. Because it's moved to RAM you can not only access it from FLEX, you can run it and even change it!! You can load Color Comuter cassette software and save it to FLEX disk. Single Drive Copy, Format and Setup commands are also included.

If you don't have a Color Computer, we can sell you one complete with 64K ram, 24K rom, Single RS disk drive and FLEX for only $1,490, set up and ready to go.

FLEX with Edit, Asmb and installation disk is $199.

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pens in the bi-directional mode and probably could be adjusted.

New options for the MX-80 include bit graphics (high resolution), serial interface and an IEEE 488 interface.

The Integral Data Systems 445

The IDS 445 Paper Tiger is a replacement for the 440. It receives the prize for the largest, heaviest, noisiest and fastest printer of the group. It has an instantaneous print speed of 198 characters per second in compressed mode, so in spite of being uni-directional, it has a short processing time.

The 445 comes standard with a 256-byte buffer, but if one selects the graphics option, a 2K-byte buffer is included. The graphics option is similar to that of the Base$_2$ 850 and offers up to 72 dots per inch vertical and 64.2 dots per inch horizontal.

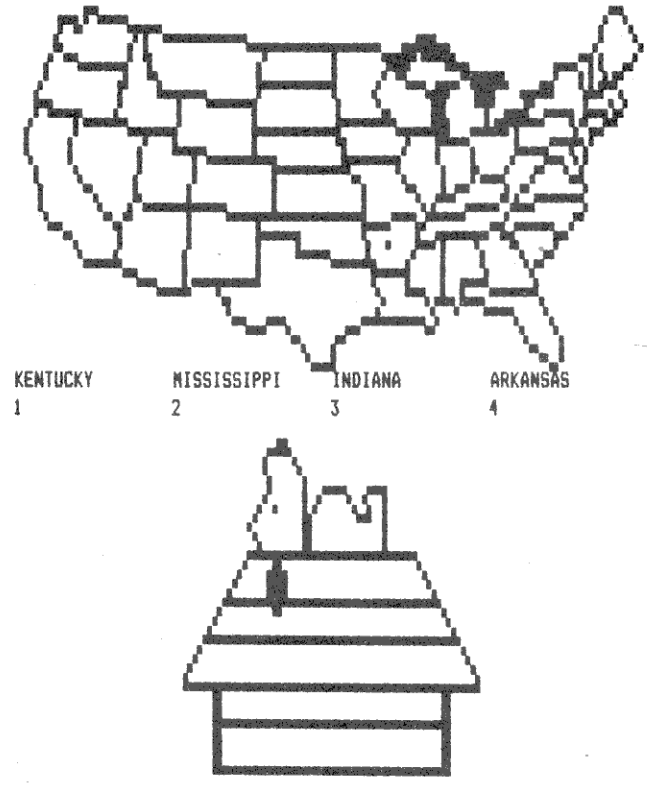
DIP switches can be used to select a serial interface (up to 1200 baud) or a parallel (Centronics compatible) interface. Character densities are software and hardware selectable, and form length control as well as one-inch perforation skip features are included.

The 445 prints a good, standard dot matrix quality and gives the densest print in the 132-character per line double-width mode. It will handle up to four-part forms with no adjustment and more than four by turning an adjustment knob. The 445 has a very fast line feed and, in operation, seems to be a very beefy commercial quality printer. It has internal room for a 4½-inch roll of paper, assuming one can find tractor feed roll paper.

The Okidata Microline 80

My wife was very impressed with the Microline 80. She did not consider the print quality or other features, but liked the printer because it was so inconspicuous. It is the smallest and quietest of the five printers and, therefore, her favorite.

The Microline 80 prints TRS-80 graphics (block) and seems to do a slightly more uniform job than the Epson MX-80. It has a pinfeed roller fixed at the 9½-inch paper width. A tractor option is available which can be snapped on or off very easily, so



Sample 7. Epson MX-80 graphics.

one can use friction feed roll paper for keeping paper costs down, switching to fanfold paper for the more important jobs. When the Microline 80 is in the 80 character per line mode, it can be set to 64 characters (still at 10 cpi) to give a convenient left and right margin.

The Microline 80 prints 80 cps in the 10 cpi mode as does the Epson MX-80, but the Microline 80 is uni-directional. This means it will take about 34 percent longer to print a typical Basic program.

The ribbon in the Microline 80 is probably the cheapest to replace, since it is the standard two-inch spool, ½-inch wide typewriter ribbon available universally.

Wrapping It Up

Each printer comes with a standard 90-day company warranty, although some dealers are doubling this. Each printer

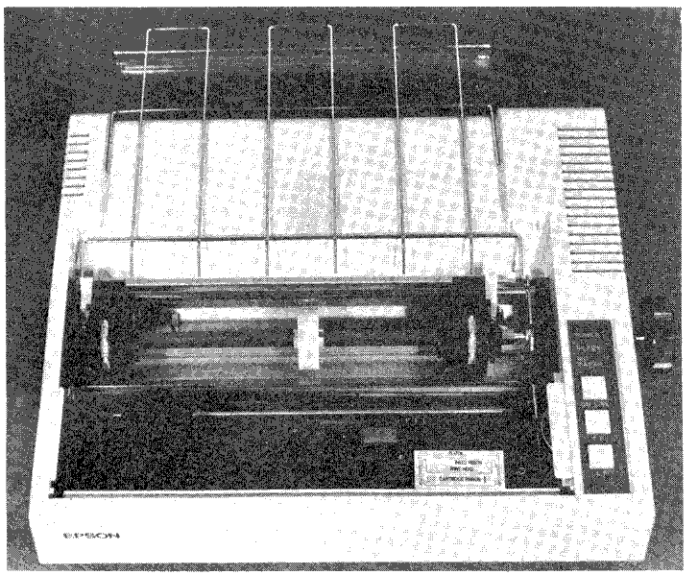
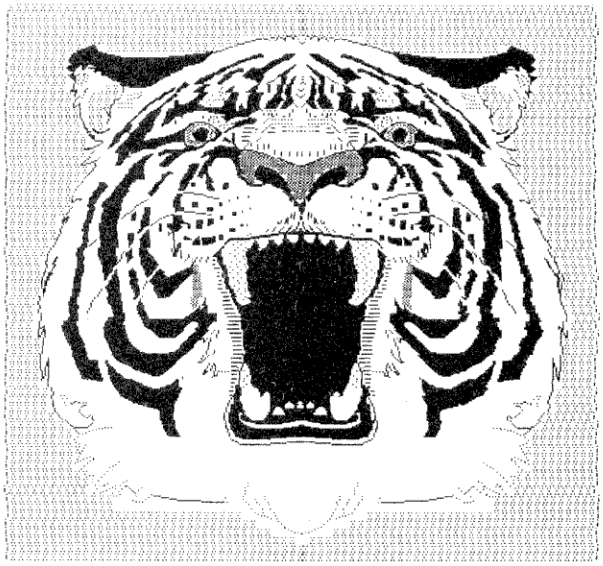


Photo 3. The Epson MX-80



Sample 8. IDS 445 Paper Tiger graphics.

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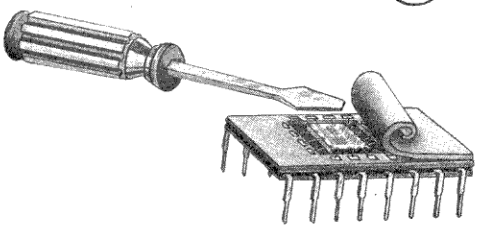

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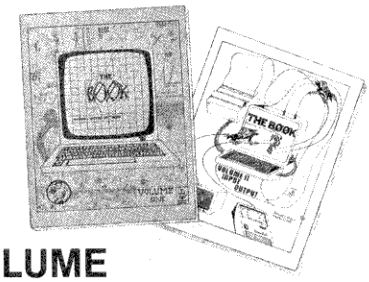

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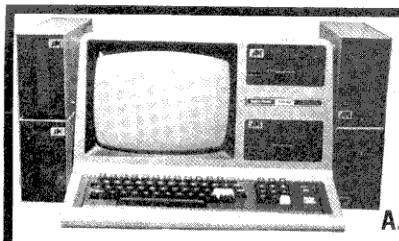

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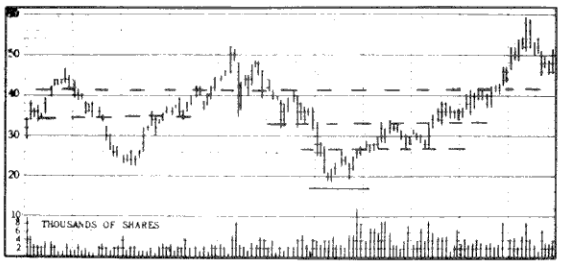

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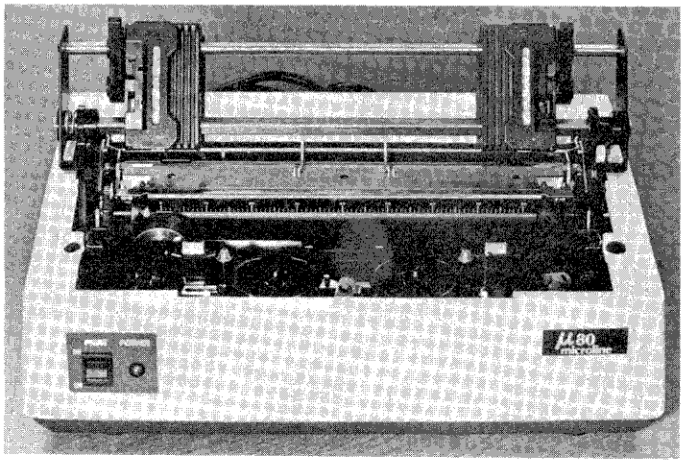
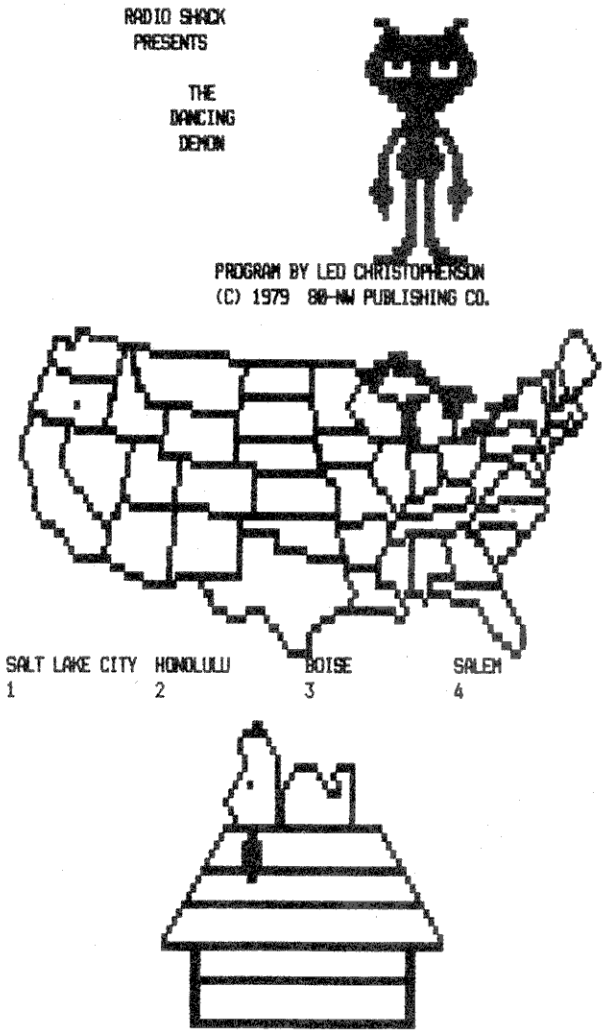


Photo 4. The Okidata Microline 80



Sample 9. Okidata Microline 80 graphics.

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Learning the words and syntax of any computer language will not make you a programmer. It takes many hours of working with the machine as you discover how to put all those words to efficient use. Here are a few of our ideas and discoveries.

Combined Statements

Articles on techniques to speed up your programs using DEFINT, multiple statement lines, and so on appear regularly. There is a major exception to the rule. Many times combining program statements makes for faster execution, but we found a time when the reverse is true!

Numerical field conversions (such as CVI, CVD) in conjunction with PRINTUSING cause a tremendous speed bog down. Two statements are faster even though they use a few extra bytes of memory. It may seem like a tiny difference in the program, but what an increase in speed!

The short program in Listing 1 demonstrates this difference. Lines 10-50 open five files and dump 30 random numbers into each record (for a total of 150 numbers). Then the program retrieves those numbers and prints them on the screen (line 80):

```
FOR X= 1 TO 30: PRINTUSINGM$;CVD
(FI$(X)): NEXT X
```

Notice how slowly it progresses.

Now watch as execution proceeds to line 120:

```
FOR X= 1 TO 30: A=CVD(FI$(X)):PRINT-
        USINGM$;A: NEXT X
```

The CVD of the field variable is assigned to variable A *before* the PRINTUSING statement. Look how fast those numbers are pulled now!

```
10 CLEAR 1000:DIM FI$(30): M$="$$#####,###.##"
20 OPEN"R",1,"TEST/FIL"
30 FORX=1 TO 30: FIELD1, (8*X) AS PH$, 8 AS FI$(X): NEXT
40 REM
50 FOR R%=1 TO 5: FORX=1 TO 30: Z=RND(32000): LSETFI$(X)=
   MKD$(Z): NEXT: PUT1,R%: NEXT
60 REM  SLOW RETRIEVE
70 FOR RE%=1 TO LOF(1): GET 1,RE%
80 FORX=1 TO 30: PRINTUSINGM$;CVD(FI$(X)): NEXT
90 NEXT RE%
100 REM  FAST RETRIEVE
110 FOR RE%=1 TO LOF(1): GET 1,RE%
120 FOR X=1 TO 30: A=CVD(FI$(X)): PRINTUSINGM$;A: NEXT
130 NEXT RE%
```

Program Listing 1

Line 80 takes about 15 seconds (Model I) to print the 30 numbers from just one record, while line 120 pulls *all* five files in about the same amount of time!

The program contains another trick. Notice how all 30 subrecords are fielded in one line (line 30) by using a For. . . Next loop and a calculation (8*X) within the loop. PH$ represents a counterfeit string. As long as FI$(X) has a consistent length across the field, use a loop.

To avoid a type mismatch error use parentheses around 8*X. Apparently the machine has trouble doing calculations within a field statement.

The Timing Loop Syndrome

Many games fill the screen with directions which either stay on the display too long and keep you waiting or do not stay on long enough for you to figure out what you are supposed to do.

Sometimes operators have to study the results of calculations or reread some lines of instructions. Finding a timing loop of optimum duration for all people is difficult.

The best technique is to display a prompting message and wait for the operator to indicate when ready.

The Key Box

Basic Level II

You can use a single Input statement, but this prints a question mark on the screen. LINEINPUT suppresses the question mark; in both cases you must hit Enter to continue execution.

```
100 INPUT"HIT<ENTER> TO
CONTINUE";A$
```

Another approach would be to use INKEY$.

```
200 PRINT"HIT ANY KEY TO CONTINUE
210 IK$=INKEY$:IFIK$=""THEN210
```

If you can use this technique several times in your program, put the lines in a subroutine to keep your program shorter and neater.

Dummy Up Your INKEY$

It is a good idea to put a dummy INKEY$ just before the INKEY$ input you want to pick up any stray keystrokes that are still held in the keyboard memory. For example, you could use

```
10 DUMMY$=INKEY$
20 PRINT"SELECT A, B, OR C"
30 IK$=INKEY$: IF IK$=""THEN
   GOTO30
```

Children's programs are good candidates for this technique, since kids often lean on the keyboard.

We wrote a program where after the operator entered a three digit number, a new menu was to be displayed and another character selected. We did this

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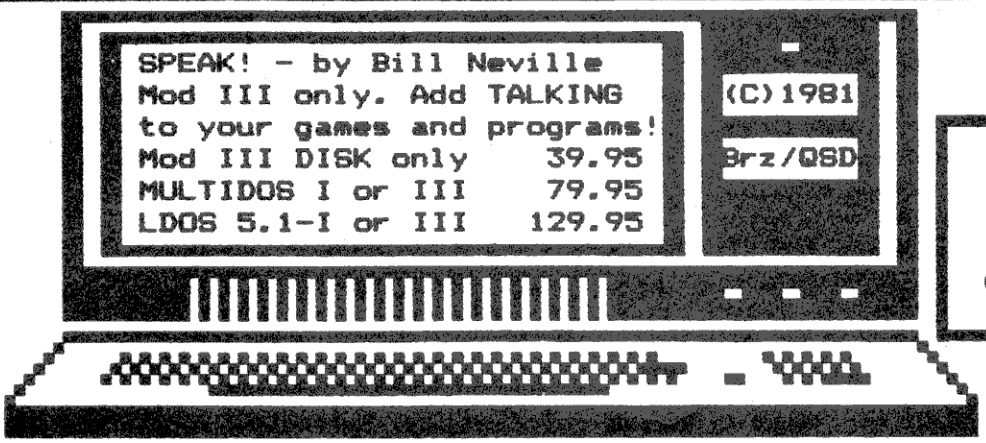

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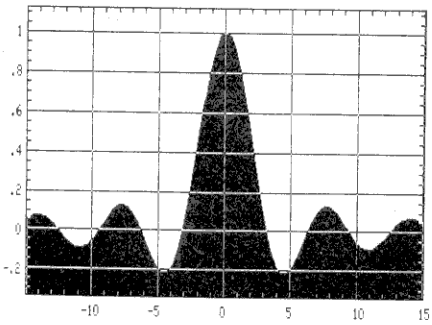

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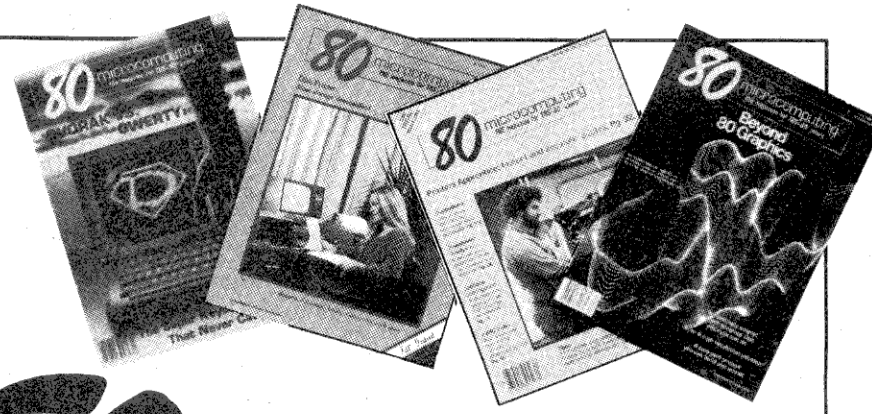

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with INKEY$ rather than INPUT statements. The dummy INKEY$ line, just after the first three numbers, guarded against someone entering a four digit number. The fourth digit was not taken by the program to be the operator's response to the next menu selection.

Printing Reports

Making neat columns of printed information can be a problem if you try to use a semicolon or comma as print tab positions. Assume A$ = "PAPER CLIPS" and B$ = "100 PER BOX". The following program creates a well centered printout.

```
10 PRINT"ITEM","PACKAGED"
20 PRINTA$,B$
```

result:

```
Item Packaged
Paper clips 100 per box
```

But a problem arises if A$ is long enough to push B$ past its anticipated tab position into the next tab stop. If A$ = "RINGS-HIGH IMPACT TEFLON", the printout would look like this:

```
Item                    Packaged
Rings-High impact teflon 100 per box
```

PRINTUSING can set up a printout format for numbers and prices and hold spaces for strings. It automatically truncates letters exceeding the desired field. The revised program looks like this:

```
10 PRINT"ITEM","PACKAGED"
20 X$ = "% %"
30 PRINTUSINGX$;A$;:PRINTB$
```

Now the result is:

```
Item                    Packaged
Rings-                  100 per box
```

Note that the percent signs count as spaces, too. For example, A$ = "% %" holds three spaces available.

Once a PRINTUSING is encountered, a colon must precede any other statements on a multiple statement line. This is legal:

```
10 PRINT" ";USING"% %";A$
```

This will produce an error:

```
10 LPRINT USING"% %";A$;USING;"%
   %;B$
```

In another approach you can combine string and numeric values in one PRINTUSING string, using extreme care. For example:

```
10 A$ = " % % $$###.## % % $$###.##"
20 PRINT"STOCK # COST LOCATION
   RETAIL"
30 FOR X = 1 TO T :REM (T = NUMBER OF
   ITEMS IN FILE)
40 PRINTUSINGA$;STOCK$;COST;LO-
   CATION$;RETAIL
50 NEXT
```

Consistency is the Best Policy

Recently we had to modify a program for a local business. We wrote it many programs ago, and it was hard to pick up our original train of thought.

Unlike languages such as Cobol, Basic is unstructured and not self-documentary. Without remarks, clear documentation, and other aids it is not always easy to figure out what is going on.

One big help was our practice of using the same variables for certain functions in all of our programs. For example, we assign IK$ to all INKEYs, and DE (representing DElay) for For... Next loops used as timing delays. In keeping with Radio Shack's DOS manual, we use R% for record number and SR% for subrecord. These symbolic characters help you associate a variable with its function. This also decreases the chance of using an important variable twice in the same program.

We do not recommend using full words, although the TRS-80 allows it. For example:

```
FOR DELAY = 1 to 100: NEXT
```

Since only the first two characters are checked, when a program gets long it is easy to accidentally pick another word that may start with the same two characters. Leave the wordy programming to Cobol.

Fortran has a start in the right direction by automatically assigning variables I–N as integers.

Presetting Variables

It is always a good policy when writing a program to require as little input from the operator as possible. This reduces both time and the chance for human error.

In an Input statement, the value of the numeric variable assigned to the input is not destroyed if the Input question is responded to with Enter.

For example, you are writing a carpentry program. The computer must ask how many inches on center the joists are to be set. The answer is usually 16 inches, but we want to be able to change it if necessary. By presetting the variable OC (for On Center) equal to 16, the user need only press Enter for the standard figure.

```
10 OC = 16
20 INPUT"HOW MANY INCHES ON
   CENTER (JUST HIT <ENTER> TO DE-
   FAULT 16";OC
30 PRINT OC
```

Dave Dischert manages a computer repair center for a large computer manufacturer. Dan Keen is employed in the field of electronics. He is a computer instructor at two schools. Together they operate Soft Horizons creating software for local businesses.

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As a high school English teacher I see many students with inadequate vocabularies. Students are frustrated; they often know more than they can write.

A significant part of our school's required course in English competence is vocabulary drill. Over the years the method has remained the same: learning by cramming. Learning psychologists claim people learn vocabulary better through natural contextual exposure: reading. We find our students do not read much outside of assigned texts. So we use the cramming approach—and, judging by written work, we have been successful in building their working vocabularies. I am convinced cramming raises college board scores, too.

The Key Box

Basic Level II
Model I
4K RAM
Epson MX 80

Testing

We often draw up our own tests. Most teachers know that making useful, easy to grade tests is tedious work.

Of all of the types we tried, the most satisfactory is the matching test. Requiring less time to administer and correct than others, this type of test also approximates the kinds of word judgements students must make on large-scale standardized tests.

But even a matching test takes time to write, and it is a repetitive task. With the active encouragement of my colleagues, among whom computer literacy is not rampant, I set to work to create a test-making program. I produced a program to alphabetize our vocabulary entries and make a ditto stencil.

The Program

Making multiple copies and cutting stencils on a dot matrix printer is a chancy operation. Some printers do not pack the wallop needed to do the job. My Epson, however allows emphatic (double force) and double-strike (twice over, with a tiny incremental feed) printing at once. Program line 50 selects the emphatic and double strike modes; delete the line to use another printer. The Centronics 737/739 and the Radio Shack LP IV and LP VIII will also make a strong impact, as will a daisy wheel or Selectric printer.

Lines 10–100 format and print the quiz heading and directions. Our quizzes are usually cumulative, and line 40 asks for the scope of the quiz. Line 60 selects double-width letters for the heading; change the control code or delete the line for other printers. Lines 110–130 clear string space, dimension strings and set flags.

Entry of key words and appropriate synonyms occurs at line 150. After the combination (word, comma, synonym) is entered, line 160 gives a running count of the number of entries. Pressing Enter closes the file and begins the sort.

The alphabetization routine that begins at line 210 was suggested by Howard Y. Gosman in the August/September, *1978, TRS-80 Monthly Newsletter.* It alphabetizes without revising the file in memory. The routine prints the words on the left and the synonyms on the right alphabetically by changing each word to ZZ as it is printed. This

```
10 CLS
20 PRINT"VOCABULARY TEST MAKER"
30 PRINT:PRINT
40 INPUT "LESSON 1 - ?";L
50 LPRINTCHR$(27)"E":LPRINTCHR$(27)"G"
60 LPRINTCHR$(27)CHR$(14)"    VOCABULARY QUIZ,  UNITS 1 -";L
70 LPRINT:LPRINT
80 LPRINT"This is a matching quiz. To the left of each number, write
90 LPRINT"the letter of the closest synonym.
100 LPRINT:LPRINT
110 CLEAR5000
120 DIMA$(500):DIMB$(500):DIMN$(500):DIMS$(500)
130 I=1:H=1
140 CLS
150 INPUT"WORD,SYNONYM";N$(I),S$(H)
160 PRINTI;N$(I),S$(H)
170 IFN$(I)=""ANDS$(H)=""GOTO210
180 I=I+1:H=H+1
190 N=N+1:M=M+1
200 GOTO150
210 FORI=1TON
220 A$(I)=N$(I)
230 NEXT
240 FORH=1TOM
250 B$(H)=S$(H)
260 NEXT
270 CLS:K=0:X=0
280 I=1
290 FORJ=2TON
300 IFA$(I)<A$(J)GOTO310ELSEI=J
310 NEXT
320 H=1
330 FORQ=2TOM
340 IFB$(H)<B$(Q)GOTO350ELSEH=Q
350 NEXT
360 IFN$(I)=""ANDS$(H)=""GOTO380
370 LPRINTTAB(8);K+1;".  ";N$(I);:READL$:LPRINTTAB(35);L$;". ";S$(H)
380 A$(I)="ZZ"
390 B$(H)="ZZZ"
400 K=K+1:X=X+1
410 IFK=NANDX=MGOTO420ELSEGOTO280
420 LPRINT
430 DATA a,b,c,d,e,f,g,h,i,j,k,l,m,n,o
```

Program Listing

COMPUTER SHACK

New!

Greymoon

Greymoon is the medieval land in which this simulation of conquest and economic development takes place. As creator of Greymoon, you can buy, sell, plant, feed, hire, build, raid, invade, and consult various advisers. Objectives? Gain land become wealthy, develop your initial small village into a city state and increase your rank from master to King. Obstacles? Every year brings one of over a dozen random events, which, until the end of year, are unknown to you except through hints by your advisors. Can you compete with the many neighboring nations of Greymoon?

Even has sound routines. It will keep you interested for hours on end. Each game is different. The game is very fast but you can play at your own speed. All ages will like it and it takes no special skills but a sharp mind. This is better then an adventure game in the fact that each game is different and is more realistic.

TRS-80 Model I or III
16K Tape ..... $15.95 Disk 18.95

Modem Games

Play CHESS, CHECKERS, and OTHELLO over your modem with your friends! Each game features full graphics, sound, and a chat mode permitting you to send messages and sounds. Games are for two players and can be played on one computer or over the modem on two computers. All three games are on each program, comes with 2 disks or 2 tapes. You must each have a Modem Game program to play over the modem. Share the cost with a friend. The same version of Modem Games will work on both the Model I or the Model III disk or tape. Modem games will work on only the Lynx modem or modems using a 232 board.

2 Tapes or 2 Disks **$29.95**

Hayes Smart Modem

We at Computer Shack think this is the best modem on the market. We include a file transfer and communications program at no charge with each purchase of the Smart Modem.

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We sell them all---We recommend and use **MULTI DOS**---Don't let its low price fool you. It'll do everything the others will and quite a few things they can't.

MULTIDOS has the BEST BASIC -- it's the EASIEST to use and its the FASTEST system around. For more details see Cos. Electronics full page ad in this magazine. Why pay twice as much for a operating system that's complicated and hard to use.

SPECIALS

MULTI DOS with Aerocomp Doubler $209.00
MULTI DOS with Super Directory $99.00
MULTI DOS with Super D & Doubler $219.00
AEROCOMP DOUBLER $139.00

The operating systems that are given out free with the doublers for $149 and $159 dollars are not comparable with all of the features of Multi Dos.
Multi Dos is sold by us with a money back guarantee. If you don't like it, send it back for a refund.

Look what you get with Multido's Basic!
A file handling utility sold separately for **$19.00** A graphics program sold separately for **$19.00** A Golbal editor sold separately for **$29.00** Boss debugger single stepper sold separately for **$19.00**
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you get all this plus the best basic for only **$79.00**

New!

Baja

Take your dune buggy and enter it in the famous Baja Desert race. The race has straightaways, curves, S's, and obstacles. We feel that this is the best car race game made for the TRS-80.

The game has 10 different action packed skill levels. The program is all machine language for fast graphics and excellent sound. 1 to 6 players.

TRS-80 Model I or III
16K Tape ..... $15.95 Disk $18.95

SUPER DIRECTORY

This will be the standard which all other Directores are judged. It will read any normal type of diskette Mod I or III, Multi Dos, Ldos, Dos Plus, and Trs Dos. Double Density, Single Density, 35, 40 or 80 track drives.

A machine language program that is easy to use, but at the same time has all the features you will ever need. Display to screen or to printer. Displays by program, or disk, or subject. Super fast sort. Scrolling displays. ect.

You can even add a line to help tell what the program is about. Example:
SARGON/CMD 146G GREAT CHESS GAME
SARGON/CMD is name of program read off of disk. 146 is you reference number for this disk G is added later designating game. "GREAT CHESS GAME" is added later as a descriptor file.

Special Introductory offer with each directory ordered before June 1st we will include 4 blank Wabash double density Disks for a dime or you can get a box of ten disks for only $19.90. Please specify the operating system you use and if a Model I ir

Please specify the operating system you use and if a model I if you have a doubler.

Super Directory **$39.00**
Super Directory with 4 Wabash Disks **$40.00**
Super Directory with 10 Wabash Disks **$59.80**

Super Directory ... $39.00 With 4 Wabash Disks ... $40.00
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Dungeon Escape

At last!! An adventure which takes quick thinking and strategy!
Different from fixed adventures.

★ **Super graphics** ★ ★ **Interactive Sound** ★
★ **Uses latest programming techniques** ★

★ **Fast Paced** - the creator's ghost has sensed an intruder, and he is determined to hunt you down. (His intelligence in tracking was set by you). This feature makes this simulation unlike others for you're always "on the go."

★ **Written by an experienced gamer** in fantasy role-playing,

Objective: Your character begins on the first of a three level dungeon, searching for magical "stones" which permit you to descend to the next lower level.

The Adventure: There are numerous traps, and over a dozen hostile monsters that come in various sizes, shapes and degrees of nastiness. It has various treasures and magic items (weapons, elixers, cloaks, scrolls, etc.) You can become a fighter, a theif or a magic-user. Each time you play you get a totally different and exciting game.

This short description only begins to tell you of the many adventures and some of the features of this exciting game.
This will be your favorite adventure game!

Complete documentation included.
You must specify Model I or Model III. Available on:
Tape, 16K ..... **$19.95** Diskette, 32K **$19.95**

Small Business Programs

CHECKING ACCOUNT Mod. I or III, 48k disk $39.00
Excellent check writing program for small business. Prints checks on printer, sorts into 32 catagories for bookeeper and IRS.

BILLING SYSTEM Mod. I or III, 48k disk $39.00
Excellent system for the small business man, It is fast and easy to use. Prints out invoice and monthly bills. Adds interest etc.

SPECIAL BOTH PROGRAMS $65.00

EP-SET

If you have a EPSON Printer you need EP-Set. A series of programs that help you use all the features of the Epson printer. One merges with a basic program to help drive the printer. One is a machine language subroutine to give you keyboard access to the printer. (example type control c to get the compressed mode. Control E to get emphised characters). Use EP-SET to set the line spacing, character modes, strike modes etc. Throw your manual away. Happiness is here with EP-SET.

Disk or Tape $18.95

WARZONE

A new game that pits you against the computer. Trying to isolate the computer before he stops your conquest. Exciting sound routines and great graphics. This is a fast paced game that is excellent for young and old. It has three skill levels.

Tape ..... $14.95 Disk $18.95

FAMILY TREE

Excellent family genelogy program works on both the model I and III. Written expecially for the person just getting into genelogy. It has over 250 pages of instructions on how to research your family tree, how to get information, and how to put it into the program. The computer program is easy to follow and gives both printouts and screen listings of your family tree. It will even give you a listing of all your living relatives birthdays.

Disk or Tape **$29.00**

COMPUTER SHACK

1691 Eason ● Pontiac, Michigan 48054 **(313) 673-2224**
(313)673-8700 ✓109

ORDERING INSTRUCTIONS:

MC and VISA OK please add $2.00 for Shipping in U.S.A. Also to help us send you the best possible version include the type of computer you have, your operating system if disk and if you have a doubler in the model I.

DEALERS . . . We are distributors for all items in this ad except for the games Scarfman, Laser Defense, Fortress, and Alien Defense. Write for our catalog and price list.

✓See List of Advertisers on page 338

Color Computer News

Subscribe to CCN

Are you tired of searching the latest magazine for articles about your new Color Computer? When was the last time you saw a great sounding program listing only to discover that it's for the Model I and it's too complex to translate? Do you feel that you are all alone in a sea of Z-80's? On finding an ad for a Color Computer program did you mail your hard earned cash only to receive a turkey because the magazine the ad appeared in doesn't review Color Computer Software? If you have any of these symptoms you're suffering from Color Computer Blues!

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It's COLOR COMPUTER NEWS.

The monthly magazine for Color Computer owners and only Color Computer owners. CCN contains the full range of essential elements for relief of CC Blues. Ingredients include: comments to the ROMS, games, program listings, product reviews, and general interest articles on such goodies as games, personal finances, a Kid's page and other subjects.
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Vocabulary Quiz, Units 1-9

This is a matching quiz. To the left of each number, write the letter of the closest synonym.

1. Calumny	a. Deceit
2. Dearth	b. Deception
3. Disparity	c. Excuse
4. Dross	d. Fraud
5. Dupe	e. Glove
6. Gauntlet	f. Inequality
7. Guile	g. Punishment
8. Humbug	h. Rate
9. Incidence	i. Refuse
10. Meed	j. Reimbursement
11. Pretext	k. Reward
12. Restitution	l. Scarcity
13. Retribution	m. Slander
14. Subterfuge	n. Trace
15. Vestige	o. Victim Of Deception

Sample test

method is faster for a long test than a sort with replacement. We sort alphabetically for ease of cross reference when compiling later cumulative quizzes.

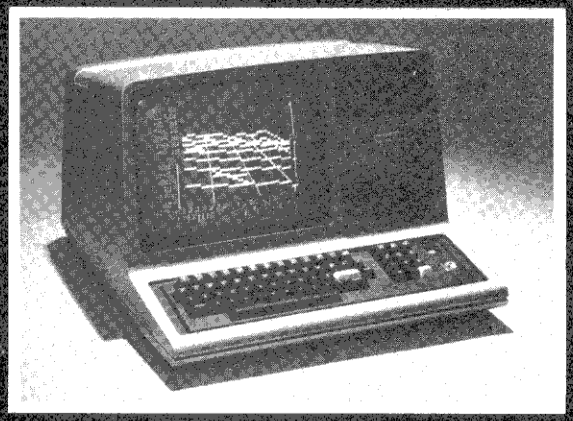
Line 370 formats the printout into two columns. Line 430 supplies, as data, the letters for the synonyms in the right column.

This program will help alleviate tedium from what is otherwise an exciting and rewarding profession. ■

Paul Kalkstein, author of several books on the teaching of writing, teaches English and coaches lacrosse at Phillips Acadamy in Andover, MA. He is also an active ham (N1PL).

T80-FS1 Flight Simulator

Available for Model I or Model III. $25.00 on cassette or $33.50 on disk (with enhancements) All versions require 16K.



If you order direct, please specify whether you have Model I or Model III (the media *are* different) and whether you want disk or cassette. Include $1.50 and indicate UPS or first class mail. Illinois residents add 5% sales tax. Visa and Mastercard accepted.

If you don't yet own a disk, don't fret. You can upgrade anytime. Cassette users may send back their cassette (but *not* the manual) along with $10 (first class shipping included) and receive the disk version.

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✓338

NEW PROGRAMS FOR THE TRS-80

INCOPROP

Income Property Analysis for the TRS-80

INCOPROP: Based upon standardized methods of property analysis used throughout the real estate industry. Generates a 3 page report containing an annual property operating statement and a comprehensive 10 year cash flow analysis. Contains I.R.S. tax table to project after-tax income stream and investor's I.R.R.

- Handles 5 different methods of tax depreciation.
- Handles up to 3 loans & 3 different type loans.
- Highly interactive format permits "Sensitivity Analysis".
- Disk files created for permanent storage of data.

Minimum system requirements: 32k RAM, 1 drive and printer. Sold with informative 78 page user's manual covering basic aspects of income property investment & 50 data worksheets.

Model I & III:	on cassette for easy transfer to disk	$120.00
Model II:	on 8-inch diskette	$145.00
Model III:	Version available in MBASIC running under CP/M	$165.00

New!

MAINDEX: An easy-to-use program to aid you in the indexing of your files on disk. Can't find that program you wrote last month? Put your computer to work! Find any program or data file in your system in seconds.

- A Main Index of all your other disk's directories.
- Alphabetizes list of files and gives you names, grans used, dates written, tracks and file descriptions.
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- Prints disk labels with disk name and file names.
- Uses all the advanced and extremely fast file manipulation capabilities of Apparat, Inc.'s NEWDOS/80.

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MODEL I or III Disk

PILOT

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* Debug Package displays all flags and commands before they execute.
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* File Chaining. A complete system from AUTO to exit.
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- Extensive error trapping & user prompting functions
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- Business & personal calendar maintenance
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TIME-TABLE was exhaustively tested and certified and includes a comprehensive user's manual. Requires (Min): TRS-80 Model I/III; Tape Ver-16K RAM, Level II/Md III ROM, TPE RCDR.

TIME-TABLE pricing (includes 51 pg user's manual);—16K Tape—$29.95; 32K/48K Tape—$49.95; 48K Disk—$79.97 (Md III disk)/$74.95 (Md I/III CASS).*

To place an order, mail to the below address or use the order phone. ✓503

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*PA Residents include 6% Sales Tax
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✓See List of Advertisers on page 338

Amortize a loan to show the monthly damage.

One Twelfth of a Misery

James K. Krapf, CPA
16160 SW 108 Avenue
Miami, FL 33157

With my TRS-80 I computed the interest expense on my installment loan and learned my output was more accurate than that of the General Motors Acceptance Corporation. Taxpayers often come to me at income tax time without their annual interest statement from the bank for their installment loans. I decided to write a program to amortize an installment loan, using the Rule of 78's method (see *80 Microcomputing*, July 1981).

I tested the program with my auto loan from General Motors Acceptance Corporation. My GMAC coupon payment book shows the interest deduction allowed for income taxes for each year of my loan. I ran my program using the information from the Regulation Z Disclosure Statement for my loan. The total interest over the life of the loan was the same for both my schedule and GMAC but my results for each year's interest deduction varied by a few pennies.

For the five months in 1980, my calculation for interest expense was $441.56; GMAC calculated $441.60, a difference of four cents. For 1981, the difference was 12 cents! I attributed the differences to rounding errors on the part of the GMAC computer (which apparently uses only four decimal places in one of its calculations).

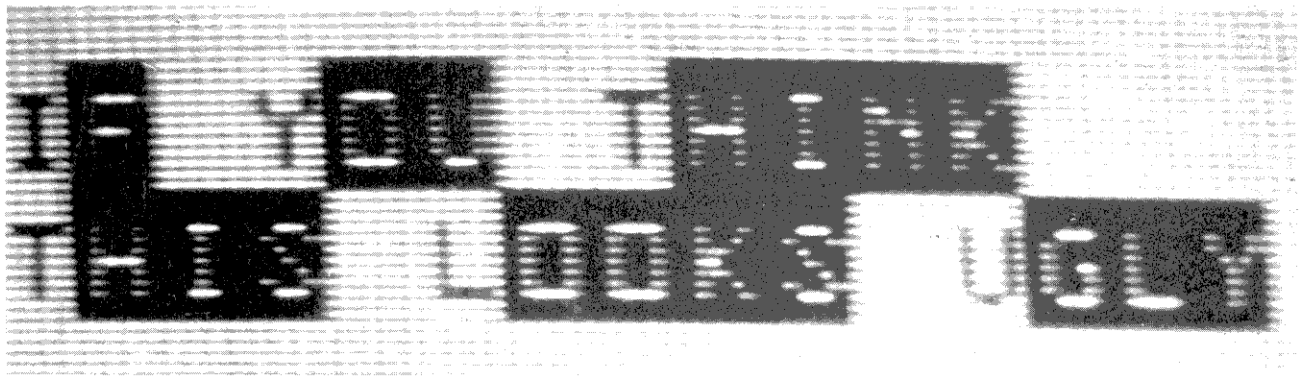
Using my calculator, I computed the sum of the digits for the five payments I made in 1980 as 230 (48 + 47 + 46 + 45 + 44). The sum over the 48 month life of the loan (48 + 47...2 + 1) is 1176. On a 48 month loan the lenders claim 48/1176 of the total interest the first month (or portion thereof), 47/1176 the second month and so on to the last month (1/1176 of the total interest charges). On a 36 month loan, the sum of the digits is 666 and the first month's interest would be 36/666 of the total finance charge. Line 140 in my program contains the algebraic formula for computing the sum of the months digits, with N being the total number of months in the contract. The correct calcul-

The Key Box

Basic Level II
Model I
16K RAM
TRSDOS 2.3
Daisy Wheel II

```
10 'PROGRAM TO AMORTIZE INSTALLMENT LOAN
50 POKE 16425,1
60 CLEAR 500:DEFDBL O,P,S,I,U,M:DEFSTR W,A
80 CLS:INPUT "WHAT IS THE TAXPAYER'S NAME";J$
90 INPUT"WHAT IS THE NAME OF THE LENDER";Z$
120 INPUT "ENTER ORIGINAL FINANCE CHARGES";FC
130 INPUT "ENTER TOTAL NUMBER OF MONTHS IN CONTRACT";N
133 INPUT "ENTER ORIGINAL AMOUNT FINANCED";OB
134 INPUT "HOW MUCH IS THE MONTHLY PAYMENT";MP
135 INPUT "FIRST MONTH OF PAYMENT";FM
136 INPUT "OF WHAT YEAR";YR
137 INPUT "WHAT IS THE MONTH OF YOUR FISCAL YEAR END ";YE
140 SYD=N*(N+1)/2
143 UI=FC:FY=YE+1
145 LPRINT CHR$(138)
146 LPRINT "TAXPAYER NAME: "J$;TAB(42)"LENDER: "Z$
147 LPRINT STRING$(77,204)
148 LPRINT CHR$(138)
150 LPRINT "TOTAL FINANCE CHARGE IS  $ ";
151 LPRINTTAB(35) USING "######.##";FC
160 LPRINT "TOTAL MONTHS IN CONTRACT ARE ";TAB(41) N
162 LPRINT "THE MONTHLY PAYMENT IS $";
163 LPRINTTAB(35)  USING "######.##";MP
166 LPRINT "THE AMOUNT FINANCED IS $ ";
168 LPRINTTAB(35) USING "######.##";OB:LPRINT CHR$(10)
172 LPRINTTAB(1) "MO";TAB(6)"YR";TAB(14)"PAYM";
173 LPRINTTAB(27)"INT";TAB(35)"PRINC";TAB(46)"BAL";
175 LPRINTTAB(55)"PAYOFF";TAB(71)"REBATE"
550 SI=0
600 I=FC*N/SYD:SI=SI+I:PRI=MP-I:OB=OB-PRI:LC=LC+1
632 IF N=1 GOTO 4400
633 OB=OB:POB=OB+MP:UI=UI-I
690 LPRINTTAB(1) USING "##";FM;
700 LPRINTTAB(4) YR;
705 LPRINTTAB(11) USING"#####.##";MP;
710 LPRINTTAB(22) USING"#####.##";I;
720 LPRINTTAB(31) USING"######.##";PRI;
725 LPRINTTAB(42) USING"######.##";OB;
735 LPRINTTAB(53) USING"######.##";POB;
740 LPRINTTAB(68) USING"######.##";UI:FM=FM+1
810 IF FM=FY GOTO 3000 ELSE 850
842 LPRINTTAB(1) "MO";TAB(6)"YR";TAB(14)"PAYM";
843 LPRINTTAB(27)"INT";TAB(35)"PRINC";TAB(46)"BAL";
845 LPRINT TAB(55)"PAYOFF";TAB(71)"REBATE"
850 N=N-1
855 IF FM=13 THEN FM=1:YR=YR+1
870 IF N=0 GOTO 3000 ELSE 600
3000 LPRINT TAB(5)"INTEREST CHARGES FOR THE FISCAL YEAR ENDED";
3002 LPRINT YE"/"YR"ARE ";
3020 LPRINT USING "######.##";SI
3100 SI=0
3195 LPRINT STRING$(77,192)
3200 LPRINT CHR$(10)
3350 IF LC>25 THEN LPRINT CHR$(12):LPRINT"TAXPAYER NAME: "J$;
3352 IF LC>25 THEN LPRINTTAB(42) "LENDER:"Z$:LPRINT STRING$(77,168):LC=1
3390 IF N=0 GOTO 5000 ELSE 842
4400 OB=0:GOTO 633
5000 LPRINT CHR$(12)
5010 END
```

Program Listing



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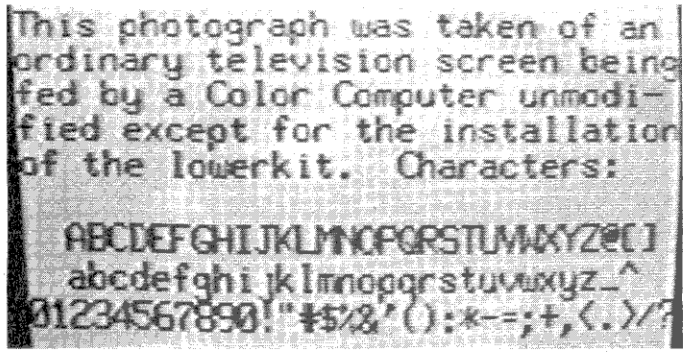

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ation of my 1980 interest deduction is 1980 digits/total digits times total finance charges; or 230/1176 times $2257.69; or .19557823129 times $2257.69; or 441.56 as computed by my TRuSty 80.

Enhancements

To put some pizazz into my program I added a Payoff column and the ability to compute interest expense on a fiscal year (any financial year end other than December). If you are a calendar year taxpayer, just tell the computer your year end is month 12.

I added a line counter into the program to prevent splitting the year between pages.

My string decorations (lines 147, 3195 and 3352) were developed using the decimal code in my Daisy Wheel II printer manual. Modify these lines for your printer or use LPRINT STRING$ (77," ") with the character of your choice between the quotes.

If you are considering paying an installment loan early, the Payoff column will tell you within a few pennies what your payoff would be in lieu of your next monthly payment, on or before the payment due date. If you make payments on your loan between your payment dates, the amount may vary based on the policy of your lender. Some lenders pro-rate the payoff month's interest on a daily basis, while other lenders keep the full interest even if you are only one day into the month.

The next time you shop for an installment loan, ask the loan officer if they compute the rebate on a daily or monthly basis. If you find two willing lenders with identical terms, choose the one who computes the rebate on a daily basis. It will save you a few dollars if you pay off early. ■

James Krapf, a 1970 graduate of the University of Delaware, has been practicing accounting in the Miami area since 1970.

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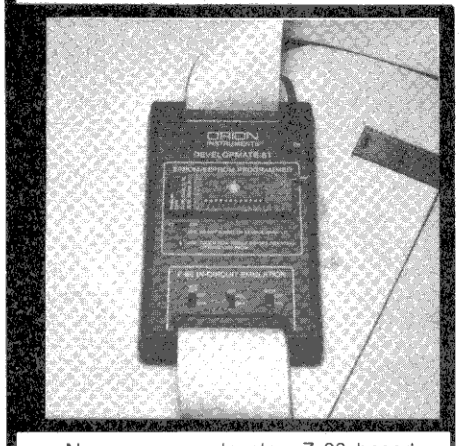

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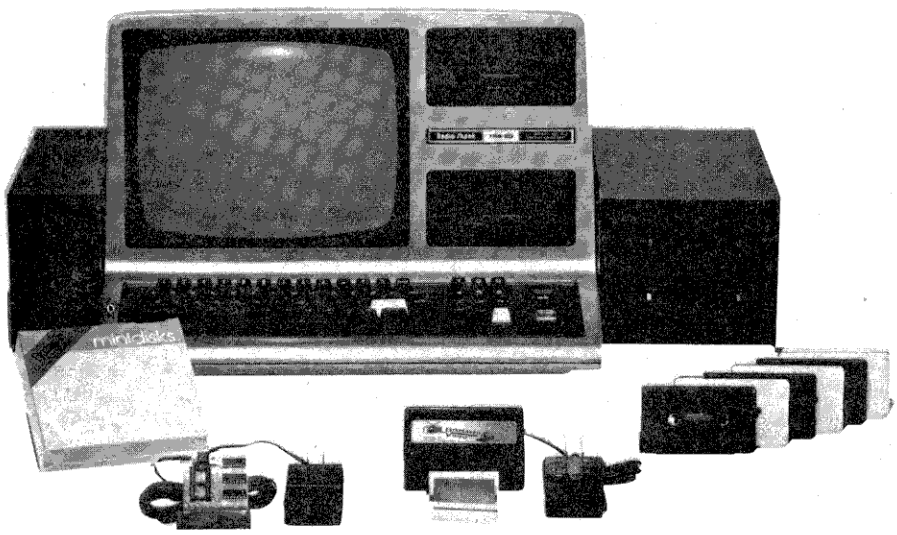

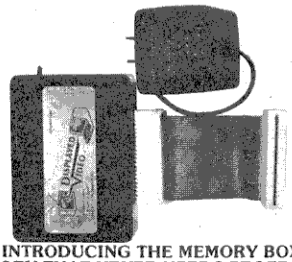

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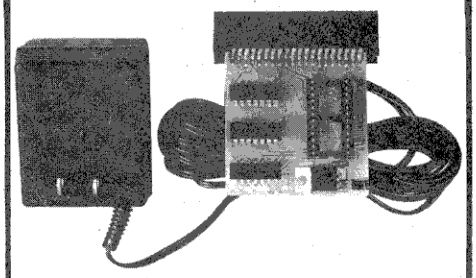

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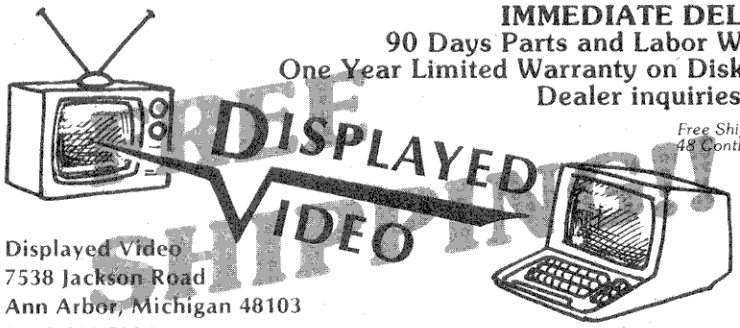

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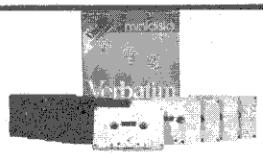

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LOAD 80

In this classroom, a TRS-80 is the ruler.

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As a high school math teacher, I have heard other teachers complain for years that some students cannot read a ruler. The program presented here has ended most complaints.

The program draws a ruler on the screen; the student measures a line of random length using the ruler. The enlarged ruler will measure up to 2-5/8 inches. The large size is easy to read and enables measurements to a sixteenth of an inch. Photo 1 shows what the screen looks like.

The Key Box

Basic Level II
Model I or III
16K RAM

The student gets three tries to answer each question, although after the first incorrect response the question is counted as incorrect in the final grade. The program also counts as incorrect any improperly reduced fractional answer. The program generates twenty questions; at the end the user can try the test again.

The test uses an eighth grade reading level, but you can easily change this to the elementary level. The test starts with a sample question which instructs the user how to type in answers. During the test itself the program shows the question number, draws the line to be measured, and then draws the ruler under the line.

The computer then asks how long is the line in whole inches. After a correct response or after three wrong answers, the computer asks what fraction of an inch is left. At this point the user types in the answer in fractional form (i.e. 3/16, or zero if the line is a multiple of a whole inch). After a correct response to this question, or after three incorrect answers, the computer prints the full correct answer. The user then presses Enter to continue. At the end of the twenty questions the computer gives the percentage correct.

Program Graphics

The graphics are the most important part of this program. A subroutine starting at line 5500 generates the line to be measured. Set statements generate the ruler; each 1/16 of an inch equals three sets. A subroutine at line 9050 draws the ruler. From there the program branches to other subroutines to print the ruler on the screen. Table 1 lists the variables used in the program.

This program is the second of two which were developed to help students who have difficulty reading a ruler. The program presented here is the test portion of the first. The first program is a much longer (15K) remedial program on how to read a ruler. You can obtain it from me for $10. ■

Dana Allison teaches math and programming languages at Pentucket Regional High School, West Newbury, MA.

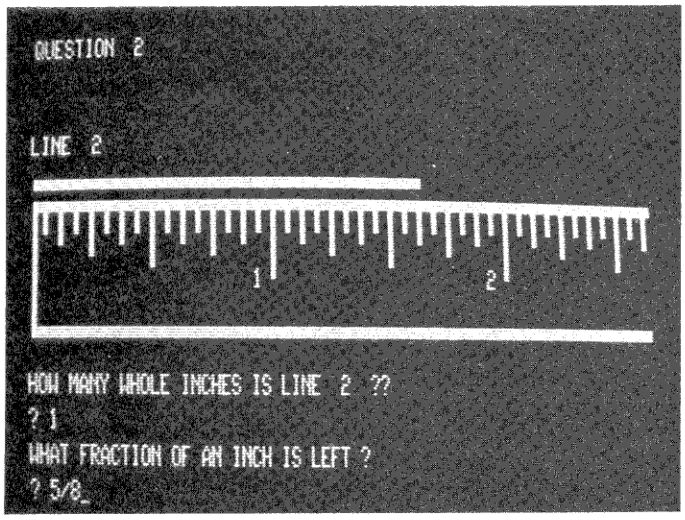

Photo 1

N$	User's name	B$	Answer denominator
K	Set statement length	A3	Answer numerator
K1	Number of sixteenths in the line	A4	Answer denominator
Q	Question number	Z	Reduce answer counter
B	Line length in whole inches	C1	Denominator
C	Line length after deducting B	A1	Answer
T	Number of tries on a question	GH	Counter
V	Number of tries on a question	F	Delay
A	Used for answers and set increments	AV	Average
I	Delay	NR	Number correct
A$	Used for answers	F	Beginning of set
L1	Input answer length	G	End of set
R	Fraction denominator length	X	Used for sets
L	Fraction numerator length	Y	Used for sets
T$	Answer numerator		

Table 1. Variable list.

Program Listing.

```
10 REM THIS PROGRAM WAS WRITTEN BY DANA B. ALLISON
15 RANDOM
20 CLS:PRINT@192,"THIS PROGRAM WILL TEST YOUR ABILITY TO READ A
RULER."
25 PRINT "THE RULER THAT WE WILL BE USING IS LARGER THAN NORMAL
THIS":PRINT"WILL MAKE READING IT A LOT EASIER.":PRINT:INPUT"TYPE
```

Program continues

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Grammatik is receiving rave reviews from both critics and users. Bob Louden in InfoWorld (12/7/81): "If you use a word processor and a spelling checker, then you should investigate the unique capabilities of this program. Grammatik is a surprisingly fast and easy tool for analyzing writing style and punctuation." Eric Balkan in The Computer Consultant: "I'm impressed with the imagination that went into this product." Many users call or write to tell us how much they like Grammatik. Some typical remarks: "Great!", "Thanks for making my life easier.", "I'm not just happy, I'm ecstatic!". Grammatik has also been selected as an officially approved Osborne Computer software package and will soon be appearing at Osborne dealers.

Only Proofreader and Grammatik can provide you with complete document proofreading, and together cost less than some spelling checkers alone. Proofreader and Grammatik have been designed to work with almost any CP/M, TRS-80, or 8086/8088 based word processor. While they have been designed to work together, they are available separately.

Aspen Software also has its own full featured word processor called Writer's Companion for all these systems. One of the best implementations of Ratfor (Rational Fortran) is available, too, along with an automatic Ratfor pretty printer. Please call or write for more details about these products.

--CP/M versions require CP/M version 2 or later and at least 48K of RAM. Standard 8" single density, Northstar, Osborne-1, Omikron, and Apple formats available directly from Aspen Software. These and most other formats also available from Digital Marketing. Some CP/M systems with limited disk capacity supplied with 28,000 word, 65,000 byte dictionary. Proofreader-$129.00, Grammatik - $150.00, Both - $250.00.

--Manuals only - $8.00 each, $15.00 for both.

--TRS-80 Model I/III versions require only one disk drive and 32K of RAM, and are compatible with all TRS-80 word processors and operating systems. Model II version requires 64K and 1 drive. TRS-80 Model I/III: Proofreader - $59.00, Interactive correction option - $30.00, Grammatik - $59.00. All - $139.00. TRS-80 Model II: Proofreader - $99.00, Grammatik - $99.00, Both - $179.00.

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Program continued

```
 IN YOUR NAME THEN HIT THE WHITE <ENTER> KEY";N$:PRINT
26 PRINT "OK "N$", DO YOU WANT TO SEE AN EXAMPLE OF A TEST QUEST
ION?":PRINT "TYPE Y OR N"
27 PRINT"AFTER YOU TYPE IN THE ANSWER TO THE QUESTION HIT THE WH
ITE      <ENTER> KEY.":INPUT A$: IF A$="N" GOTO 99
30 K=60:K1=20:Q=0:GOTO 110
99 CLS:PRINT@192, "LETS START THE TEST.":FOR I=1 TO 600:NEXT I
100 NR=0:FOR Q=1 TO 20:B=9:A$=N$:K=3*RND(42):K1=K/3
110 CLS:PRINT"QUESTION "Q:PRINT@192,"LINE "Q:GOSUB5500:GOSUB9050

115 GH=0
120 B=INT(K1/16):C=K1-(B*16):T=0:V=0
125 IF Q=0 GOTO 300
130 PRINT@640,"HOW MANY WHOLE INCHES IS LINE "Q" ??":INPUTA:IFA=
BTHEN PRINT@768,"CORRECT "N$"                    ":FOR F=1 TO 800:N
EXT: GOTO150
132 PRINT@704,"WRONG, TRY AGAIN":FOR I=1 TO 600:NEXT
140 T=T+1:IFT=3 THEN GOTO145 ELSE GOTO 130
145 PRINT@704,"THE CORRECT ANSWER IS "B
150 PRINT@768,"WHAT FRACTION OF AN INCH IS LEFT ?":INPUTA$:IFVAL
(A$)=0 THEN A=0:GOTO157
152 L1=LEN(A$):IF L1<3 OR L1>5 THEN GOTO 157 ELSE IF L1=3 THEN L
=1:R=1:GOTO155
153 IF L1=4 THEN L=1:R=2:GOTO155
154 IF L1=5 THEN L=2:R=2
155 T$=LEFT$(A$,L):B$=RIGHT$(A$,R):A3=VAL(T$):A4=VAL(B$):IF A4=0
THEN A=3 ELSE A=A3/A4:IF A4>16 THEN A=3
156 IF MID$(A$,L+1,1)<>"/" THEN A=3
157 IF GH=1 GOTO 182
170 FOR Z=4 TO 1 STEP -1:IF C/2<>INT(C/2)GOTO 178
175 C=C/2:NEXTZ
178 IFZ=0 AND A=0 GOTO 230
180 C1=2[Z:A1=C/C1
182 IFA1=A AND C1=A4 THEN GOTO200
185 PRINT@832,"WRONG, TRY AGAIN":V=V+1:GH=1:FORF=1TO700:NEXT
190 IF V=3 THEN GOTO 210 ELSE GOTO 150
200 IF B=0 THEN GOTO 220 ELSE PRINT@832,"YOU ARE CORRECT "N$"
                    ":PRINT@896,"LINE"Q"IS "B" AND "C"/"C1" INCHE
S LONG":GOSUB20000:GOTO 250
210 PRINT@896,"THE CORRECT ANSWER IS "B"AND "C"/"C1:GOSUB20000:G
OTO250
220 PRINT@832,"YOU ARE CORRECT "N$"
      ":PRINT@896,"LINE"Q"IS "C"/"C1" OF AN INCH LONG":GOSUB200
00:GOTO250
230 PRINT@832,"YOU ARE CORRECT "N$"
      ":IF B=1 THEN PRINT@896,"LINE"Q"IS ONE INCH LONG" ELSE PRI
NT@896,"LINE"Q"IS "B" INCHES LONG"
235 GOSUB20000
250 IF V=0 AND T=0 THEN NR=NR+1
255 NEXT Q
260 CLS:AV=NR/20:AV=INT(AV*100 +.5):PRINT@320, CHR$(23) "YOU GOT
"NR"CORRECT OUT":PRINT"OF 20 QUESTIONS FOR A":PRINT"SCORE OF"AV"
PERCENT."
270 PRINT:INPUT"DO YOU WANT TO TRY ANOTHER 20   QUESTIONS, TYPE
Y OR N";A$:IFA$="Y"GOTO 100
280 PRINT:PRINT "THANKS FOR USING THIS PROGRAM":PRINT"I HOPE YOU
 DID WELL."
299 END
300 PRINT@128,"EACH QUESTION WILL LOOK LIKE THIS";:PRINT@640,"HO
W MANY WHOLE INCHES IS LINE  0  ??":PRINT@704,"? "CHR$(95):PRINT
@710,"AT THE QUESTION MARK YOU WILL ENTER THE ANSWER.":FOR I=1 T
O 1500:NEXT
310 PRINT@774,"IN THIS PROBLEM THE ANSWER IS 1":PRINT@832,"ARE Y
OU READY IF SO TYPE 1 THEN HIT THE WHITE <ENTER> KEY";:INPUTB:PR
INT@704,"? 1
 "
320 PRINT@768,"WHAT FRACTION OF AN INCH IS LEFT ":PRINT@832,"? "
CHR$(95)
325 PRINT@840,"AT THE QUESTION MARK ENTER THE ANSWER IN REDUCED
                FRACTION FORM. ";:INPUT"REMEMBER BOTH 2/8 AND 4/16
 ARE NOT REDUCED SO THE CORRECT ANSWER IS 1/4, SO TYPE IN 1/4.";
A$
330 PRINT@768,"? 1/4
        ";:FORI=1TO 300:NEXT:PRINT@768,"YOU ARE CORRECT "N$:PRI
NT@832,"LINE 0 IS  1  AND  1/4  INCHES LONG":GOSUB20000
340 CLS:PRINT@320,"IF YOU GIVE AN INCORRECT ANSWER THE COMPUTER
WILL PRINT WRONG.  YOU WILL HAVE 3 CHANCES TO GET THE QUESTION R
IGHT.  AFTER        THE THIRD MISS YOU WILL BE GIVEN THE CORRECT
ANSWER."
350 PRINT:INPUT "IF YOU WANT TO SEE THE EXAMPLE AGAIN, TYPE IN Y
 OR N.";A$:IF A$="Y" GOTO 30
360 PRINT:PRINT:INPUT "LETS START THE TEST BY HITTING THE <ENTER
> KEY";A$:GOTO100
399 END
4000 REM MARKERS
4005 FORY=16TO16+A:SET(X,Y):NEXTY:RETURN
5000 REM RULER TOP AND BOTTOM AND NUMBERS INCH AND 1/2 IN."
5010 PRINT@469,1:PRINT@493,2:Y=15:GOSUB9000:Y=26:GOSUB9000:X=1:F
ORY=16TO25:SET(X,Y):NEXTY:FORX=48TO127STEP48:A=5:GOSUB4000:NEXTX
:FORX=24TO127STEP48:A=4:GOSUB4000:NEXTX:RETURN
5500 FORX=1TOK:SET(X,13):NEXTX:RETURN
6000 REM 1/4 INCH MARKERS
6010 FORX=12TO127STEP24:A=3:GOSUB4000:NEXTX:RETURN
7000 REM 1/8 INCH MARKERS
7010 FORX=6TO127STEP12:A=2:GOSUB4000:NEXTX:RETURN
8000 REM 1/16 INCH MARKERS
8010 FORX=3TO127STEP6:A=1:GOSUB4000:NEXTX:RETURN
9000 REM HORIZONTAL LINE
9010 FORY=1TO127:SET(X,Y):NEXTX:RETURN
9050 REM SUB TO GOSUB
9060 GOSUB5000:GOSUB6000:GOSUB7000:GOSUB8000:RETURN
20000 PRINT@968,"IF YOU ARE READY TO CONTINUE HIT THE <ENTER> KE
Y";:INPUTKK$:RETURN
```


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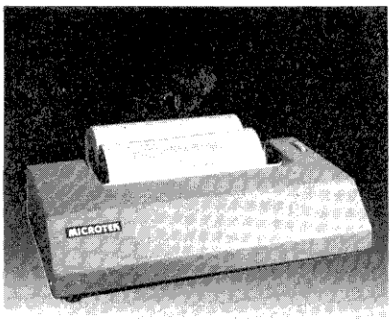

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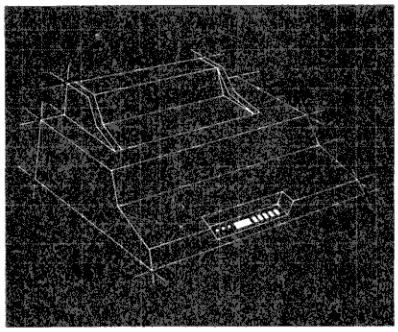
Our extensive testing has proved that the Tekwriter-1 interfaces problem-free to most parallel Centronics and serial (RS-232) computers.

The Tekwriter-1 is tough to beat for performance and quality.

*Data Source: Epson MX-80 Operation Manual

Parallel $349
Serial $389

TekWriter-2



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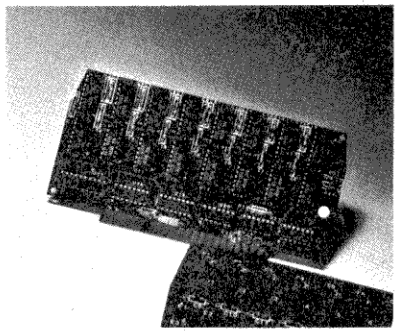

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CP80

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With all the monitor programs on the market you might ask why write your own. Surely one of those popular programs could satisfy me. But after long searching I concluded that none of them fit my needs completely.

Other Monitors

Zedbug, by Northern Technology, is part of an editor/assembler that uses 8080 mnemonics. I became familiar with it while testing the beginnings of a communications program. The input and output commands are useful and only a few monitors feature this. It sends a byte of data to a port. Testing the hardware for Compac this way reduced debugging time dramatically. The drawback with Zedbug is the command format which terminates all commands with a period. I got the feeling I was entering sentences not commands. The format is rigid in that it prohibits a multi-number of blanks within the command line.

The first monitor I bought was T-Bug by Radio Shack. Its memory location was awkward. The programs I wanted to test fell in the 4380-4980 hexadecimal memory location. I found it incredible that in order to modify a register, I had to look up its display command location and use the memory modify command. This was a little cheap on bytes and the breakpoint command was also awkward.

MON3 showed promise with its ability to move itself around in memory via the relocate command, but it lacked a register display command and a breakpoint command. It was rather large for a monitor (approximately 4K) but this was the fault of the rigid format of the disassembler. You had to enter the punch command without a blank between the command and the start address. The same was true for the relocate com-

```
DISPLAY

   D R - displays all registers
   D G - displays general purpose registers
   D P - displays the program counter
   D S - displays the stack pointer
   D X - displays IX index reg (can use IX)
   D Y - displays IY index reg (can use IY)
   D mmmm  - displays one line of memory
   D mmmm. - displays full screens of memory.  Break to quit
             or enter to continue display.

STORE

   S Gr xx - where r is A,B,C,D,E,H, or L and xx is byte
   S PC xxxx - stores xxxx into PC (c is optional)
   S SP xxxx - stores xxxx into SP (p is optional)
   S IX xxxx - stores xxxx into IX (I is optional)
   S IY xxxx - stores xxxx into IY (I is optional)
   S mmmm   xxxxxxxx...(cr) - stores up to 255 bytes in hex
   S Tmmmm  xxxxxxxx...(cr) - stores  ascii into  memory at mmmm

BEGIN

   B - returns to adstop address.

ADSTOP

   A xxxx - sets an adstop and clears the old one.
   A - clears adstop.

EXCHANGE

   EX  - exchanges AF with AF'
   EXX - exchanges BC,DE,HL with BC',DE',HL'
```

Table 1. CP80 Command Table

The Key Box

Model I
32K RAM
One disk drive

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COMPARISON CHART	SUPER COLOR WRITER			THE COMPETITION		
System Size	4K	16K	32K	4K	16K	32K
TAPE: Text space	N/A	8K	24K	N/A	2K	18K
ROMPAK: Text space	2.5K	15K	31K	N/A	N/A	N/A
DISK: Text space	N/A	6.5K	22.5K	N/A	0.5K	16.5K
Right Justify		YES			NO	
Video Window		YES			NO	
Edit any ASCII File		YES			NO	

The figures speak for themselves and with professional features like PROGRAMMABLE function string commands to perform up to 28 commands automatically, PROGRAMMABLE text file chaining, PROGRAMMABLE column insert & delete, and right hand JUSTIFICATION with punctuation precedence, the choice is clear but there's still more!

The **Super "Color" Writer** takes full advantage of the new breed of "smart printers" with Control codes 1-31, 20 Programmable control codes 0-255 for special needs and built in Epson MX-80, Centronics 737, 739 and R.S. Line Printer IV, VII, VIII drivers.

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SUPER "COLOR" WRITER DISK

The Disk version of the **Super "Color" Writer** works with the TRS-80C Disk System and has all the features listed above plus many more! Use with up to four Disk Drives. Includes an extended HELP table you can access at any time. Call a directory, print FREE space, Kill disk files and SAVE and LOAD text files you've created all from the **Super "Color" Writer**. Print, merge or append any **Super "Color" Terminal** file, ASCII file, BASIC program or Editor/Assembler source listing stored on the Disk or tape. The **Super "Color" Writer Disk** version has additional formatting and print features for more control over your printer and PROGRAMMABLE chaining of disk files for "hands off" operation. Print an entire BOOK without ever touching a thing!

Includes comprehensive operators manual.

TAPE $49.95 ROM PAK $74.95 DISK $99.95

Manual only, $7.00 Refundable with purchase.

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Super "Color" Terminal Disk

The Disk version offers all the features listed above plus Host ability in full duplex • Lower case masking • 10 Keystroke Multiplier (MACRO) buffers on disk to perform repetitive log-on tasks and send short messages (up to 255 bytes) • Programmable prompts for send next line • Selectable character trapping • Set printer line length • Pagination • Linefeed with CR option • Printer Baud: 110, 300, 600, 1200 & 2400 • Documentation.

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mand. Also, it rejects the lowercase modification when issued a punch command.

RSM was like MON3 except that it was not relocatable. Each of these products was more of a tape utility package than a monitor program.

Microsoft's EDTASM PLUS and Z-Bug monitor magazine advertisements promised breakpoints, the ability to single-step through memory, register display and modify commands. I was sold until I saw the user's manual at a TRS-80 club meeting. My hopes were dashed at this classic example of command overkill. Commands set the display to byte form, word form, ASCII, or mnemonic form. (Another case of the mnemonic plague.) I had to enter a shift up arrow for the commands. It was like typing things in backwards since each command line ended with the command itself. FFFF LLLL$T, where FFFF is the first address and LLLL is the last address, the dollar sign is the shift up arrow and the T is the display command. A command marathon!

After this let-down I decided to write my own monitor. I would own the source and could always debug or add new features without patching a monitor with only the object code. The program could grow at its own pace. I based CP80 on the debugging aids of IBM's Control Program (CP). I use them every day, so I used familiar command names. It feels good to go from one system to another and use the same debug commands on both machines. Such ties bridge the gap between large systems and microcomputers.

```
* LETS DISPLAY OUR GENERAL REGISTER SET
D G
A   B   C   D   E   H   L
00  00  00  00  00  00  00
* LETS DISPLAY AN AREA OF MEMORY
D 00F0.
00F0  CEFF22B1 401922A0 40CD4D1B 211101CD  *....@...@.M.....*
0100  A728C319 1A4D454D 4F525920 53495A45  *.....MEMORY SIZE*
0110  00524144 494F2053 4841434B 204C4556  *.RADIO SHACK LEV*
0120  454C2049 49204241 5349430D 001E2CC3  *EL II BASIC.....*
0130  A219D7AF 013E8001 3E01F5CF 28CD1C2B  *.....>..>.......*
0140  FE80D24A 1EF5CF2C CD1C2BFE 30D24A1E  *...J........0.J.*
0150  16FF14D6 0330FBC6 034FF187 5F06027A  *.....0...O......*
0160  1F577B1F 5F10F879 8F3C47AF 378F10FD  *.W.......<G.7...*
0170  4F7AF63C 571AB7FA 7C013E80 47F1B778  *O..<W.....>.G...*
0180  281012FA 8F01792F 4F1AA112 CF29C9B1  *........O.......*
0190  18F9A1C6 FF9FE5CD 8D09E118 EFD7E53A  *...............:*
01A0  9940B720 06CD5803 B72811F5 AF329940  *.@. ..X......2.@*
01B0  3CCD5728 F12AD440 77C38428 21281922  *<.W....@........*
01C0  21413E03 32AF40E1 C93E1CCD 3A033E1F  *.A>.2.@..>..:.>.*
01D0  C33A03ED 5F32AB40 C92101FC CD210206  *.:...2.@........*

* LETS START OFF THIS EXAMPLE BY SETTING AN ADSTOP IN MEMORY
* DISPLAY THE ADDRESS BEFORE THE ADSTOP IS SET
D 7FF0
7FF0  00000000 00000000 00000000 00000000  *................*
* NOW LETS SET THE ADSTOP
A 7FF0
* AND DISPLAY IT
D 7FF0
7FF0  F7000000 00000000 00000000 00000000  *................*
* WE NOW SEE AN F7 IS STORED THERE
* LETS SET OUR STACK POINTER TO SOME ADDRESS
S SP 6000
* AND DISPLAY IT
D S
6000
* NOW LETS POINT OUR PC AT OUR ADDSTOP
S PC 7FF0
D P
7FF0
* NOW WE WILL JUMP OFF TO OUR ADSTOP WITH THE BEGIN COMMAND
B
ADSTOP AT 7FF0
* AND WE FIND OURSELVES BACK IN CP80.
* NOW LETS SEE HOW THE STORE COMMAND WORKS ON MEMORY.
* WE WILL WORK WITH THE SAME ADDRESS AS WE DID FOR THE ADSTOP
D 7FF0
7FF0  F7000000 00000000 00000000 00000000  *................*
S 7FF0 1122334455
STORE COMPLETE
D 7FF0
7FF0  11223344 55000000 00000000 00000000  *..3DU...........*
* LETS NOW STORE WITH TRANSLATION INTO THE SAME LOCATION
S T7FF0 THIS IS A TEST TO SEE RESULT OF STORE
STORE COMPLETE
D 7FF0
7FF0  54484953 20495320 41205445 53542054  *THIS IS A TEST T*
```

Table 2. CP80 Terminal Session

So, You Need a Monitor?

I did not set out to please *everyone* when I wrote this program as did each of the other monitor authors. In each case they failed. Owning the source means you can pick the parts you want, rework them, add commands, and create your personal version.

- A monitor should be relatively small so it can stay out of the program you are testing.
- A monitor should load anywhere in memory to avoid conflict with the program you are testing.
- A monitor is a debug tool. It *should* display and modify memory and the CPU registers. It *should not* have tape I/O features such as copy tape or save system tape commands which add to the program and complicate the command language. It is better to reassemble the source with changes than to zap and save the object. Otherwise, when you change and reassemble the source, your zaps will be cancelled and the original problem or bug will reappear.
- The commands should be brief and simple. Display, Store, Breakpoint, and Go are all you really need to debug a program.
- The command line should allow freedom to enter multi-blanks.
- Single step, memory move, byte and word search, should be an extension program that can connect with the main program only as needed
- The display of memory is the window into the machine and should please the eye as well as transmit information. Memory display should offer the option to see a little or a lot, but always allow you more than one byte. It is better to fill a line with data than to waste space on the screen. Usually one line is sufficient but sometimes it is nice to fill the display so you can browse without restrictions. Both the ASCII and hexadecimal versions should display so you need not reset the display

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mode and re-issue the display command to see the data in the required format.

- A monitor should never contain a disassembler. It wastes space and should be a separate program.

DISPLAY

The Display command can display both memory and CPU registers. Memory display will show sixteen data bytes starting at the nearest zero address specified. For example, the command D 4032 would start at location 4030. The display consists of the address followed by four groups of four hexadecimal data bytes and by the same sixteen data bytes in ASCII, wherever possible. A period signals unprintable characters. Round down to the last zero address and calculate the address on the screen, since each group of four hex bytes starts on address zero, four, eight, or twelve (hex C). If you prefer the display to start at the actual address entered, and avoid the round down process, store NOP instructions in memory locations 7205 and 7206. This eliminates the AND 0F0H instruction, keeping the address as entered from the keyboard. More than one byte should be displayed since you will probably want to see the next byte. An extension to the display of memory will show fifteen lines of memory data on the screen. This will scroll when you hit Enter, or terminate when you press the Break key. To use this display append the address with a decimal point (e.g. D 403F.). For an example of this display see both the CP80 and IBM sample sessions.

The register display reduces several areas. As with the IBM display command, subsets of the registers can be displayed. Infrequently you may want to see all registers. If you have only one command and it displays every register in the system, you get a screen-full of numbers. (A case of not seeing the trees for the forest.) I have broken the registers down into a set called the general purpose registers. They consist of A, B, C, D, E, H, and L. I deleted the alternate set of registers since you do not manipulate them anyway. Several other options allow the display of the remaining registers. D P will show you the PC, and D S will display the stack pointer. D IX or D IY will show the index registers (the I is optional). These are like the IBM D P, D Y, D X register display instructions. If you insist on all of the registers, simultaneously use a D R command. This command also will display the alternate registers.

```
* LETS DISPLAY OUR GENERAL REGISTER SET
D G
GPR  0 =  00001218  003C2D30  000007A0  00000003
GPR  4 =  00000848  C4404040  00000040  00003EB0
GPR  8 =  000007A0  00000848  003C2A48  00000000
GPR 12 =  003C2A48  FFFFFFFD  403C2BBA  00000000
* LETS DISPLAY AN AREA OF MEMORY
D T02A0.
0002A0    C4404040  40404040  C4404040  40404040    *D        D        *
0002B0    D5C5E340  40404040  D5C5E340  40404040    *NET      NET      *
0002C0    40404040  40404040  C1C3C3C5  E2E24040    *         ACCESS   *
0002D0    F0F261F1  F661F8F1  9186E34B  2D400000    *02/16/81jfT.. ..*
0002E0    00000000  00000000  00000000  00000000    *................*
0002F0 TO 000300   SUPPRESSED LINE(S) SAME AS ABOVE .....
000300    C3D4E2D3  C9C24040  C3F3F7F0  40404040    *CMSLIB  C370    *
000310    FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF    *................*
000320 TO 000340   SUPPRESSED LINE(S) SAME AS ABOVE .....
000340    FFFFFFFF  FFFFFFFF  0000510C  00000600    *................*
000350    0000570C  00000000  D7D3C9D3  C9C24040    *........PLILIB  *
000360    D7D3C9E4  D6E64040  C3D4E2D3  C9C24040    *PLIUOW  CMSLIB  *
000370    E6C1E3D3  C9C24040  C3F3F7F0  40404040    *WATLIB  C370    *
000380    D7D3C9D6  D7D3C9C2  FFFFFFFF  FFFFFFFF    *PLIOPLIB........*
000390    FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF    *................*
0003A0    00000180  000000C0  00000000  00000000    *................*
0003B0    00000160  000003BC  FFFFFFFF  40404040    *...-........    *
0003C0    40404040  40404040  40404040  40404040    *                *
0003D0 TO 000440   SUPPRESSED LINE(S) SAME AS ABOVE .....
000440    00000000  00000ACA  003EB23E  07FE0000    *................*
000450    00000000  00000000  00000000  00000000    *................*
* NOTICE THAT THE T FOR TRANSLATION IS REQUIRED FOR IBM DISPLAY.
* THIS IS THE DEFAULT WITH CP80.
* LETS LOOK AT THE MEMORY LOCATION BEFORE THE ADSTOP IS SET
D T20000
020000    47F0F00C  D7E2E6C4  40404040  58F0F030 E0  *.00.PSWD    .00.*
* NOW LETS SET AN ADSTOP
ADSTOP 20000
* LETS DISPLAY THE ADDRESS NOW
D T20000
020000    0AB3F00C  D7E2E6C4  40404040  58F0F030 E0  *..0.PSWD    .00.*
* LETS CONTINUE THE PROGRAM AND ENCOUNTER THE ADSTOP
BEGIN
ADSTOP AT 020000
* NOW LETS SEE HOW STORE INTO MEMORY WORKS
d t20000
020000    00000000  00000000  00000000  00000000 E0  *................*
* LETS STORE A VALUE AT THIS ADDRESS
STORE 20000 11223344
STORE COMPLETE
D T20000
020000    11223344  00000000  00000000  00000000 E0  *................*
* NOW LETS STORE WITH TRANSLATION ON.
STORE T20000 TEST
STORE COMPLETE
D T20000
020000    E3C5E2E3  00000000  00000000  00000000 E0  *TEST............*
```

Table 3. IBM CP Terminal Session

STORE

Store is like the Display command. With it you can store hex values directly into memory for a length of 255 bytes and none of the bytes are stored until you press Enter. Before that, if the memory location is invalid, or for any other reason, you Break and terminate the entire store into memory. No other monitor allows this. It stores ASCII values directly into memory in the same way by preceding the memory address with a T translating the command before storing. Basic ROM defines the buffer that stores the 255 bytes. Calling location 40H activates this buffer. The routine will recognize control functions such as backspace. The C register will be set if Break terminates the line. Location 40A7H contains the address used by Level II Basic for its input buffer. Disk-basing changes the contents of this location. You can store directly into the general registers by specifying Gx where x is the general register. An example of this is S GB 4F. This will store

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4FH into the B register.

ADSTOP

IBM calls the interrupt breakpoint ADSTOP. ADSTOP pops you into the interrupt handler where a one-byte instruction is stored. The contents of that byte address are stored in CP80 until another ADSTOP is entered or until an ADSTOP clear is issued. When the system tries to execute the instruction (a hexadecimal F7H), a call is made to location 30H in ROM where a jump instruction is found which gets you to RAM address 400F. Normally this address contains a return instruction, but replacing it with the address of the ADSTOP handler gives you the RST facility. CP80 does this store for you at start up time.

BEGIN

This command loads the registers with the values stored when the last ADSTOP interrupt occurred, or with new values if registers were updated via the Store command. It then jumps off to the address stored in the new program counter.

Some Frills

First are two Exchange commands. I am often frustrated when the alternate set of registers are unavailable to the program I am running. When an error in a subroutine call clobbers a register it would be nice to be able to switch register banks, set ADSTOP before exiting the routine, and continue with the program. With ADSTOP you can switch the register banks and carry on. The Z-80 instruction set allows this by supplying an EX and an EXX instruction. I provided an EX and an EXX command. The EX command swaps the AF register with the AF' register. The EXX command swaps the BC, DE, HI registers with the BC', DE', HL' bank.

To get a printout of my debugging session I had to modify CP80 to provide the examples. I left the extra instructions and control keys in. The modification allowed me to send what was displayed on the screen down the RS-232 line where an editor on the IBM system caught it. Change port address and status bits to send the output to the standard Radio Shack RS-232 port or even to the printer port since I am using my own interface. The location of the port address is 7696 and the location of the status test is 768F. By changing the port address and status bits you can perform an I/O test on any port. A printout of a session is often handy when reviewing changes but you only need this occasionally. To provide an ON/OFF switch, I set the up and down arrows to start and end the printout. Another feature when using the printer is the comment ability. If a line of text starts with a *, the entire line will go to the printer port without any other action. You can read your debugging session as you go. Along with the special functions of up and down arrow keys I enabled the Break and Clear keys throughout CP80. Any time Clear will clear the screen and Break will terminate your command line.

User Hooks

Several locations on CP80 contain NOP instructions which allows writing overlay programs to load only when CP80 will provide incomplete debugging assistance. Unless you plan to add overlays you can eliminate NOP instructions. I plan an extension program that will tie into CP80 called CPX80, a single-step feature, byte search, memory move, and several other features which are standard in some monitor programs. CPU80 will be a utility program linking into CP80. It will feature system tape read and write, copy ability, and other I/O functions. With CP80, CPX80 and CPU80 I can bypass most monitor programs. I need only load the parts I require thus saving on memory.

The first user hook occurs in the command table at location 707BH. Before falling through to the invalid command message, you can insert a call to your command handler. If the command entered is not found just return and the invalid message will be displayed.

The second user hook is in the display register command at location 73B4H where additional display information can be inserted such as a description of the flag bits, or a display of the DCBs.

The third user hook is in the keyboard input routine at location 7564H. It scans for flag settings for additional commands. ■

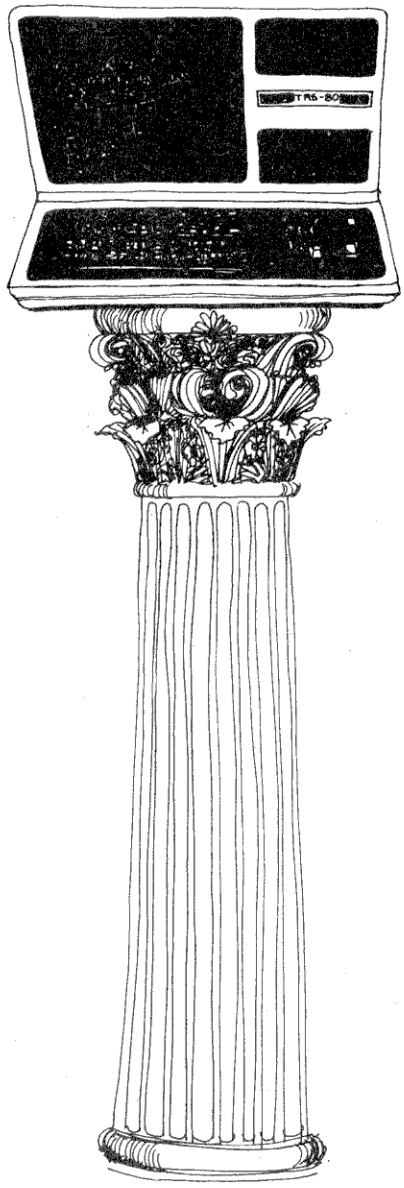
For more information, refer to the Command table (Table 1) and two sample sessions comparing IBM CP monitor commands and CP80 (see Tables 2 and 3).

Program Listing

```
                01000
                01010
0060            01020 DELAY     EQU   0060H
0040            01030 GSTRNG    EQU   40H
40A7            01040 BBUFF     EQU   40A7H
400F            01050 DEBUG     EQU   400FH
000D            01060 CR        EQU   0DH
0000            01070 EOM       EQU   00H
01C9            01080 CLEAR     EQU   01C9H
002B            01090 KBD       EQU   2BH            ;KEYBOARD ROUTINE
0033            01100 RSDSP     EQU   33H
00F0            01110 DATA      EQU   0F0H
00F1            01120 CTRL      EQU   0F1H
28A7            01130 MSGDSP    EQU   28A7H
                01140 ;*****************************************
                01150 ;  INIT ROUTINE
                01160 ;*****************************************
7000            01170           ORG   7000H
7000 315077     01180 CP80:     LD    SP,STACK
7003 21B076     01190           LD    HL,LOGO
7006 CDA728     01200           CALL  MSGDSP
7009 3EC3       01210           LD    A,0C3H         ;LOAD A JUMP
700B 320F40     01220           LD    (DEBUG),A         ;LOAD THE JUMP
700E 218B74     01230           LD    HL,ADINT
7011 221040     01240           LD    (DEBUG+1),HL
7014 CD9770     01250           CALL  OURKBD
7017 CDC901     01260           CALL  CLEAR
                01270 ;*****************************************
                01280 ;            COMMAND HANDLER                ;
                01290 ;*****************************************
701A            01300 CMDHND    EQU   $
701A AF         01310           XOR   A                ;CLEAR A REG
701B 32F876     01320           LD    (CMDFLG),A       ;RESET FLAGS
701E CD9770     01330           CALL  OURKBD           ;SCAN FOR COMMAND
7021 FE1F       01340           CP    1FH              ;IS IT A CLEAR
7023 2005       01350           JR    NZ,NOTCL         ;NO
7025 CDC901     01360           CALL  CLEAR            ;JUST CLEAR SCREEN
7028 18F0       01370           JR    CMDHND           ;CONTINUE
702A            01380 NOTCL     EQU   $
702A FE0D       01390           CP    0DH              ;IT IT CR
702C 200D       01400           JR    NZ,NOCR          ;NO - BYPASS
702E            01410 CP80M     EQU   $
702E CD7B76     01420           CALL  OURMSG
7031 0E         01430           DEFB  0EH              ;INSURE CURSOR ON
7032 43         01440           DEFM  'CP80 '
                01450 ; AN EXTRA BLANK FOR CPX80 AND CPU80 ZAP
7037 0D         01460           DEFB  CR
7038 00         01470           DEFB  EOM
7039 18DF       01480           JR    CMDHND             ;RETURN
                01490 ;
703B            01500 NOCR      EQU   $
703B FE20       01510           CP    20H              ;IS IT A BLANK?
703D 28DB       01520           JR    Z,CMDHND         ;YES RETURN
```

Program continues

FORUM-80



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```
703F FE0A    01530          CP    0AH          ;DOWN ARROW?
7041 2006    01540          JR    NZ,NOTD      ;NO
7043 AF      01550          XOR   A            ;CLEAR FOR NOP
7044 328876  01560          LD    (POUT),A     ;STORE IT
7047 18D1    01570          JR    CMDHND
             01580 ;
7049         01590 NOTD     EQU   $
70AC         02200 WCR      EQU   $
70AC CD9770  02210          CALL  OURKBD
70AF FE20    02220          CP    20H          ;BLANK?
70B1 28F9    02230          JR    Z,WCR        ;YES RETRY
70B3 FE0D    02240          CP    0DH          ;IS IT CR
70B5 20F2    02250          JR    NZ,NOTBL     ;NOPE
70B7 C9      02260          RET
             02270 ;
             02280 ;*************************************************
             02290 ; HERE TO SWAP REGISTER WHEN USER ISSUES
             02300 ; EX (SWAP AF WITH AF')
             02310 ; EXX (SWAP BC DE HL WITH BC' DE' HL')
             02320 ;*************************************************
70B8         02330 ECMD     EQU   $
70B8 CD9770  02340          CALL  OURKBD
70BB FE58    02350          CP    58H          ;IS IT X?
70BD 20BF    02360          JR    NZ,ICMD      ;NO ERROR
70BF CD9770  02370          CALL  OURKBD
70C2 FE0D    02380          CP    0DH          ;IS IT EX CMD?
70C4 2015    02390          JR    NZ,NOTEX     ;NO CHECK EXX
70C6 2AFA76  02400          LD    HL,(AFSV)
70C9 221277  02410          LD    (TEMPR),HL
70CC 2A0277  02420          LD    HL,(AFPSV)
70CF 22FA76  02430          LD    (AFSV),HL
70D2 2A1277  02440          LD    HL,(TEMPR)
70D5 220277  02450          LD    (AFPSV),HL
70D8 C31A70  02460          JP    CMDHND
70DB         02470 NOTEX    EQU   $
70DB FE58    02480          CP    58H          ;IS IT X?
70DD C27E70  02490          JP    NZ,ICMD
70E0 CD9770  02500          CALL  OURKBD
70E3 FE0D    02510          CP    0DH
70E5 C27E70  02520          JP    NZ,ICMD
70E8 21FC76  02530          LD    HL,BCSV
70EB 111277  02540          LD    DE,TEMPR
70EE 010600  02550          LD    BC,6
70F1 EDB0    02560          LDIR
70F3 210477  02570          LD    HL,BCPSV
70F6 11FC76  02580          LD    DE,BCSV
70F9 010600  02590          LD    BC,6
70FC EDB0    02600          LDIR
70FE 211277  02610          LD    HL,TEMPR
7101 110477  02620          LD    DE,BCPSV
7104 010600  02630          LD    BC,6
7107 EDB0    02640          LDIR
7109 C31A70  02650          JP    CMDHND
             02660 ;
             02670 ;*************************************************
             02680 ;ENTER HERE AFTER STORE IS VALIDATED
             02690 ;1.WAIT FOR A BLANK
             02700 ;2.GET ADDRESS TO STORE DATA
             02710 ;3.WAIT FOR A BLANK
             02720 ;4KEEP RECEIVING BYTES AND STORE UNTIL CR
             02730 ;5.REPLY - STORE COMPLETE
             02740 ;
             02750 ;*************************************************
710C         02760 STCMD    EQU   $
710C 21F976  02770          LD    HL,TRNFLG
710F CB8E    02780          RES   TRANS,(HL)   ;TURN TRANSLATE OFF
7111 21F876  02790          LD    HL,CMDFLG
7114 CBD6    02800          SET   STORE,(HL)   ;SET FLAG BIT
7116 CDA170  02810          CALL  WBLK         ;GET A BLANK
7119         02820 STTM     EQU   $
7119 CD3C75  02830          CALL GETADD        ;GET AN ADDRESS
711C CDA170  02840          CALL  WBLK         ;GET ANOTHER BLANK
711F         02850 STMEM    EQU   $
711F E5      02860          PUSH  HL           ;SAVE DEST ADDR
7120 2AA740  02870          LD    HL,(BBUFF)   ;GET BUFFER ADDRESS
7123 06FF    02880          LD    B,255        ;SHOW LENGTH
7125 CD4000  02890          CALL  GSTRNG       ;GET OUR STRING
7128 DA5476  02900          JP    C,CJMP       ;BREAK - TERMINATE
712B 21F976  02910          LD    HL,TRNFLG    ;GET FLAG
712E CB4E    02920          BIT   TRANS,(HL)   ;IS TRANS ON?
7130 203A    02930          JR    NZ,NOTTR     ;NO BYPASS
7132 2AA740  02940          LD    HL,(BBUFF)   ;POINT TO SOURCE
7135 FDE1    02950          POP   IY           ;POINT TO DESTINATION
7137         02960 TRANM    EQU   $
7137 CD5071  02970          CALL  TRANA
713A 23      02980          INC   HL           ;POINT TO NEXT BYTE
713B CB27    02990          SLA   A
713D CB27    03000          SLA   A
713F CB27    03010          SLA   A
7141 CB27    03020          SLA   A
7143 47      03030          LD    B,A
7144 CD5071  03040          CALL  TRANA
7147 80      03050          ADD   A,B
7148 FD7700  03060          LD    (IY+0),A     ;STORE IT
714B FD23    03070          INC   IY
714D 23      03080          INC   HL
714E 18E7    03090          JR    TRANM
             03100 ;
7150         03110 TRANA    EQU   $
7150 7E      03120          LD    A,(HL)       ;GET A CHAR
7151 FE0D    03130          CP    0DH          ;END?
7153 2003    03140          JR    NZ,TRANC     ;NO - CONTINUE
```

Program continues

Program continued

```
7155 F1        03150          POP   AF            ;KILL STACK ENTRY
7156 181D      03160          JR    STCMM         ;LINK UP
7158           03170 TRANC    EQU   $
7158 D630      03180          SUB   30H           ;REMOVE SPECIAL CODES
715A FA6871    03190          JP    M,TRANIV      ;INVALID
715D FE0A      03200          CP    0AH           ;0-9?
715F F8        03210          RET   M             ;YES
7160 D607      03220          SUB   7             ;FLIP BIT
7162 FA6871    03230          JP    M,TRANIV      ;ERROR
7165 FE10      03240          CP    10H           ;A-F?
7167 F8        03250          RET   M             ;YES
7168           03260 TRANIV   EQU   $
7168 D1        03270          POP   DE            ;KILL STACK ENTRY
7169 C35476    03280          JP    CJMP
               03290 ;
716C           03300 NOTTR    EQU   $
716C 48        03310          LD    C,B
716D AF        03320          XOR   A             ;CLEAR A REG
716E 47        03330          LD    B,A
716F D1        03340          POP   DE            ;RESTORE DEST
7170 2AA740    03350          LD    HL,(BBUFF)    ;SOURCE AGAIN
7173 EDB0      03360          LDIR                ;MOVE IT
7175           03370 STCMM    EQU   $
7175 CD7B76    03380          CALL  OURMSG
7178 0D        03390          DEFB  CR
7179 53        03400          DEFM  'STORE COMPLETE'
7187 0D        03410          DEFB  CR
7188 00        03420          DEFB  EOM
7189 C31A70    03430          JP    CMDHND
               03440 ;
               03450 ;*****************************************************
               03460 ;ENTER HERE IF AN I WAS ENCOUNTERD
               03470 ;FROM HERE WE DETERMINE IF IT
               03480 ;IS AN X OR Y
               03490 ;*****************************************************
718C           03500 STIND    EQU   $
718C CD9770    03510          CALL  OURKBD
718F FE59      03520          CP    59H           ;IS IT A Y
7191 2814      03530          JR    Z,STY         ;YES
7193 FE58      03540          CP    58H           ;IS IT AN X
7195 C2A970    03550          JP    NZ,NOTBL      ;NO - ERROR
7198           03560 STX      EQU   $
7198 CDA170    03570          CALL  WBLK
719B CD3C75    03580          CALL  GETADD        ;GET NEW IX
719E CDAC70    03590          CALL  WCR           ;WAIT FOR A CR
71A1 220A77    03600          LD    (IXSV),HL     ;STORE NEW IX
71A4 C31A70    03610          JP    CMDHND        ;RETURN
               03620 ;
71A7           03630 STY      EQU   $
71A7 CDA170    03640          CALL  WBLK
71AA CD3C75    03650          CALL  GETADD        ;GET NEW IY
71AD CDAC70    03660          CALL  WCR           ;WAIT FOR A CR
71B0 220C77    03670          LD    (IYSV),HL     ;STORE NEW IY
71B3 C31A70    03680          JP    CMDHND        ;RETURN
               03690 ;
               03700 ;*****************************************************
               03710 ;ENTER AFTER A STORE
               03720 ;A B C D E H L
               03730 ;THE HL IS POINTING TO
               03740 ;CORRECT AREA TO STORE INTO
               03750 ;*****************************************************
71B6           03760 STG      EQU   $
71B6 CDA170    03770          CALL  WBLK          ;WAIT FOR A BLANK
71B9 CD4575    03780          CALL  GETNUM        ;GET THE VALUE
71BC 77        03790          LD    (HL),A        ;STORE IT
71BD CDAC70    03800          CALL  WCR           ;WAIT FOR A CR
71C0 C31A70    03810          JP    CMDHND        ;RETURN
               03820 ;*****************************************************
               03830 ;ENTER HERE FROM THE GETADD
               03840 ;CODE FOR STORE
               03850 ;FIRST BYTE OF ADDRE WAS THE
               03860 ;CHAR P TELLING US TO STORE
               03870 ;A NEW PC
               03880 ;*****************************************************
71C3           03890 STOREP   EQU   $
71C3 CD9770    03900          CALL  OURKBD        ;GET A CHAR
71C6 FE20      03910          CP    20H           ;BLANK?
71C8 2808      03920          JR    Z,DOPC        ;YES
71CA FE43      03930          CP    43H           ;IS IT C?
71CC C2A970    03940          JP    NZ,NOTBL      ;NO - ERROR
71CF CDA170    03950          CALL  WBLK          ;WAIT FOR BLANK
71D2           03960 DOPC     EQU   $
71D2 CD3C75    03970          CALL  GETADD        ;GET THE NEW PC
71D5 CDAC70    03980          CALL  WCR           ;WAIT FOR A CR
71D8 221077    03990          LD    (PCSV),HL     ;STORE IT
71DB C31A70    04000          JP    CMDHND        ;AND RETURN
               04010 ;*****************************************************
               04020 ;FIRST BYTE WAS A S
               04030 ;SO WE SHOULD STORE NEW SP
               04040 ;*****************************************************
71DE           04050 WST3     EQU   $
71DE CD9770    04060          CALL  OURKBD        ;GET A CHAR
71E1 FE20      04070          CP    20H           ;BLANK?
71E3 2808      04080          JR    Z,SPNOB       ;YES
71E5 FE50      04090          CP    50H           ;UPPER CASE P?
71E7 C2A970    04100          JP    NZ,NOTBL      ;NO INVALID FORMAT
71EA CDA170    04110          CALL  WBLK          ;WAIT FOR A BLANK
71ED           04120 SPNOB    EQU   $
71ED CD3C75    04130          CALL  GETADD        ;GET NEW SP
71F0 CDAC70    04140          CALL  WCR           ;WAIT FOR A CR
71F3 220E77    04150          LD    (SPSV),HL     ;SAVE IT
71F6 C31A70    04160          JP    CMDHND        ;RETURN
               04170 ;
```

Program continues

more . . .

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Program continued

```
                04180 ;*************************************************
                04190 ; ENTER HERE WHEN DISPLAY HAS BEEN
                04200 ;VALIDATED. IT IS NOW OUR JOB TO
                04210 ;FIN OUT WHAT KIND OF DISPLAY IS
                04220 ;REQUIRED.
                04230 ;****************************************
71F9            04240 DICMD     EQU   $
71F9 CDA170     04250           CALL  WBLK          ;WAIT FOR A BLANK
71FC 21F876     04260           LD    HL,CMDFLG
71FF CBCE       04270           SET   DISPLY,(HL)   ;SET FLAG BIT
7201 CD3C75     04280           CALL  GETADD
7204 7D         04290           LD    A,L           ;GET LOW BYTE
7205 E6F0       04300           AND 0F0H            ;ROUND OFF
7207 6F         04310           LD    L,A           ;SAVE IT BACK
7208 CD9770     04320           CALL  OURKBD        ;GET A CHAR
720B FE0D       04330           CP    CR
720D 200A       04340           JR    NZ,CKDOT      ;NOT CR
720F FD21F876   04350           LD    IY,CMDFLG     ;LOAD FLAGS
7213 FDCB00A6   04360           RES   DOT,(IY+0)    ;TURN DOT OFF
7217 1810       04370           JR    PREN          ;LINK UP
7219            04380 CKDOT     EQU   $
7219 FE2E       04390           CP    2EH           ;IS IT A DOT
721B C27E70     04400           JP    NZ,ICMD       ;NO - ERROR
721E CDAC70     04410           CALL  WCR           ;WAIT FOR CR
7221 FD21F876   04420           LD    IY,CMDFLG     ;LOAD FLAGS
7225 FDCB00E6   04430           SET   DOT,(IY+0)    ;TURN DOT ON
7229            04440 PREN      EQU   $
7229            04450 NULN      EQU   $
7229 CD2B00     04460           CALL  KBD           ;SCAN KEYS
722C B7         04470           OR    A             ;ANYTHING?
722D 2807       04480           JR    Z,KDSP        ;NO
722F FE01       04490           CP    1             ;BREAK?
7231 2003       04500           JR    NZ,KDSP        ;YES - END
7233 C31A70     04510           JP    CMDHND        ;RETURN
7236            04520 KDSP      EQU   $
7236 AF         04530           XOR   A             ;CLEAR A REG
7237 321B77     04540           LD    (CNT),A       ;CLEAR COUNT
723A 321D77     04550           LD    (BLKN),A      ;CLEAR BLOCK NUMBER
723D E5         04560           PUSH  HL            ;SAVE START ADDR
723E CDD572     04570           CALL  DSPADD        ;DISPLAY THE ADDRESS
7241 CD0273     04580           CALL  DSPC          ;FIRE IT OFF
7244            04590 DDMP      EQU   $
7244 7E         04600           LD    A,(HL)        ;GET CHAR
7245 CDE272     04610           CALL  DSPCAR        ;SHOW IT IN HEX
7248 23         04620           INC   HL            ;POINT TO NEXT
7249 3A1B77     04630           LD    A,(CNT)       ;GET COUNT
724C 3C         04640           INC   A             ;ADD 1
724D 321B77     04650           LD    (CNT),A       ;STORE BACK
7250 FE04       04660           CP    4             ;LIMIT?
7252 2802       04670           JR    Z,BLNK        ;YES
7254 18EE       04680           JR    DDMP
                04690 ;
7256            04700 BLNK      EQU   $
7256 3E20       04710           LD    A,20H         ;LOAD A BLANK
7258 CD8176     04720           CALL  DSP           ;FIRE IT
725B AF         04730           XOR   A             ;CLEAR REG
725C 321B77     04740           LD    (CNT),A       ;CLEAR COUNT
725F 3A1D77     04750           LD    A,(BLKN)      ;GET BLOK NUM
7262 3C         04760           INC   A             ;ADD 1
7263 321D77     04770           LD    (BLKN),A      ;STORE BACK
7266 FE04       04780           CP    4
7268 2802       04790           JR    Z,ASCDP       ;DONE PART 1
726A 18D8       04800           JR    DDMP          ;CONTINUE
                04810 ;
726C            04820 ASCDP     EQU   $
726C AF         04830           XOR   A             ;CLEAR A REG
726D 321B77     04840           LD    (CNT),A       ;RESET COUNT
7270 321D77     04850           LD    (BLKN),A      ;RESET BLOCK
7273 3E20       04860           LD    A,20H         ;LOAD A BLANK
7275 CD8176     04870           CALL  DSP           ;FIRE IT OFF
7278 3E2A       04880           LD    A,'*'
727A CD8176     04890           CALL  DSP
727D E1         04900           POP   HL            ;GET BACK START ADDR
727E            04910 MOREA     EQU   $
727E 7E         04920           LD    A,(HL)        ;GET A CHAR
727F FE20       04930           CP    20H           ;IS IT BLANK?
7281 280E       04940           JR    Z,CKEND       ;YES - DISPLAY
7283 FE30       04950           CP    30H           ;LOW WATER?
7285 FA8F72     04960           JP    M,DODOT       ;NO
7288 FE5B       04970           CP    5BH           ;HIGH WATER MARK?
728A F28F72     04980           JP    P,DODOT       ;NO
728D 1802       04990           JR    CKEND         ;SEE IF DONE
728F            05000 DODOT     EQU   $
728F 3E2E       05010           LD    A,'.'         ;BEST JUST ..
7291            05020 CKEND     EQU   $
7291 CD8176     05030           CALL  DSP           ;SHOW IT
7294 3A1B77     05040           LD    A,(CNT)       ;GET COUNT
7297 3C         05050           INC A
7298 321B77     05060           LD    (CNT),A       ;STORE IT BACK
729B 23         05070           INC   HL            ;POINT TO NEXT
729C FE10       05080           CP    16            ;LIMIT?
729E 20DE       05090           JR    NZ,MOREA      ;NO
72A0 3E2A       05100           LD    A,'*'
72A2 CD8176     05110           CALL  DSP           ;SHOW IT
72A5 3E0D       05120           LD    A,CR
72A7 CD8176     05130           CALL  DSP           ;FIRE IT OFF
72AA FD21F876   05140           LD    IY,CMDFLG     ;GET FLAG
72AE FDCB0066   05150           BIT   DOT,(IY+0)    ;IS DOT ON?
72B2 CA1A70     05160           JP    Z,CMDHND      ;NO - DONE
72B5 3A1C77     05170           LD    A,(SCNT)      ;GET SCREEN COUNT
72B8 3C         05180           INC   A             ;ADD 1
72B9 321C77     05190           LD    (SCNT),A      ;SAVE IT BACK
72BC FE0F       05200           CP    15            ;LIMIT?
72BE C22972     05210           JP    NZ,NULN       ;NO - DO MORE
```

Program continues

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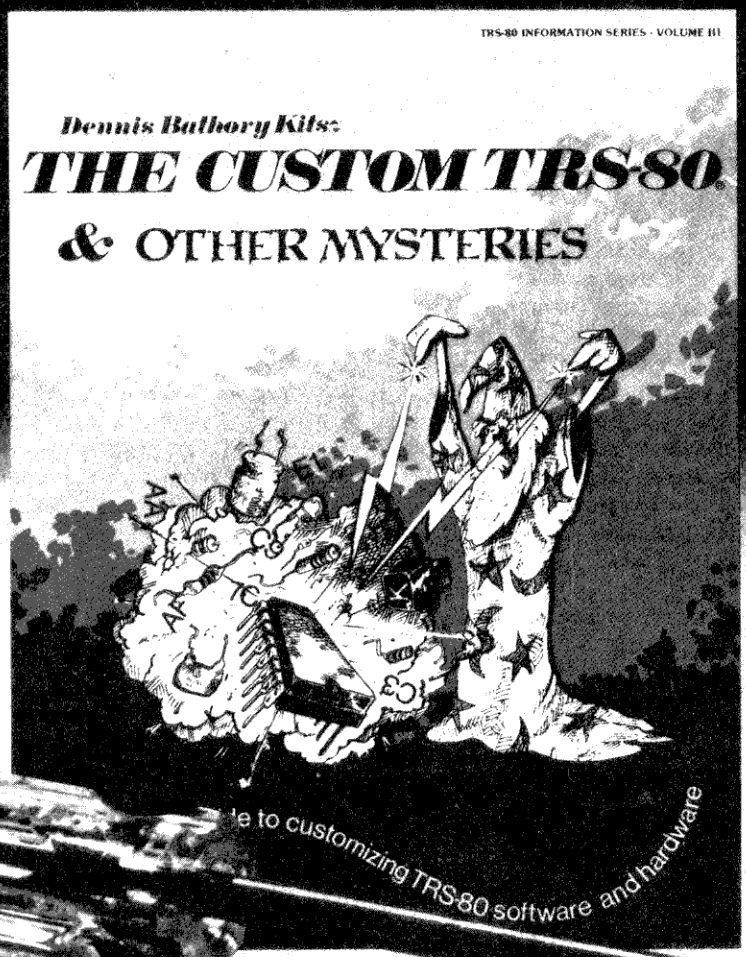

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```
72C1 AF        05220          XOR   A              ;CLEAR A REG
72C2 321C77    05230          LD    (SCNT),A       ;CLEAR THE COUNT
72C5 CD9770    05240          CALL  OURKBD         ;GET A CHAR
72C8 FE01      05250          CP    1              ;IS IT BREAK?
72CA CA2E70    05260          JP    Z,CP80M        ;YES - DONE
72CD FE0D      05270          CP    0DH            ;JUST RETURN?
72CF C27E70    05280          JP    NZ,ICMD        ;NO - ERROR
72D2 C32972    05290          JP    NULN
               05300 ;
72D5           05310 DSPADD   EQU   $
72D5 E5        05320          PUSH  HL             ;GET ADDR
72D6 7C        05330          LD    A,H            ;LOAD FIRST BYTE
72D7 C5        05340          PUSH  BC             ;SAVE REGS
72D8 CDE272    05350          CALL  DSPCAR         ;SHOW CHAR
72DB 7D        05360          LD    A,L            ;LOAD SECOND BYTE
72DC CDE272    05370          CALL  DSPCAR         ;SHOW IT
72DF C1        05380          POP   BC             ;RESTORE REG
72E0 E1        05390          POP   HL             ;RESTORE ADDR
72E1 C9        05400          RET
               05410 ;
72E2           05420 DSPCAR   EQU   $
72E2 4F        05430          LD    C,A
72E3 CB3F      05440          SRL   A
72E5 CB3F      05450          SRL   A
72E7 CB3F      05460          SRL   A
72E9 CB3F      05470          SRL   A
72EB CDF572    05480          CALL  CKIT
72EE 79        05490          LD    A,C
72EF E60F      05500          AND   0FH
72F1 CDF572    05510          CALL  CKIT
72F4 C9        05520          RET
72F5           05530 CKIT     EQU   $
72F5 C630      05540          ADD   A,30H
72F7 FE3A      05550          CP    3AH
72F9 FAFE72    05560          JP    M,CK1
72FC C607      05570          ADD   A,7
72FE           05580 CK1      EQU   $
72FE CD8176    05590          CALL  DSP
7301 C9        05600          RET
               05610 ;
7302           05620 DSPC     EQU   $
7302 3E20      05630          LD    A,20H
7304 CD8176    05640          CALL  DSP
7307 CD8176    05650          CALL  DSP
730A C9        05660          RET
               05670 ;
               05680 ;*********************************************
               05690 ; ENTER HERE TO DISPLAY ALL
               05700 ;THE CPU REGISTERS. THIS
               05710 ;HAS BEEN ADDED FOR ALL
               05720 ;THE PEOPLE WHO DON'T WANT
               05730 ;TO MISS OUT ON ANYTHING
               05740 ;*********************************************
730B           05750 DRS      EQU   $
730B CDAC70    05760          CALL  WCR            ;WAIT FOR CR
730E CD7B76    05770          CALL  OURMSG
7311 20        05780          DEFM  ' AF    BC    DE    HL      AF'
732E 27        05790          DEFB  27H
732F 20        05800          DEFM  '   BC'
7334 27        05810          DEFB  27H
7335 20        05820          DEFM  '   DE'
733A 27        05830          DEFB  27H
733B 20        05840          DEFM  '   HL'
7340 27        05850          DEFB  27H
7341 0D        05860          DEFB  CR
7342 00        05870          DEFB  EOM
7343 21FA76    05880          LD    HL,AFSV        ;POINT TO START
7346 AF        05890          XOR   A              ;CLEAR ...
7347 321B77    05900          LD    (CNT),A        ;OUR COUNTER
734A           05910 DOMOR    EQU   $
734A CDBA73    05920          CALL  DDSP           ;DO A DOUBLE DISPLAY
734D CD0273    05930          CALL  DSPC           ;DOUBLE SPACE
7350 3A1B77    05940          LD    A,(CNT)        ;GET COUNT
7353 3C        05950          INC   A              ;ADD 1
7354 321B77    05960          LD    (CNT),A        ;SAVE BACK
7357 FE04      05970          CP    4              ;DONE?
7359 20EF      05980          JR    NZ,DOMOR       ;NOT YET
735B CD0273    05990          CALL  DSPC           ;DOUBLE SPACE
735E AF        06000          XOR   A              ;RESET
735F 321B77    06010          LD    (CNT),A        ;..COUNTER
7362           06020 DOPRM    EQU   $
7362 CDBA73    06030          CALL  DDSP           ;DOUBLE DISPLAY
7365 CD0273    06040          CALL  DSPC           ;DOUBLE SPACE
7368 3A1B77    06050          LD    A,(CNT)
736B 3C        06060          INC   A
736C 321B77    06070          LD    (CNT),A
736F FE04      06080          CP    4              ;DONE?
7371 20EF      06090          JR    NZ,DOPRM       ;NOT YET
7373 CD7B76    06100          CALL  OURMSG
7376 0D        06110          DEFB  CR
7377 20        06120          DEFM  ' IX    IY'
7380 0D        06130          DEFB  CR
7381 00        06140          DEFB  EOM
7382 210A77    06150          LD    HL,IXSV
7385 CDC773    06160          CALL  D16
7388 CD0273    06170          CALL  DSPC
738B 210C77    06180          LD    HL,IYSV
738E CDC773    06190          CALL  D16
7391 CD7B76    06200          CALL  OURMSG
7394 0D        06210          DEFB  CR
7395 20        06220          DEFM  ' SP    PC'
739E 0D        06230          DEFB  CR
739F 00        06240          DEFB  EOM
73A0 210E77    06250          LD    HL,SPSV
```

Program continues

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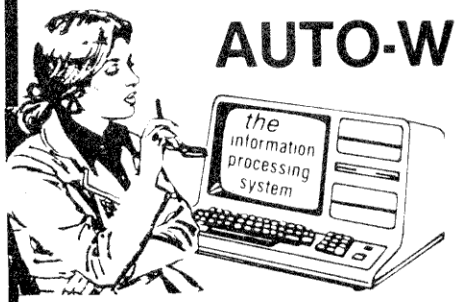

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- DON'T BE CONFUSED BY ALL THE BRAND NAMES YOU SEE IN THE MARKET PLACE, THERE ARE VERY FEW MANUFACTURERS OF THE BASIC DRIVE CHASSIS, ALL THE OTHER NAMES ARE THOSE OF THE ASSEMBLERS OR THE RETAILERS.
- AS MANUFACTURED, THE DRIVE WILL NOT RUN ON A TRS-80‡, IT MUST BE MODIFIED BY THE ASSEMBLER.
- THE QUALITY OF THE DRIVE DELIVERED TO YOU IS DEPENDENT ON BOTH THE MANUFACTURER AND THE ASSEMBLER, THE BEST CAN TURN TO JUNK IF THE ASSEMBLY IS IMPROPERLY DONE.
- THE POWER SUPPLY AND CASE ARE VERY IMPORTANT COMPONENTS OF THE COMPLETE DRIVE, THE CASE MUST ALLOW PROPER COOLING AIR FLOW, AND THE POWER SUPPLY MUST MAINTAIN TWO CONSTANT VOLTAGES.
- YOU MUST DEPEND ON THE COMPANY SELLING YOU THE DRIVE TO SERVICE IT AT REASONABLE COST WHEN IT FAILS YOU, THE MANUFACTURER IS NOT EQUIPPED TO DO THIS!
- THE BEST MEASURE OF QUALITY IN A DRIVE IS IT'S SPECIFICATIONS, WILL IT HANDLE DOUBLE DENSITY, WHAT IS THE TRACK TO TRACK ACCESS TIME, THE ANSWERS TO THESE TWO QUESTIONS INDICATE THE PRECISION OF IT'S COMPONENTS.
- WHAT KIND OF DRIVE SHOULD YOU BUY ? LEVEL IV HAS CHOSEN TO DISTRIBUTE EXCLUSIVELY, THE MPI LINE, ALL MODELS OF MPI ARE DOUBLE DENSITY RATED AND REQUIRE ONLY A FIVE MILLI-SECOND TRACK TO TRACK ACCESS TIME.
- WHAT DO ALL THE MODEL NUMBERS MEAN?
  B-51= 40 TRACKS SINGLE HEAD SINGLE SIDE B-52= 40/40 TRACKS DOUBLE HEAD DOUBLE SIDE
  B-91= 80 TRACKS SINGLE HEAD SINGLE SIDE B-92= 80/80 TRACKS DOUBLE HEAD DOUBLE SIDE
  (DOUBLE HEADS)-READ BOTH SIDES OF DISK (DUALS)-TWO DRIVES IN ONE CASE (RAW)-NO POWER SUPPLY OR CASE
- WHERE SHOULD YOU BUY YOUR DRIVE, LEVEL IV IS ONE OF THE OLDEST AND LARGEST DISTRIBUTORS OF TRS-80‡ EQUIPMENT, LOOK AT THE ADS IN YOUR OLD MAGAZINES, MANY OF THE ADVERTISERS ARE NO LONGER IN BUSINESS, LEVEL IV HAS BEEN A LEADER SINCE THE BEGINNING, WE STAND BEHIND OUR PRODUCTS, AND WE'LL BE HERE WHEN YOU NEED HELP.
- WHERE DO THE NATIONALLY KNOWN AUTHORS BUY THEIR DRIVES ? LEVEL IV CAN SHOW COPIES OF SALES RECEIPTS FOR DRIVES TO MOST OF THEM, LEVEL IV ALSO PROVIDES SERVICE FOR THEIR DRIVES AND COMPUTER SYSTEMS IN OUR FULLY EQUIPPED TECH CENTER.
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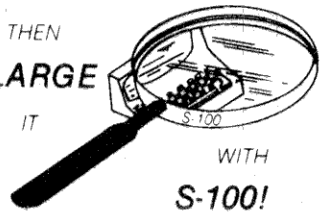

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Program continued

```
73A3 CDC773   06260          CALL  D16
73A6 CD0273   06270          CALL  DSPC
73A9 211077   06280          LD    HL,PCSV
73AC CDC773   06290          CALL  D16
73AF 3E0D     06300          LD    A,0DH
73B1 CD8176   06310          CALL  DSP
              06320 ; ALLOW A HOOK INTO DISPLAY
73B4 00       06330          NOP
73B5 00       06340          NOP
73B6 00       06350          NOP
73B7 C31A70   06360          JP    CMDHND
              06370 ;
73BA          06380 DDSP     EQU   $
73BA CDC173   06390          CALL  SDSP
73BD CDC173   06400          CALL  SDSP
73C0 C9       06410          RET
              06420 ;
73C1          06430 SDSP     EQU   $
73C1 7E       06440          LD    A,(HL)
73C2 CDE272   06450          CALL  DSPCAR
73C5 23       06460          INC   HL
73C6 C9       06470          RET
              06480 ;
73C7          06490 D16      EQU   $
73C7 23       06500          INC   HL
73C8 7E       06510          LD    A,(HL)
73C9 CDE272   06520          CALL  DSPCAR
73CC 2B       06530          DEC   HL
73CD CDC173   06540          CALL  SDSP
73D0 C9       06550          RET
              06560 ;
              06570 ;*********************************************
              06580 ;HERE FOR DISPLAY OF GENERAL
              06590 ;REGISTERS A,B,C,D,E,H,L
              06600 ;
              06610 ;*********************************************
73D1          06620 DG       EQU   $
73D1 CDAC70   06630          CALL WCR              ;WAIT FOR CR
73D4 CD7B76   06640          CALL  OURMSG
73D7 41       06650          DEFM  'A   B   C   D   E   H   L'
73F0 0D       06660          DEFB  CR
73F1 00       06670          DEFB  EOM
73F2 3AFA76   06680          LD    A,(AFSV)        ;GET USER A REG
73F5 CDE272   06690          CALL  DSPCAR          ;SHOW IT
73F8 CD0273   06700          CALL  DSPC            ;DOUBLE SPACE
73FB 21FC76   06710          LD    HL,BCSV         ;POINT TO B REG
73FE AF       06720          XOR   A               ;CLEAR A
73FF 321B77   06730          LD    (CNT),A         ;CLEAR COUNT
7402          06740 DGM      EQU   $
7402 CDC173   06750          CALL  SDSP            ;SHOW IT
7405 CD0273   06760          CALL  DSPC            ;DOUBLE SPACE
7408 3A1B77   06770          LD    A,(CNT)         ;GET COUNT
740B 3C       06780          INC   A               ;ADD 1
740C 321B77   06790          LD    (CNT),A         ;SAVE BACK
740F FE06     06800          CP    6               ;LIMIT?
7411 20EF     06810          JR    NZ,DGM          ;KEEP DSPING
7413 3E0D     06820          LD    A,CR            ;LOAD A CR
7415 CD8176   06830          CALL  DSP
7418 C31A70   06840          JP    CMDHND
              06850 ;
              06860 ;*********************************************
              06870 ;THE DISPLAY TYPE JUMPS HERE WHEN IT
              06880 ;DECIDES WHAT 16 BIT REGISTER SHOULD
              06890 ;BE DISPLAYED.  THE ADDRESS WILL
              06900 ;BE POINTED TO BY THE HL REGISTER
              06910 ;BIT8R SHOULD BE JUMPED TO IF
              06920 ;AN 8 BIT REGISTER IS TO BE
              06930 ;DISPLAYED.
              06940 ;*********************************************
741B          06950 BIT16    EQU   $
741B CDAC70   06960          CALL  WCR             ;WAIT FOR CR
741E 23       06970          INC   HL              ;POINT TO LOW
741F 7E       06980          LD    A,(HL)          ;GET THE CHAR
7420 CDE272   06990          CALL  DSPCAR          ;SHOW IT
7423 2B       07000          DEC   HL              ;POINT TO 2ND PART
7424          07010 BIT8R    EQU   $
7424 7E       07020          LD    A,(HL)          ;GET 2ND PART
7425 CDE272   07030          CALL  DSPCAR          ;SHOW IT
7428 3E0D     07040          LD    A,CR            ;LOAD A CR
742A CD8176   07050          CALL  DSP
742D C31A70   07060          JP    CMDHND
              07070 ;
              07080 ;*********************************************
              07090 ;WE ENTER HERE AFTER A VALID BEGIN IS FOUND
              07100 ;ALL REGISTERS ARE RESTORED
              07110 ;FROM THE SAVE AREA AND
              07120 ;A JUMP TO THE PC IS MADE
              07130 ;*********************************************
7430          07140 BCMD     EQU   $
7430 CDAC70   07150          CALL  WCR             ;WAIT FOR A CR
7433 ED7B0E77 07160          LD    SP,(SPSV)       ;USE USERS STACK
7437 C1       07170          POP   BC              ;GET OLD PC
7438 ED4B1077 07180          LD    BC,(PCSV)       ;SAVE USERS PC
743C C5       07190          PUSH  BC              ;SAVE PC ON STACK
743D 315077   07200          LD    SP,STACK        ;REINIT OUR STACK
              07210 ;RESTORE AF
7440 ED5B0277 07220          LD    DE,(AFPSV)
7444 43       07230          LD    B,E
7445 4A       07240          LD    C,D
7446 C5       07250          PUSH  BC
7447 F1       07260          POP   AF
              07270 ;RESTORE HL
7448 ED5B0877 07280          LD    DE,(HLPSV)
```

Program continues

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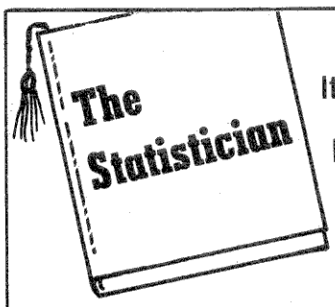

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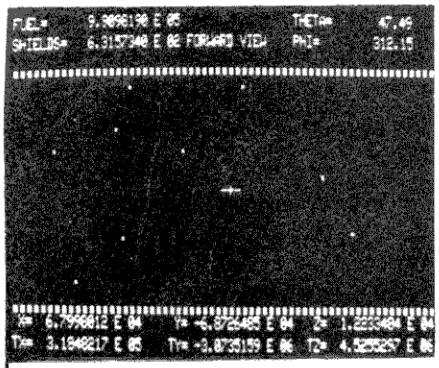

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Program continued

```
744C 43          07290            LD     B,E
744D 4A          07300            LD     C,D
744E C5          07310            PUSH   BC
                 07320 ;RESTORE DE
744F ED5B0677    07330            LD     DE,(DEPSV)
7453 43          07340            LD     B,E
7454 4A          07350            LD     C,D
7455 C5          07360            PUSH   BC
                 07370 ;RESTORE BC
7456 ED5B0477    07380            LD     DE,(BCPSV)
745A 43          07390            LD     B,E
745B 4A          07400            LD     C,D
                 07410 ;
745C D1          07420            POP    DE
745D E1          07430            POP    HL
745E DD2A0A77    07440            LD     IX,(IXSV)
7462 FD2A0C77    07450            LD     IY,(IYSV)
                 07460 ;
7466 D9          07470            EXX
7467 08          07480            EX     AF,AF'
                 07490 ;RESTORE AF
7468 ED5BFA76    07500            LD     DE,(AFSV)
746C 43          07510            LD     B,E
746D 4A          07520            LD     C,D
746E C5          07530            PUSH   BC
                 07540 ;RESTORE DE
746F ED5BFE76    07550            LD     DE,(DESV)
7473 43          07560            LD     B,E
7474 4A          07570            LD     C,D
7475 C5          07580            PUSH   BC
                 07590 ;RESTORE HL
7476 ED5B0077    07600            LD     DE,(HLSV)
747A 43          07610            LD     B,E
747B 4A          07620            LD     C,D
747C C5          07630            PUSH   BC
                 07640 ;RESTORE BC
747D ED5BFC76    07650            LD     DE,(BCSV)
7481 43          07660            LD     B,E
7482 4A          07670            LD     C,D
                 07680 ;
7483 E1          07690            POP    HL
7484 D1          07700            POP    DE
7485 F1          07710            POP    AF
                 07720 ;
7486 ED7B0E77    07730            LD     SP,(SPSV)
                 07740 ;
748A C9          07750            RET
                 07760 ;
                 07770 ;*********************************************
                 07780 ;        ADSTOP INTERRUPT CODE
                 07790 ;
                 07800 ;THIS SECTION IS ENTERED WHEN AN
                 07810 ;ADSTOP HAS BEEN SET VIA THE ADSTOP
                 07820 ;COMMAND OR BY THE USER STORING A HEX
                 07830 ;F7 IN THE PROGRAM.  ALL REGISTERS
                 07840 ;ARE SAVED.
                 07850 ;*********************************************
748B             07860 ADINT    EQU    $
748B ED43FC76    07870            LD     (BCSV),BC       ;FREE BC FOR WORK
748F C1          07880            POP    BC              ;GET OLD PC
7490 0B          07890            DEC    BC              ;POINT TO REAL ADDRESS
7491 C5          07900            PUSH   BC              ;SAVE NEW PC
7492 ED431077    07910            LD     (PCSV),BC       ;SAVE IT
7496 ED730E77    07920            LD     (SPSV),SP       ;SAVE STACK PTR
749A 315077      07930            LD     SP,STACK        ;USE OUR STACK
                 07940 ;SAVE DE
749D F5          07950            PUSH   AF
749E 43          07960            LD     B,E
749F 4A          07970            LD     C,D
74A0 ED43FE76    07980            LD     (DESV),BC
                 07990 ;SAVE HL
74A4 45          08000            LD     B,L
74A5 4C          08010            LD     C,H
74A6 ED430077    08020            LD     (HLSV),BC
                 08030 ;SAVE AF
74AA D1          08040            POP    DE
74AB 43          08050            LD     B,E
74AC 4A          08060            LD     C,D
74AD ED43FA76    08070            LD     (AFSV),BC
                 08080 ;SAVE BC
74B1 ED5BFC76    08090            LD     DE,(BCSV)
74B5 43          08100            LD     B,E
74B6 4A          08110            LD     C,D
74B7 ED43FC76    08120            LD     (BCSV),BC
                 08130 ;SAVE INDEX
74BB DD220A77    08140            LD     (IXSV),IX
74BF FD220C77    08150            LD     (IYSV),IY
                 08160 ;GET NEXT SET
74C3 D9          08170            EXX
74C4 08          08180            EX     AF,AF'
74C5 ED430477    08190            LD     (BCPSV),BC      ;SAVE FOR WORK
                 08200 ;SAVE DE
74C9 F5          08210            PUSH   AF
74CA 43          08220            LD     B,E
74CB 4A          08230            LD     C,D
74CC ED430677    08240            LD     (DEPSV),BC
                 08250 ;SAVE HL
74D0 45          08260            LD     B,L
74D1 4C          08270            LD     C,H
74D2 ED430877    08280            LD     (HLPSV),BC
                 08290 ;SAVE AF
74D6 D1          08300            POP    DE
74D7 43          08310            LD     B,E
74D8 4A          08320            LD     C,D
```

Program continues

Program continued

```
74D9 ED430277 08330          LD    (AFPSV),BC
              08340 ;SAVE BC
74DD ED5B0477 08350          LD    DE,(BCPSV)
74E1 43       08360          LD    B,E
74E2 4A       08370          LD    C,D
74E3 ED430477 08380          LD    (BCPSV),BC
74E7 CD7B76   08390          CALL  OURMSG
74EA 0E       08400          DEFB  0EH             ;CURSOR ON
74EB 0D       08410          DEFB  CR
74EC 41       08420          DEFM  'ADSTOP AT '
74F6 00       08430          DEFB  EOM
74F7 2A1077   08440          LD    HL,(PCSV)       ;GET THE PSW
74FA CDD572   08450          CALL  DSPADD          ;SHOW IT
74FD 3E0D     08460          LD    A,CR            ;RETURN CURSOR
74FF CD8176   08470          CALL  DSP             ;SHOW IT
7502 C31A70   08480          JP    CMDHND
              08490 ;
              08500 ;*********************************************
              08510 ;ENTER HERE AFTER VALID FORM OF ADSTOP
              08520 ;IS ENTERED.  IF NO ADDRESS IS ENTERED
              08530 ;WE CLEAR THE ADSTOP.  IF AN ADDRESS
              08540 ;IS ENTERED WE RESET THE OLD CODE
              08550 ;AND ZAP THE NEW ADDRESS AFTER
              08560 ;DOING A SAVE ON THE BYTE WE ARE
              08570 ;GOING TO ADSTOP ON.
              08580 ;*********************************************
7505          08590 ADSTP   EQU   $
7505 CD9770   08600          CALL  OURKBD
7508 FE20     08610          CP    20H             ;BLANK?
750A 280B     08620          JR    Z,DOADD         ;YES
750C FE0D     08630          CP    CR              ;CR?
750E C2A970   08640          JP    NZ,NOTBL        ;NO - ERROR
7511 CD2E75   08650          CALL  SWAPAD          ;CLEAR OLD PART
7514 C31A70   08660          JP    CMDHND          ;WE ARE DONE
7517          08670 DOADD   EQU   $
7517 CD3C75   08680          CALL  GETADD          ;GET THE ADDRESS IN HL
751A CDAC70   08690          CALL  WCR             ;WAIT FOR A CR
751D E5       08700          PUSH  HL              ;SAVE ADDRESS
751E CD2E75   08710          CALL  SWAPAD
7521 E1       08720          POP   HL              ;RESTORE ADDRESS
7522 7E       08730          LD    A,(HL)          ;GET NEW CHAR
7523 321A77   08740          LD    (ADSINS),A      ;SAVE NEW CHAR
7526 221877   08750          LD    (ADSADR),HL     ;SAVE NEW ADDR
7529 36F7     08760          LD    (HL),0F7H       ;LOAD A RST
752B C31A70   08770          JP    CMDHND
              08780 ;
752E          08790 SWAPAD  EQU   $
752E 2A1877   08800          LD    HL,(ADSADR)     ;GET OLD ADDRESS
7531 3A1A77   08810          LD    A,(ADSINS)      ;GET OLD INST
7534 77       08820          LD    (HL),A          ;RESTORE IT
7535 210000   08830          LD    HL,0            ;CLEAR HL
7538 221877   08840          LD    (ADSADR),HL     ;CLEAR OLD AREA
753B C9       08850          RET
              08860 ;
              08870 ;*********************************************
              08880 ; THIS ROUTINE RETURNS AN ADDRESS OR A BYTE
              08890 ; DEPENDING ON FLAG SETTINGS FOR CERTAIN
              08900 ; COMMANDS.
              08910 ;*********************************************
753C          08920 GETADD  EQU   $
753C CD4575   08930          CALL  GETNUM          ;GET 1ST PART OF ADDR
753F 67       08940          LD    H,A             ;SAVE IT IN HIGH
7540 CD4575   08950          CALL  GETNUM          ;GET LAST PART OF ADDR
7543 6F       08960          LD    L,A             ;SAVE IT IN LOW
7544 C9       08970          RET
7545          08980 GETNUM  EQU   $
7545 C5       08990          PUSH  BC              ;SAVE REGS
7546 CD5875   09000          CALL  GETDIG          ;GET FIRST DIGIT
7549 CB27     09010          SLA   A
754B CB27     09020          SLA   A
754D CB27     09030          SLA   A
754F CB27     09040          SLA   A
7551 47       09050          LD    B,A             ;SAVE IT FOR ADD
7552 CD5875   09060          CALL  GETDIG          ;GET SECOND DIGIT
7555 80       09070          ADD   A,B             ;PUT TOGETHER
7556 C1       09080          POP   BC              ;RESTORE REGS
7557 C9       09090          RET
              09100 ;
7558          09110 GETDIG  EQU $
7558 CD9770   09120          CALL  OURKBD          ;GET BYTE FROM KEYBOARD
755B FE01     09130          CP    1               ;IS IT BREAK
755D CA5476   09140          JP    Z,CJMP
7560 FE20     09150          CP    20H             ;BLANK?
7562 28F4     09160          JR    Z,GETDIG        ;YES TRY AGAIN
              09170 ; HOOK FOR USER TO GET AT INPUT
7564 00       09180          NOP
7565 00       09190          NOP
7566 00       09200          NOP
7567 D9       09210          EXX
7568 21F876   09220          LD    HL,CMDFLG       ;GET THE FLAG
756B CB56     09230          BIT   STORE,(HL)      ;IS IT STORE CMD
756D CAE575   09240          JP    Z,NOTSTR        ;NO - BYPASS
7570 FE47     09250          CP    47H             ;IS IT G?
7572 2030     09260          JR    NZ,NOTSG        ;NO - BYPASS
7574 CD7076   09270          CALL  POPRES          ;POP AND RESET
7577          09280 GETGC   EQU   $
7577 CD9770   09290          CALL  OURKBD          ;GET A CHAR
757A FE20     09300          CP    20H             ;IS IT BLANK?
757C 28F9     09310          JR    Z,GETGC         ;YES - TRY AGAIN
757E FD21E176 09320          LD    IY,GTAB         ;POINT TO TABLE
7582          09330 TGC     EQU   $
7582 FDBE00   09340          CP    (IY+0)          ;SAME?
```

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```
7585 2812      09350          JR    Z,FGC          ;YES
7587 08        09360          EX    AF,AF'         ;SAVE REGS
7588 FD7E00    09370          LD    A,(IY+0)
758B FEFF      09380          CP    0FFH           ;END OF TAB?
758D CA7E70    09390          JP    Z,ICMD         ;YES - ERROR
7590 08        09400          EX    AF,AF'         ;RESTORE
7591 FD23      09410          INC   IY             ;POINT
7593 FD23      09420          INC   IY             ;TO NEXT
7595 FD23      09430          INC   IY             ;CHAR
7597 18E9      09440          JR    TGC            ;AND TRY AGAIN
7599           09450 FGC      EQU   $
7599 FD23      09460          INC   IY             ;POINT TO ADDR
759B FD6601    09470          LD    H,(IY+1)       ;LOAD IT UP
759E FD6E00    09480          LD    L,(IY+0)       ;LOAD IT UP
75A1 C3B671    09490          JP    STG            ;LINK COMMON CODE
75A4           09500 NOTSG    EQU   $
75A4 FE54      09510          CP    54H            ;IS IT T?
75A6 200B      09520          JR    NZ,NOTT
75A8 CD7076    09530          CALL  POPRES         ;KILL STACK
75AB 21F976    09540          LD    HL,TRNFLG      ;GET FLAG
75AE CBCE      09550          SET   TRANS,(HL)     ;SET IT
75B0 C31971    09560          JP    STTM           ;LINK UP
75B3           09570 NOTT     EQU   $
75B3 FE50      09580          CP    50H            ;IS IT P
75B5 2006      09590          JR    NZ,NOTSP       ;NO - BYPASS
75B7 CD7076    09600          CALL  POPRES         ;POP AND RESET
75BA C3C371    09610          JP    STOREP         ;LINK UP WITH P CODE
75BD           09620 NOTSP    EQU   $
75BD FE53      09630          CP    53H            ;IS IT S
75BF 2006      09640          JR    NZ,NOTSS       ;NO - BYPASS
75C1 CD7076    09650          CALL  POPRES         ;POP AND RESET
75C4 C3DE71    09660          JP    WST3           ;RETURN
75C7           09670 NOTSS    EQU   $
75C7 FE49      09680          CP    49H            ;IS IT I
75C9 2006      09690          JR    NZ,NOTSI       ;NO - BYPASS
75CB CD7076    09700          CALL  POPRES         ;POP AND RESET
75CE C38C71    09710          JP    STIND          ;RETURN
75D1           09720 NOTSI    EQU   $
75D1 FE58      09730          CP    58H            ;IS IT X
75D3 2006      09740          JR    NZ,NOTSX       ;NO - BYPASS
75D5 CD7076    09750          CALL  POPRES         ;POP AND RESET
75D8 C39871    09760          JP    STX            ;GO DO X
75DB           09770 NOTSX    EQU   $
75DB FE59      09780          CP    59H            ;IS IT Y
75DD 2006      09790          JR    NZ,NOTSY       ;NO - BYPASS
75DF CD7076    09800          CALL  POPRES         ;POP AND RESET
75E2 C3A771    09810          JP    STY            ;GO DO Y
75E5           09820 NOTSY    EQU   $
75E5           09830 NOTSTR   EQU   $
75E5 CB4E      09840          BIT   DISPLY,(HL)    ;TEST IT
75E7 CA3876    09850          JP    Z,NOTDSP       ;BYPASS
75EA FE47      09860          CP    47H            ;GEN REGS?
75EC 2007      09870          JR    NZ,NOTG        ;NO - BYPASS
75EE F1        09880          POP   AF             ;GET RID OF RETURN
75EF F1        09890          POP   AF             ;GET RID OF RETURN
75F0 F1        09900          POP   AF             ;GET RID OF RETURN
75F1 F1        09910          POP   AF             ;GET RID OF RETURN
75F2 C3D173    09920          JP    DG             ;DISPLAY IT
75F5           09930 NOTG     EQU   $
75F5 FE52      09940          CP    52H            ;IS IT R?
75F7 2007      09950          JR    NZ,NOTR        ;NO
75F9 F1        09960          POP   AF
75FA F1        09970          POP   AF
75FB F1        09980          POP   AF
75FC F1        09990          POP   AF
75FD C30B73    10000          JP    DRS
7600           10010 NOTR     EQU   $
7600 FE50      10020          CP    50H            ;PC?
7602 2006      10030          JR    NZ,NOTP        ;NO - BYPASS
7604 211077    10040          LD    HL,PCSV        ;POINT TO IT
7607 C34D76    10050          JP    JBIT16         ;SHOW IT OFF
760A           10060 NOTP     EQU   $
760A FE53      10070          CP    53H            ;SP?
760C 2006      10080          JR    NZ,NOTS        ;NO - BYPASS
760E 210E77    10090          LD    HL,SPSV        ;POINT TO IT
7611 C34D76    10100          JP    JBIT16         ;SHOW IT OFF
7614           10110 NOTS     EQU   $
7614 FE49      10120          CP    49H            ;INDEX?
7616 200E      10130          JR    NZ,NOTI        ;NO
7618 CD9770    10140          CALL  OURKBD
761B FE58      10150          CP    58H            ;X INDEX?
761D 280B      10160          JR    Z,HOOKX        ;YES
761F FE59      10170          CP    59H            ;Y INDEX?
7621 2810      10180          JR    Z,HOOKY        ;YES
7623 C35476    10190          JP    CJMP
               10200 ;
7626           10210 NOTI     EQU   $
7626 FE58      10220          CP    58H            ;X INDEX?
7628 2005      10230          JR    NZ,NOTX        ;NO
762A           10240 HOOKX    EQU   $
762A 210A77    10250          LD    HL,IXSV        ;POINT TO IX
762D 181E      10260          JR    JBIT16
762F           10270 NOTX     EQU   $
762F FE59      10280          CP    59H            ;Y INDEX?
7631 2005      10290          JR    NZ,NOTY        ;NO
7633           10300 HOOKY    EQU   $
7633 210C77    10310          LD    HL,IYSV
7636 1815      10320          JR    JBIT16
7638           10330 NOTY     EQU   $
7638           10340 NOTDSP   EQU   $
7638 D9        10350          EXX
7639 D630      10360          SUB   30H            ;STRIP SPECIAL CHAR
```

Program continues

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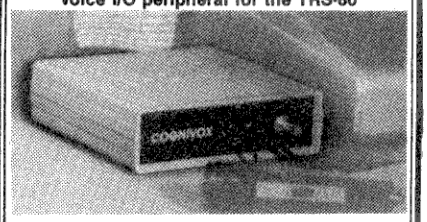

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```
763B FA4976   10370          JP    M,INVT          ;INVALID
763E FE0A     10380          CP    0AH             ;0-9?
7640 F8       10390          RET   M               ;YES
7641 D607     10400          SUB   7               ;FLIP BIT
7643 FA4976   10410          JP    M,INVT          ;INVALID
7646 FE10     10420          CP    10H             ;A-F?
7648 F8       10430          RET   M               ;YES
7649          10440 INVT     EQU   $
7649 D1       10450          POP   DE
764A D1       10460          POP   DE
764B 1807     10470          JR    CJMP
764D          10480 JBIT16   EQU   $
764D F1       10490          POP   AF
764E F1       10500          POP   AF              ;GET RID OF RETURN
764F F1       10510          POP   AF
7650 F1       10520          POP   AF
7651 C31B74   10530          JP    BIT16
              10540 ;
7654          10550 CJMP     EQU   $
7654 CD7B76   10560          CALL  OURMSG
7657 0E       10570          DEFB  0EH             ;CURSOR ON
7658 0D       10580          DEFB  CR
7659 43       10590          DEFM  'COMMAND TERMINATED'
766B 0D       10600          DEFB  CR
766C 00       10610          DEFB  EOM
              10620 ;
766D C31A70   10630          JP    CMDHND           ;RETURN TO NORM CODE
              10640 ;
              10650 ;
7670          10660 POPRES   EQU   $
7670 C1       10670          POP   BC              ;SAVE OUR RETURN
7671 F1       10680          POP   AF              ;GET RID OF RETURN
7672 F1       10690          POP   AF
7673 F1       10700          POP   AF
7674 F1       10710          POP   AF
7675 AF       10720          XOR   A
7676 32F876   10730          LD    (CMDFLG),A
7679 C5       10740          PUSH  BC              ;RESTORE RETURN ADDR
767A C9       10750          RET
              10760 ;
767B          10770 OURMSG   EQU   $
767B E1       10780          POP   HL              ;GET MSG ADDR
767C CDA728   10790          CALL  MSGDSP          ;SHOW IT
767F C5       10800          PUSH  BC              ;SAVE IT AS OUR RETURN
7680 C9       10810          RET
              10820 ;
7681          10830 DSP      EQU   $
7681 CD3300   10840          CALL  RSDSP
7684 CD8876   10850          CALL  POUT
7687 C9       10860          RET
              10870 ;
7688          10880 POUT     EQU   $
7688 C9       10890          RET
7689 FE0D     10900          CP    0DH             ;IS IT CR?
768B 2816     10910          JR    Z,SHIPB         ;YES FILL
768D 08       10920          EX    AF,AF'
768E          10930 POUT2    EQU   $
768E DBF1     10940          IN    A,(CTRL)        ;GET STATUS
7690 CB47     10950          BIT   0,A             ;ANYTHING?
7692 28FA     10960          JR    Z,POUT2         ;NO KEEP LOOKING
7694 08       10970          EX    AF,AF'          ;RESTORE
7695 D3F0     10980          OUT   (DATA),A        ;SEND IT
7697 FE0D     10990          CP    0DH             ;WAS IT A CR
7699 C0       11000          RET   NZ
769A 01FFFF   11010          LD    BC,0FFFFH       ;SET RECOVER TIME
769D CD6000   11020          CALL  DELAY           ;LET LINE TURN AROUND
76A0 3E0D     11030          LD    A,CR
76A2 C9       11040          RET
76A3          11050 SHIPB    EQU   $
76A3 08       11060          EX    AF,AF'          ;SAVE
76A4          11070 POUT3    EQU   $
76A4 DBF1     11080          IN    A,(CTRL)        ;STATUS
76A6 CB47     11090          BIT   0,A
76A8 28FA     11100          JR    Z,POUT3
76AA 3E20     11110          LD    A,20H
76AC D3F0     11120          OUT   (DATA),A
76AE 18DE     11130          JR    POUT2
              11140 ;
76B0          11150 LOGO     EQU   $
76B0 0E       11160          DEFB  0EH
76B1 1C       11170          DEFB  1CH
76B2 1F       11180          DEFB  1FH
76B3 17       11190          DEFB  17H
76B4 0D       11200          DEFB  CR
76B5 0D       11210          DEFB  CR
76B6 0D       11220          DEFB  CR
76B7 0D       11230          DEFB  CR
76B8 0D       11240          DEFB  CR
76B9 0D       11250          DEFB  CR
76BA 0D       11260          DEFB  CR
76BB 20       11270          DEFM  '          CP80'
76C9 0D       11280          DEFB  CR
76CA 0D       11290          DEFB  CR
76CB 20       11300          DEFM  '     BY BRIAN CAMERON'
76E0 00       11310          DEFB  EOM
76E1          11320 GTAB     EQU $
76E1 41       11330          DEFB  41H
76E2 FA76     11340          DEFW  AFSV
76E4 42       11350          DEFB  42H
76E5 FC76     11360          DEFW  BCSV
76E7 43       11370          DEFB  43H
```

Program continues

Program continued

```
76E8 FD76    11380          DEFW  CSV
76EA 44      11390          DEFB  44H
76EB FE76    11400          DEFW  DESV
76ED 45      11410          DEFB  45H
76EE FF76    11420          DEFW  ESV
76F0 48      11430          DEFB  48H
76F1 0077    11440          DEFW  HLSV
76F3 4C      11450          DEFB  4CH
76F4 0177    11460          DEFW  LSV
76F6 FFFF    11470          DEFW  0FFFFH
76F8 00      11480 CMDFLG   DEFB  00H
76F9 00      11490 TRNFLG   DEFB  00H
0001         11500 DISPLY   EQU   1
0002         11510 STORE    EQU   2
0004         11520 DOT      EQU   4
0008         11530 MEMORY   EQU   8
0001         11540 TRANS    EQU   1
76FA 00      11550 AFSV     DEFB  00H
76FB 00      11560 FSV      DEFB  00H
76FC 00      11570 BCSV     DEFB  00H
76FD 00      11580 CSV      DEFB  00H
76FE 00      11590 DESV     DEFB  00H
76FF 00      11600 ESV      DEFB  00H
7700 00      11610 HLSV     DEFB  00H
7701 00      11620 LSV      DEFB  00H
7702 0000    11630 AFPSV    DEFW  0000H
7704 0000    11640 BCPSV    DEFW  0000H
7706 0000    11650 DEPSV    DEFW  0000H
7708 0000    11660 HLPSV    DEFW  0000H
770A 0000    11670 IXSV     DEFW  0000H
770C 0000    11680 IYSV     DEFW  0000H
770E 0000    11690 SPSV     DEFW  0000H
7710 0000    11700 PCSV     DEFW  0000H
0006         11710 TEMPR    DEFS  6
7718 0000    11720 ADSADR   DEFW  0000H
771A 00      11730 ADSINS   DEFB  00H
771B 00      11740 CNT      DEFB  00H
771C 00      11750 SCNT     DEFB  00H
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0032         11770          DEFS  50
7750         11780 STACK    EQU   $
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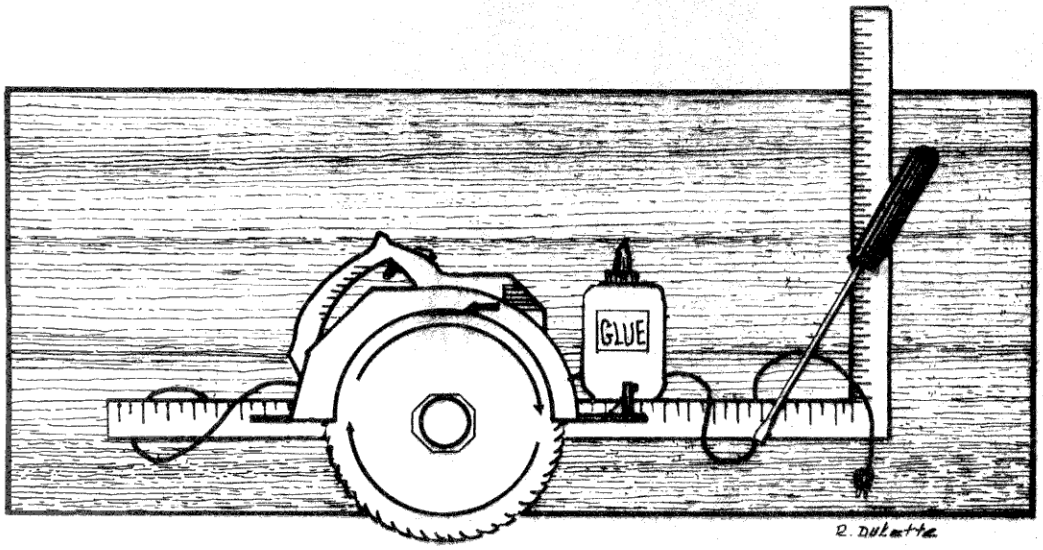

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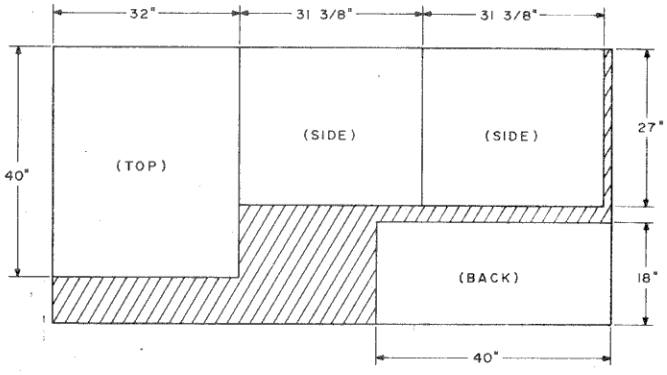
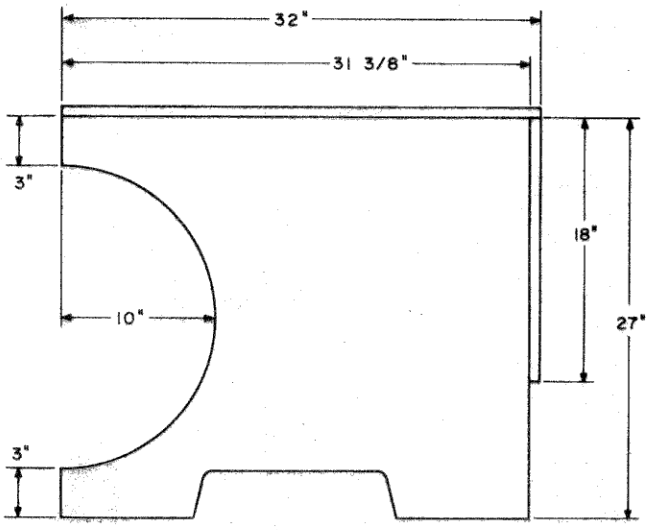


Figure 1



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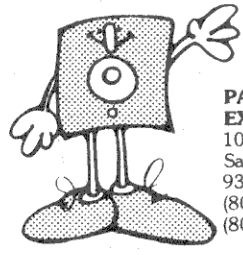

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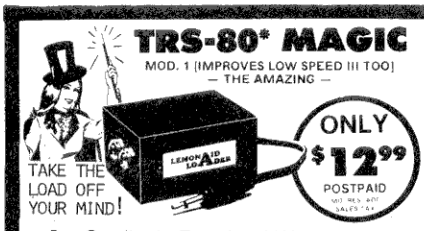

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TRS80 color

From the January 1981 issue of the CSRA Computer Club newsletter:

> There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical informations on the TRS-80 color computer™. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

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```
OK Gary: F80 DEMODMA,DEMODMA = DEMODMA-N
DEMDMA
SETBAS
SCNDEM
CLS
PRINT$
OK Gary: L80 DEMODMA,DEMODMA-N,-M
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OK Gary: L80 DEMO, -E
LINK-80 3.4 28-NOV-80 COPYRIGHT 1979,80 (C) MICROSOFT
DATA      5200      5980      <  1920>
30890 BYTES FREE
(5206 5980)
OK Gary:
Note that /BASECM/ is located at X'5200' and that the second load, without WRITE
or FORMAT in the program, is quite a bit smaller. (The "OK Gary:" is really "LDOS
Ready" except I personalized SYS1/SYS.)
```

Fig. 1. Compile and Load of the DEMODMA/FOR Program.

You need two things for this to work. You must define an array and you must know exactly where the loader is going to store the array in the runtime module. The first part is easy and the second is standard in Radio Shack's Fortran. The loader will tell you the location (see Fig. 1). The variables associated with the $MAIN program will always be loaded at X'5200' unless you tell the loader to put data somewhere else. To be sure you know where things are, it is a good idea to put the array into a named common block and always make it the first thing you define. I generally make my $MAIN program a simple call to the real program, which becomes a subroutine that never returns.

So, we have a $MAIN with an array in named common:

```
      INTEGER*1   X$5200(1)
      COMMON  /BASECM/  X$5200
```

This will do the job nicely. We just told the compiler that we have an array. We already know where the loader will put it. The array size does not matter, but we need to know where it starts. It is the programmer's responsibility to watch array boundaries in most Fortrans, including this one. When the manual says dimensions *must* match it means "they better, for your own good." However, we are going to break a couple of standard Fortran rules, but the compiler is too dumb to catch us and the runtime system will let us.

To make the technique more general, let's do this in two steps. First we will offset all the way to memory location X'0001'. From there we can offset again to any place we want by simply using the known absolute memory address. If ABSMEM is an INTEGER*1 array with ABSMEM(1) located at X'0001' then ABSMEM(15360) is the first position in the TRS-80's memory mapped screen (15360 decimal

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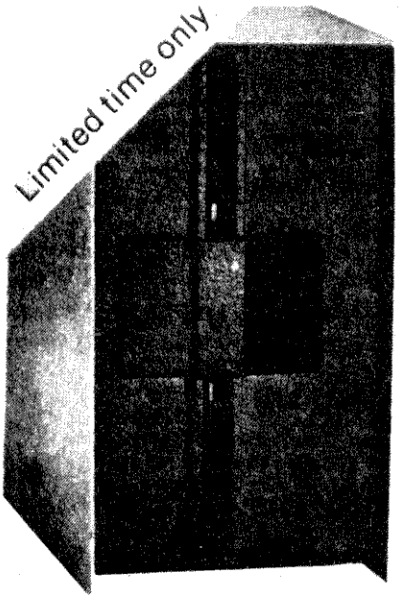

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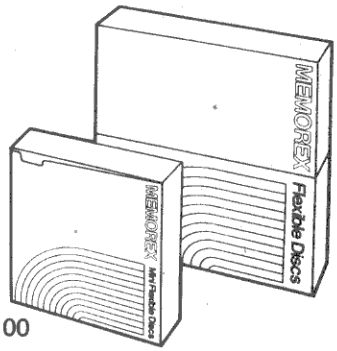

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= 3C00 hex). It turns out that the magic number is −20990. That is, the location of X$5200(1) at X'5200', element X$5200 (−20990) is the absolute memory address X'0001'. (Ah, but negative subscripts are illegal, you say?) Since the subscript is a variable, Fortran does not know it is negative. Actually, 20990 is X'51FE', which when subtracted from X'5200' leaves us pointing at X'0001'.

The main program sets one location based on another known location and passes that on to the Setbas subroutine. Setbas then offsets again to define Screen at X'3C00'. Remember that arguments in subroutine and function calls are not values, but are the addresses of where the values are stored. So, when we pass the argument X$5200 (−20990) to Setbas, we are passing the address X'0001'. Whatever we decide to call the receiving array in the subroutine, it will be located at that address. I have called the new array ABSMEM and it is also dimensioned one.

Screen will be based by a call with the subscript X'3C00'. The array at the other end will then have element Screen(1) at that location. The screen is now a regular Fortran array. We can assign values, get values, do arithmetic (may look strange) just like any other Fortran variable. You should be able to follow the DEMDMA program pretty easily from here on.

In case you are a new Fortran user, to compile, load and run the program just create it with Edit or Scripsit and name it DEMODMA/FOR. Then,

F80 DEMODMA = DEMODMA
and
L80 DEMODMA, DEMODMA-N,-E

To run it, just Enter DEMODMA. The results are a demonstration of putting characters on the screen.

You will notice a phenomenal improvement from Write to Call POKE and a very noticeable change from POKE to the direct array access. If you only need to put a few special characters here and there on the screen, POKE will do fine and you can avoid the two dummy routines to set up the array. On the other hand, POKE only moves one byte at a time while the array is much more flexible (and faster) and you can move array elements easily with Do loops. Here is another surprise: check the run module size of the example (that's the number in < > displayed at the end of the load), comment out all the Writes and Formats, and compile and load it again. You can save over 5K by avoiding Fortran's I/O modules. For some applications that is practical. I have a 1200 baud Fortran terminal program that emulates the Visual 200 and Videotex protocols and has no Fortran I/O at all, yet it is written entirely in Fortran.

One Limitation

The technique has one important limitation. In order for the basing to be effective, the arrays must be passed as arguments. You cannot locate the Screen array in common. This is not too serious a limitation as long as you remember it. Any time you break a rule, be very careful. This is a powerful technique when you do it on purpose. Do it by accident or do it wrong, and you will have a very nasty bug.

The demonstration program illustrates how to directly access the lower 32K of memory. In order to access the high 32K it is necessary to use an additional offset. The reason for this requirement is that the integer subscripts become negative if you attempt to exceed 32767. The most direct way to setup the high memory addresses is to establish an array at X'8001'. Do that by using X$5200(11777) as an argument to Setbas and then call it something like HIMEM(1) in Setbas. To access locations in the top 32K, just subtract X'8000' from the absolute address and refer to HIMEM( ) with that value for the subscript.

Experimentation

When I was experimenting with this technique, there were many times that I could have used an LOC function. LOC is available in some Fortrans to discover the memory address of its argument. LOC is similar to VARPTR in Basic.

Radio Shack's Fortran has the capability of telling you the absolute address of a variable. The trick is only a minor infraction of the rules; you just use a do-nothing *subroutine* as the *integer function*. For example, in the demonstration program you would have:

BASOFF = −LOC(X$5200) + 2

instead of the constant. All that is needed for this to work is the following subroutine:

```
SUBROUTINE LOC
RETURN
END
```

You must make LOC a subroutine, even though you use it as a function. That is what makes it work. When arguments are passed to subroutines the first argument's address is placed in the HL register. BASOFF = −LOC(X$5200) puts the address X'5200' in HL. Since subroutine LOC is not expecting any arguments and doesn't do anything but return, the HL register pair is left containing the address of the argument. The calling program, however, expects an integer value to be returned by the function. By standard calling convention for this compiler, a function returns an integer value (note that is value, not address) in the HL register pair. So there you have it. The calling program looks at HL for the function value and gets back the address it just put there.

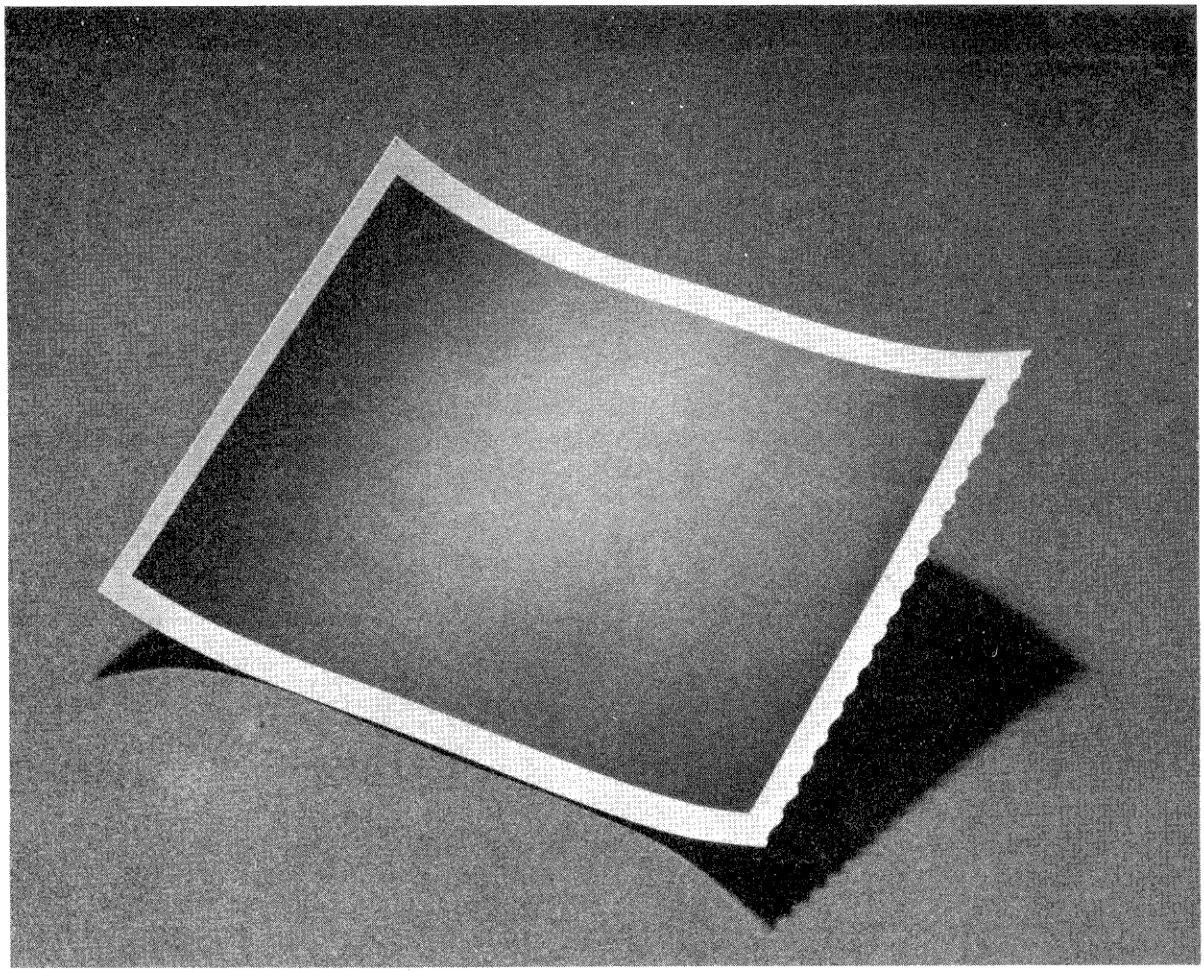
By using LOC in place of the magic number you no longer care exactly where the reference array is loaded, as long as it is in the lower 32K of memory. In fact, the X$5200 array is not really needed. It's only purpose was to give the programmer a known memory location to start from. Any array in the program can be the reference point by finding its LOC.

Notice that plus two is added to the LOC of the reference array. You must increase the negative subscript by one to point at X'0001' rather than zero, and you must count element X$5200(0). ■

Program Listing

```
C     DEMDMA  --  Demonstrate FORTRAN Direct Memory Access
C
C     JG Bender, N5BFM
C     Los Alamos, NM  87544
C
C     Version  810716-2130
C
C
C  The purpose of this $MAIN program is to establish the locatio
n
C  of Common /BASECM/ and the X$5200() array at X'5200'.
C
      PROGRAM DEMDMA
      Integer*1 X$5200(1)
      Integer*2 BASOFF
      Common   /BASECM/ X$5200, BASOFF
      BASOFF = -20990
      Call SETBAS(X$5200(BASOFF))
      Stop **end
      End
C
C
      Subroutine  SETBAS(ABSMEM)
C
C  Set the location for base of memory and point to the screen.
C  It is a good idea to also pass ABSMEM(1) as an argument so yo
u can make
C  make absolute memory calls at any time.
C
      Integer*1  ABSMEM(1)
      Integer*2  LOCSCR
      Data  LOCSCR/X'3C00'/
C
C  It is not necessary to put positive subscripts into variables
, but it
C  will make it easier to adjust the offset values for other mac
hines.
C
      Call  SCNDEM(ABSMEM(LOCSCR),ABSMEM)
      Return
      End
C
C
C
C  Demonstrate the speed of direct screen access.
C
C  First ... "flash" the screen 20 times with WRITEs
C  Then  ... use "Call POKEs"
C  Then  ... direct access thru an offset array
C
      Subroutine  SCNDEM(SCREEN,ABSMEM)
C
      Integer*1   SCREEN(1), ABSMEM(1), I1, J1, K1
```

Program continues



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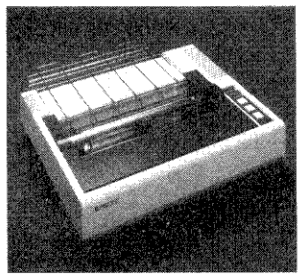

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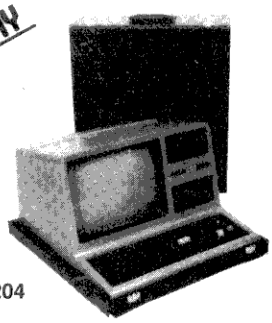

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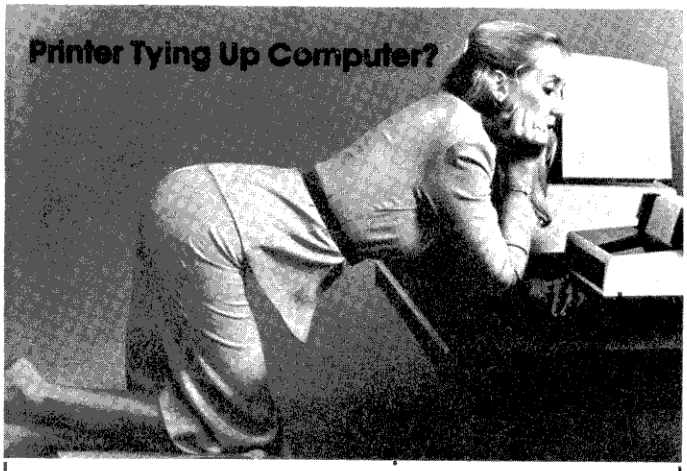

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Program continued

```
      Integer*2   SOLID(31), BLANKS(31)
      Data        SOLID/31*X'BFBF'/, BLANKS/31*X'2020'/
C
      Call CLS(SCREEN)
      Call PRINT$(SCREEN(86),'This is using WRITEs',20)
C
C  Following code sets the system's cursor position in the Devic
e Control
C  Block to the begining of the screen.
C
      ABSMEM(X'4020') = X'00'
      ABSMEM(X'4021') = X'3C'
C
      Do 5 I=1,32767
5     Continue
C
      Do 21 J1=1,20
        Do 10 I1=1,16
           Write (1,1010) SOLID
10      Continue
C
      ABSMEM(X'4020') = X'00'
      ABSMEM(X'4021') = X'3C'
C
        Do 20 I1=1,16
           Write(1,1010) BLANKS
20    Continue
C
      ABSMEM(X'4020') = X'00'
      ABSMEM(X'4021') = X'3C'
C
21    Continue
C
1010  Format (1X,31A2)
C
C
      Call CLS(SCREEN)
      Call PRINT$(SCREEN(86),'This is using POKEs',19)
      Do 25 I=1,32767
25    Continue
C
      Do 40 J1=1,20
         Do 30 I=X'3C00',X'3FFF'
30          Call POKE(I,X'BF')
C
         Do 40 I=X'3C00',X'3FFF'
40          Call POKE(I,X'20')
C
C
      Call CLS(SCREEN)
      Call PRINT$(SCREEN(80),'This is with direct array access',
32)
      Do 50 I=1,32767
50    Continue
C
      Do 70 J1=1,20
         Do 60 I=1,1024
60          SCREEN(I) = X'BF'
C
         Do 70 I=1,1024
70          SCREEN(I) = X'20'
C
C
      Call CLS(SCREEN)
      Call PRINT$(SCREEN(541),'D o n e',7)
      Do 80 I=1,32767
80    Continue
      Return
      End
C
C
C  CLS -- Clear Screen subroutine
C  << this routine does not maintain the system cursor location
pointer>>
C
      Subroutine  CLS(SCREEN)
C
      Integer*1   SCREEN(1024)
      Integer*2   I
C
C  Move blanks (character X'20') to the entire screen.
C
      Do 10 I=1,1024
10    SCREEN(I) = X'20'
C
      Return
      End
C
C
C PRINT$ -- Subroutine similar to BASIC's PRINT@
C  Call with WHERE() array based at screen position (1-1024)
C  STRING() array is the string to display.
C  LEN is the length of STRING() (note this version is limited
C  to 127 characters because of the use of Integer*1 for its typ
e.
C  << system cursor pointer at X'4020' is not maintained by this
 version.
C     A mix of FORTRAN I/O and PRINT$ will not be consistent in
screen
C     placement. >>
C
      Subroutine  PRINT$(WHERE,STRING,LEN)
C
      Integer*1   WHERE(1), STRING(1), LEN, ILOOP
C
C  (this routine cannot check that WHERE is actually on the scre
en, it
C   is really a general MOVE subroutine usable anywhere.)
C
      Do 10 ILOOP=1,LEN
10    WHERE(ILOOP) = STRING(ILOOP)
C
      Return
      END
```

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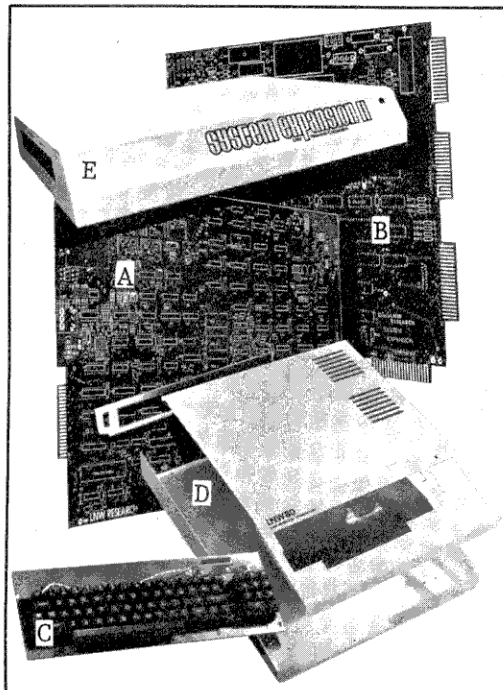

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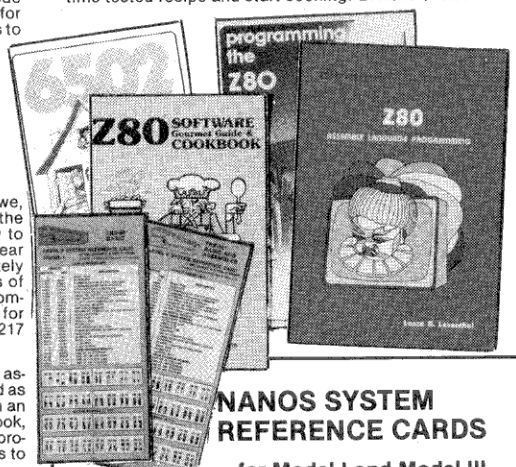

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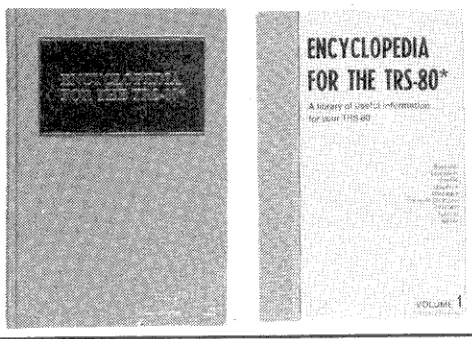

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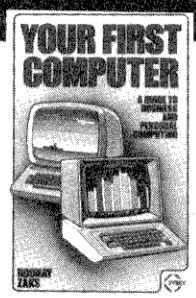

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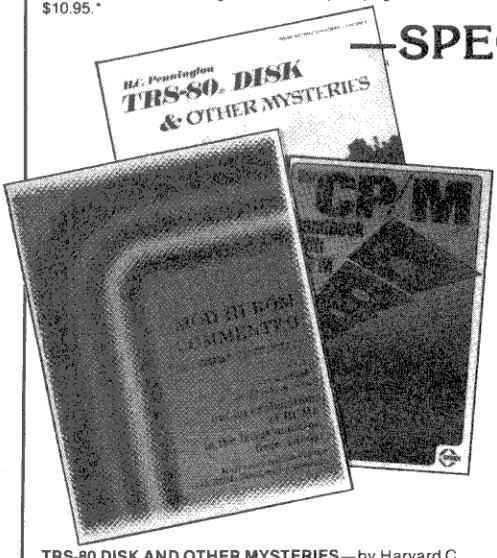

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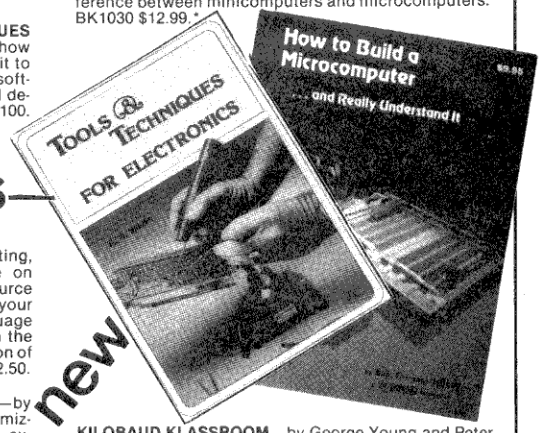

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2-3 Montana Council of Teachers of Mathematics and Montana Office of Public Instruction. **Rocky Mountain Computer Conference for Educators,** Ramada Inn, Billings, MT.

2-4 Kengore Corp., Franklin Park, NJ. **Eighty/Apple Computer Show—An Exposition for Products and Services for Apple and TRS-80 Computers,** NY Statler Hotel, New York, NY.

2-4 Kengore Corporation, Franklin Park, NJ. **Eighty/Apple Computer Show,** New York City, NY.

5-7 American Federation of Information Processing Societies Inc., Arlington, VA. **1982 Office Automation Conference,** Moscone Center, San Francisco, CA.

6-9 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Design,** Sacramento, CA.

7-9 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Planning,** Chicago, IL.

12-14 American Management Associations, New York, NY. **Course on Paperwork Management,** Chicago, IL.

12-16 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Design/Structured Program Design,** Raleigh, NC.

13-16 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Data Base Design,** Washington, DC.

13-16 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Requirements Definition,** St. Paul, MN.

15-17 The Interface Group, Framingham, MA. **Showcase Expo for Small Business Proprietors, Independent Neighborhood Professionals and Mid-Level Corporate Managers,** A. J. Cervantes Hall, St. Louis.

15-18 National Computer Shows, Chestnut Hill, MA. **Southwest Computer Show and Office Equipment Exposition,** Market Hall, Dallas Market Center, Dallas, TX.

16-18 Virginia Computer User's Conference, Association for Computing Machinery, and Virginia Polytechnic Institute and State University. **: 2th Annual Conference with topics on artificial intelligence, office automation and data-base management,** Marriot Hotel, Blacksburg, VA.

16-18 Technical Education Research Centers, Cambridge, MA. **Microcomputers in Education Workshops,** Jersey City State College, Jersey City, NJ.

19 Ken Orr and Associates Inc., Topeka, KS. **Course on Management Overview of Data Structured Systems Development,** Boston, MA.

19-23 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Design/Structured Requirements Definition,** Lake Tahoe, NV.

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22-23 Data Processing Management Association, Mile High Chapter, Denver, CO. **Exposition and Conference of Computer Technology,** Rocky Mountain Data Processing Expo, Curigan Hall, Denver.

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23-25 The Interface Group, Framingham, MA. **Showcase Expo for Small Business Proprietors, Independent Neighborhood Professionals and Mid-Level Corporate Managers,** Miami Expo Center, Miami, FL.

24 John Craig's Computer Swap, Palo Alto, CA. **Flea Market for Computer Enthusiasts,** Santa Clara County Fairgrounds, San Jose, CA.

26-30 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Design/Structured Program Design,** Omaha, NE.

May

3-7 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Design/Structured Requirements Definition,** Tampa, FL.

4 University of New Hampshire, Computer Science Department. **Microcomputer Fair,** Memorial Union Building, UNH, Durham, NH.

4-7 Integrated Computer Systems, Santa Monica, CA. **Hands-On Pascal Workshop,** San Francisco, CA.

4-7 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Requirements Definition,** Seattle, WA.

4-8 University of California Extension, Berkeley. **16-Bit Microprocessor Workshop,** (6 week evening course), Mountain View, CA.

6-9 The National Computer Shows, Chestnut Hill, MA. **Southern California Computer Show and Office Equipment Exposition,** L.A. Convention Center, Los Angeles.

7-9 The Interface Group, Framingham, MA. **Showcase Expo for Small Business Proprietors, Independent Neighborhood Professionals and Mid-Level Corporate Managers,** Anaheim Convention Center, Anaheim, CA.

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18-19 The Yankee Group, Cambridge, MA. **The Next Generation of Consumer Electronics seminar,** Palo Alto, CA.

18-20 Technical Education Research Centers, Cambridge, MA. **Microcomputers in Education Workshops,** Gutman Library, Cambridge, MA.

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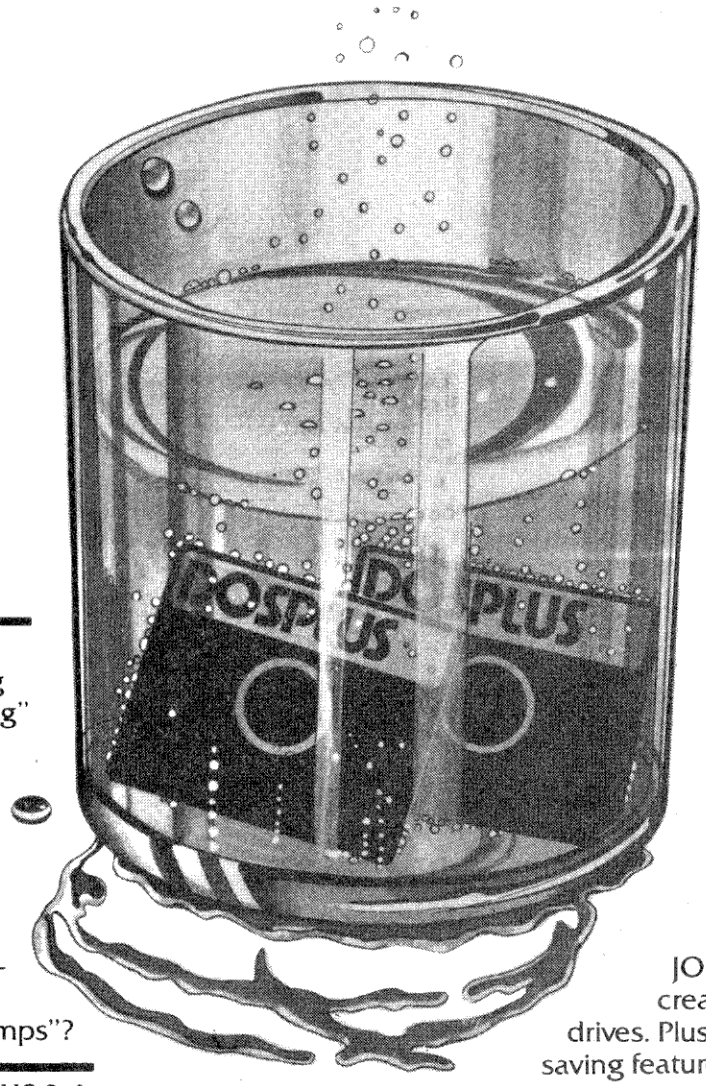

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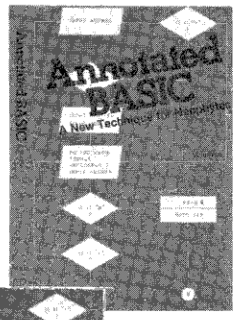

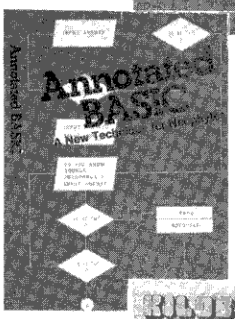

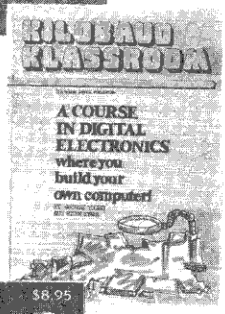

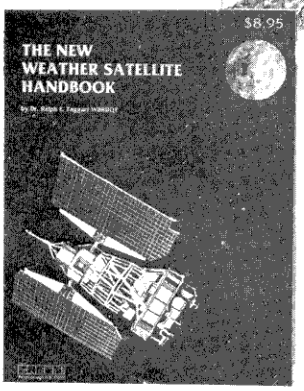

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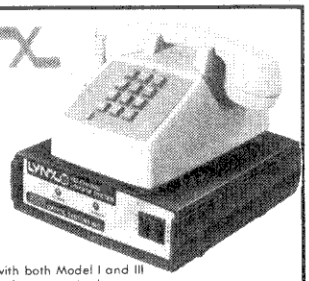

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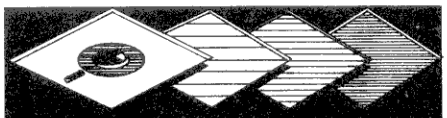

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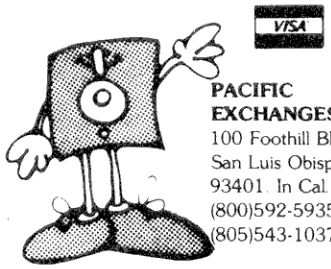

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SOFT BITS
a basic/assembly column

by Roger Fuller

This month I will examine Radio Shack's Editor/Assembler (EDTASM). Radio Shack provides only thirteen pages of documentation on its operation, probably one of the reasons users have such trouble with it. The manual accompanying EDTASM also assumes the user already knows about assemblers and how they work.

In General

An assembler produces object code from a source code or assembly listing. Object code is machine code, the actual instructions executed by the computer. Object code must reside in memory when it is executed because the Z80 fetches its instructions from read/write memory, not disk or tape. You can use EDTASM's editor to generate a source listing, or load one from media.

The editor is very similar to the editor in Level II. It is line oriented (you must specify the line number to be edited, just like in Basic). Line numbers can range from 00000 to 65529 and include the leading zeros. The maximum length of a line is 128 bytes (not counting the line number or its trailing space).

Commands

Unlike Level II, you cannot enter line numbers in EDTASM's command mode: You must use the I command. This command follows the same format and operation as Level II's Auto command. (To get the feel of using it to enter text, try using only Auto to write a Basic program.) The I command retains the increment you used to determine line spacing; it will not overwrite an existing line.

Lines can only be deleted with the D command. Just specify the line number after the D. The editor has three abbreviations. As in Disk Basic the period indicates the last line entered, printed or edited. The pound sign (#) indicates the first line in the source program, and the asterisk stands for the last line. The item delimiter is a colon. There is no New command; D#:* performs the same function.

The R command works like a combination of D and I commands. It replaces a current line in your program by inserting a new line as you type code. The R command does not continue unless the next line number generated does not exist.

The N command renumbers the entire text or source program. (There is no provision for renumbering only parts of the text.) The increment you specify becomes the new default value. For example, N 20,110 renumbers all lines by 110 starting with line 20. If you enter N 30 after the above, the renumbered program will still have an increment of 110, but will start at line 30.

The E command is almost identical to Level II's Edit mode. The D subcommand does not display deleted characters between exclamation points.

When you are entering text using either the I or E commands, the right arrow key tabs to the next print zone. This tab is CHR$(9), and is not converted to spaces. (This saves memory because the actual spaces are not stored.) Backing up over a tab sends the cursor the full distance of the tab instead of just a single space.

The P command replaces Basic's List command. Parameters are optional: If you specify no parameters the assembler scrolls 15 lines on the screen. If these lines are one screen width, they will all be displayed. If some lines are longer than the screen width, the top line of the scrolled page will be pushed off the top. To see the entire program enter P#:*. P100 displays only line 100. The H command behaves like LLIST.

The T command is the same as the H command except it does not print the line numbers. The assembler does not use line numbers; they are there only to help you edit text.

The manual says the up and down arrows scroll up or down and display the previous and following source line. They display the lines, but as implemented this is not scrolling.

The F command is handy. It searches from the line following the current one to the end of text for a string of 16 characters or less. The Find command does not recognize tabs in this string but it does recognize leading and trailing spaces. A common mistake is forgetting to reset the current line pointer before conducting an F (Find). Just type P# to accomplish this.

The B command transfers control to address 0000H.

The A command assembles an object program from the source listing. Because EDTASM is an in-memory assembler, the source listing must be resident in the text buffer. You can type in the text or load a program from tape with the L command (similar to Basic's System loader). If you do not specify a file name (six characters, maximum), the editor will load the next source file.

Unlike Basic, EDTASM does not automatically erase the resident text file in memory. If you do not want to concatenate files, perform a D#:* before loading. The W command acts as the reverse of the L command. If you do not specify a file name you will get the default value of NONAME. Remember the W (Write) command writes a source file, not the object file. Both the L and W command require a single space between the command and the file name.

Assembly

There are five assembly options: no listing, no output, no symbols, line printed, and wait on error. Assembly switches (/NL, /NO, /NS, /LP and /WE) activate the options. Placing a switch after the A command activates the corresponding option. The slash mark helps the assembler distinguish a switch from a file name.

How does the assembler produce an object program? A legitimate line of source code will contain as many as four fields. For example:

```
        Label   Opcode  Operand(s)  Comment
00100   START   ORG     7F00H       ;TOP OF 16K
```

As in Basic, you can specify numbers as a constant or an expression. Constants can be expressed in one of three numeration systems. The default numeration system (or *radix*) is decimal. Each number, regardless of radix, must begin with a numeral 0–9 to be classified as a number. As the assembler examines the characters on each line, it must decide if the characters are numbers; only numbers can start with a numeral.

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Once the assembler has determined that a group of characters is a number it examines the last character of the group to determine the radix. (Remember, numbers are evaluated right to left.) EDTASM determines the end of the number by a delimiter. The delimiters are space, tab, semicolon or one of four operation symbols I will cover later.

If the last character is the letter O, the assembler evaluates the group as an octal number. If the last character is H the assembler evaluates the group as a hexadecimal number. If the last character is not O or H (or if it is D), the assembler treats the group as a decimal number. The suffix D is optional for decimal notation. (I wish Microsoft had left out octal and included binary notation. It would be handy when setting up masks for bit manipulation.)

An illegal numeral in a number generates an error. Using the digit 9 in octal is illegal. The letters A-F are illegal in decimal and octal notation. Whatever radix you use, the result cannot exceed 65535, as this is the maximum word the Z80 can accept. But what about negative numbers?

The Editor/Assembler allows two unary operations (operations executed on only one operand). A +21 uses the operator + on a single operand, the 21. The result of such an operation is the value of the operand, or 21. The other unary operator is minus. A −21 produces the two's complement of 21. This result (and all numbers) are two-byte words. A −21 would be 0FFDFH. This allows the assembler's math section to handle only words, not bytes.

Z80 instructions that specify a single

```
Addr  Obj Code  Line#  Labels  Op-code  Operands  Memory Contents
-----------------------------------------------------------------
7F00            00008           ORG      7F00H     0800 0A .ORG.7F00H
                00016   VIDEO   DEFL     0033H     1000 10 VIDEO.DEFL.0033H
                00024                             1800 00
7F00  CD2B00    00032   TYPER   CALL     KEYBD     2000 0F TYPER.CALL.KEYBD
                00040           OR       A         2800 05 .OR.A
7F04  28FA      00048           JR       C,$-4     3000 09 .JR.Z$-4
7F06  CD3300    00056           CALL     VIDEO     3800 0B .CALL.VIDEO
7F09  18F5      00064           JR       TYPER     4000 08 .JR.TYPER
                00072   ;                          4800 01 ;
002B            00080   KEYBD   EQU      002BH     5000 0F KEYBD.EQU.002BH
0000            00088           END                5800 04 .END

00000 TOTAL ERRORS                                 FFFF End of text marker


KEYBD   002B                                       85 KEYBD 2B00
TYPER   7F00                                       85 TYPER 007F
VIDEO   0033                                       AF VIDEO 3300
                                                   00 End of table marker
```

Figure 1

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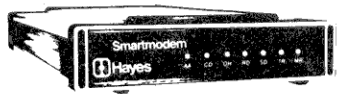

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byte such as LD A, – 21 generate an error, but LD A,21 does not. The assembler checks the value needed against the maximum allowed, so 21 (0015H) can be expressed as a single byte while – 21 (0FFDFH) cannot. This means you cannot express a byte as a negative number directly.

The binary operator & will perform an arithmetic AND on the two operands it separates. A – 21 & 0FFH produces a 00DFH which can be expressed as a single byte. To use a negative number as a byte just AND it with 3370 or 255 or 0FFH (all represent a byte with all eight bits set).

Remember both the plus (+) and minus (–) operators perform their normal functions. The fourth binary operator (<) performs a bit shift on the first operand for the direction and amount of the second operand. A 40H < 1 shifts the bits in 40H left one position, resulting in 80H. A 40H < – 1 shifts the bits in 40H right one position, producing 20H. Since this is a bit shift you can duplicate the results by multiplications or divisions by two. See Table 1 for a comparison to Basic.

The Editor/Assembler performs multiple binary operations on a first-come first-served basis. No parentheses are allowed. A 10H < 1+1 equals 21H, not 40H, because < is the left-most operation.

Labels can define numbers. Labels are limited to six alphanumeric characters; the first character must be alphabetic. You cannot use the name of a Z80 register, a status flag, or the words ON or OFF for a label. Labels are similar to variables in Basic but, except in two cases, they cannot change the values assigned to them. Values are assigned to labels only by placing the label in the first column of a source code line.

This action assigns them the current address the assembler contains when it assembles that line unless the pseudo-ops DEFL or EQU are used. They are called pseudo-ops because they are not actually Z80 operations. A DEFL (pronounced define label) assigns the label the value of the following operand. For example:

```
00100  START  DEFL  8000H
00200  START  DEFL  13H
00300  START  LD    A,1
```

Line 100 makes the value of the label (START) 8000H. You can redefine a label by using another DEFL on it only if you first defined it by a DEFL pseudo-op. You can change the value of START in line 200 to 0013H because you originally defined it by a DEFL and you are now redefining it by a DEFL. The last line is illegal because START was already defined in line 200 as 13H; you cannot redefine it except by another DEFL. EQU does not allow redefinition. Any value assigned to a label by EQU (Equate) cannot be changed.

"Labels are similar to variables in Basic."

You can only create a label by starting the label in column one. At any time the remaining length of the source line may be devoted to comments by inserting a semicolon, equivalent to Basic's REM.

There are six more pseudo-ops in the Editor/Assembler. ORG (Origin) initializes the current address counter to the value assigned it. This value can be a number, an expression or another label. If you do not use an ORG statement the assembler uses the default address 0000H. The ORG statement is usually the first statement in an assembly or source listing. Although you can use as many ORGs as you like, I recommend you use only one per program.

The ORG statement is open-ended; it does not specify how much memory the object code will use. The END statement terminates an assembly program; you can specify an execution address by placing an address after it. This is not automatically the ORG address. The execution address is the address the assembler uses after you load a System tape and enter a slash (/). You can omit an ORG statement (it will default to zero), but the absence of an END statement produces an error.

The remaining four pseudo-ops (DEFB, DEFW, DEFS and DEFM) are used mostly in producing tables. DEFB places a byte at the current assembler address. This byte can be a number, a label, an expression or a one-byte string. An apostrophe instead of a quotation mark delimits strings in the Editor/Assembler. This allows you to include quotation marks within strings. If the string is longer than one byte, you must precede it by the DEFM (Define memory) pseudo-op. DEFB and DEFM can specify a single byte string.

To specify a two-byte word use DEFW (Define word). This installs the value in LSB/MSB format starting at the current assembler address. You cannot use DEFW with strings.

DEFS reserves space for buffers and work areas. The assembler fills these spaces with zeroes when it assembles the object code.

There are also two assembler commands (in contrast to twelve editor commands). *LIST OFF and *LIST ON turn the listing of the combined assembly and object code off and on. When debugging this is useful (along with the /NL and /NO switches) to cut down on wait time.

The program in Fig. 1 shows the source listing and its format in memory. The line numbers are stored as binary numbers followed by the length of the line as a single byte. The periods represent the 09H tabs in the text buffer. The end of text is marked by a 0FFFH word (remember, you cannot enter this as a legitimate line number).

The symbol table (in the top of available memory) stores all labels the program will use. The format is a status bytes followed by the label and its value. This explains

Editor/Assembler	Basic
.	.
.	.
.	.
<–4	/16
<–3	/8
<–2	/4
<–1	/2
<0	/1
	*1
<1	*2
<2	*4
<3	*8
<4	*16
.	.
.	.
.	.

Table 1

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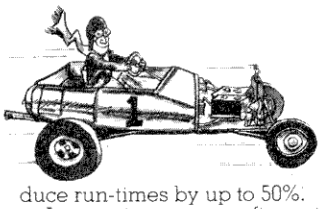

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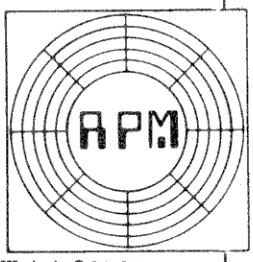

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why all labels are stored as two-byte words. An 00H byte marks the end of the table.

When you request an assembly of the source code residing in the text buffer, the assembler makes a first pass through the text. On this pass it places any label it encounters in the symbol table. If the label is defined as the assembler encounters it, the assembler sets bit seven of the status byte. Thereafter, any attempt to define this label again produces an error. The assembler must search the table each time it adds a label to prevent duplicates. The low nibble stands for the number of characters in the label.

On the first pass the assembler also increments the program counter. The special label $ accesses the program counter or the current assembler address. I used it in line 48 to loop back if no key was pressed. The assembler updates the counter by determining the number of bytes in the instruction. The assembler determines this number by accessing a table of op-codes within itself. The table contains the mnemonic along with the first byte of its object code, the length of the mnemonic, and an offset byte for parsing the operands.

After the first pass is complete the second pass begins and all labels are defined. As the assembler proceeds it lists the combined codes on the appropriate output device. If the assembler is producing an object code tape the output fills a 128-byte buffer. When the buffer is full or assembly ends the assembler writes a record to tape. (This is why you hear pauses in an EDTASM object tape, and why the load records are never more than 128 bytes long.)

In conclusion, I am including a table of significant addresses in EDTASM 1.1 (see Table 2).

Addresses	Function
4100	Length of string in Find buffer
4101-4110	Find buffer
4111,4112	Pointer to current line # (.)
4113,4114	Last byte of usable memory. Protect hi-mem here.
4115,4116	Pointer to first byte of unused text buffer
4117,4118	Line increment
4119,411A	Pointer to start of text line
411B,411C	Pointer to address of current line
411D,411E	Pointer to address of next line
4121,4122	I/O buffer pointer to next byte
4123	Temporary checksum during assembly
4124	Current length of buffer contents during assembly
4125,4126	Address for byte at start of I/O buffer
4127-41A7	I/O buffer (128 bytes)
41A8,41A9	Pointer to byte in I/O buffer
41AA	Length of contents of I/O buffer in use
41AB,41AC	Pointer to Filename for tape
41AD	Length of Filename
4AE,41AF	Start address of assembled instruction
41b0	0 for single-byte op-codes; DD,ED,FD for multiple-byte op-codes
41B1	Initial hex code from op-code tables
41B2,41B3	Pointer to I/O buffer during assembly
41B4,41B5	Length of assembled instruction
41B6,41B7	Internal program counter, current assembler address
41B8,41B9	Error counter
41BA	I/O flag 1 = cassette 0 = no
41BB	Byte counter of I/O buffer
41BC	Display type flag 0 = video 1 = printer
41BE	Block flag 0 = new FF = old
41BF	Error flag 1 = error
41C0	Assembler pass counter
41C1,41C2	Value of an expression
41C3,41C4	Pointer to symbol table
41C5	Strip line number flag 1 = T 0 = H
41C6-42FE	Stack work area
4300-4317	DCB
4318-	Make a pip
435D-	Read a byte
4389-	Write a byte
43CE-	Driver entry
43EF-	Keyboard driver
4460-	Video driver
45AA-45F5	Printer driver
4673-4989	Assembler option table
468A	Main entry point to EDTASM
4696-	Top of memory testing
46A2	Reentry point to EDTASM keeps text intact
476B-4904	Message table has bit seven set of last character
4905-4931	Command table; change B jump
4941-49BA	Parser for input
4E06-	A-gain
4E11-	L-ist
4E22-	Space
4E31-	Carriage return
4E48-	E-xit
4E4C-	C-hange
4E67-	D-elete
4E74-	Q-uit
4E79-	I-nsert
4E7D-	X-tra
4E81-	H-ack

Table 2

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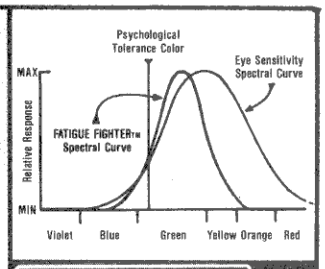

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80 NEWS

edited by John P. Mello Jr.

Micro joins war against crime

This super cop has neither cape nor mask

by Kerry Leichtman
80 Micro Staff

With Superman busy making motion pictures again, America's crime fighters have had to seek alternative methods for keeping us safe from crime. One such alternative is the TRS-80. It would be difficult to say who was first to incorporate TRS-80s in police work, but certainly one of the more elaborate systems must be the one used by the police in Hanover Park, IL.

Police Chief Robert Sauer has put together a system of five Level II TRS-80 Model Is, each with one disk drive and 48K of RAM; a Corvus 20-megabyte hard disk; an IBM 34 minicomputer; auto answer and acoustical modems; a Line Printer I, Line Printer VI and an Epson MX-80; and a Model II is on the way.

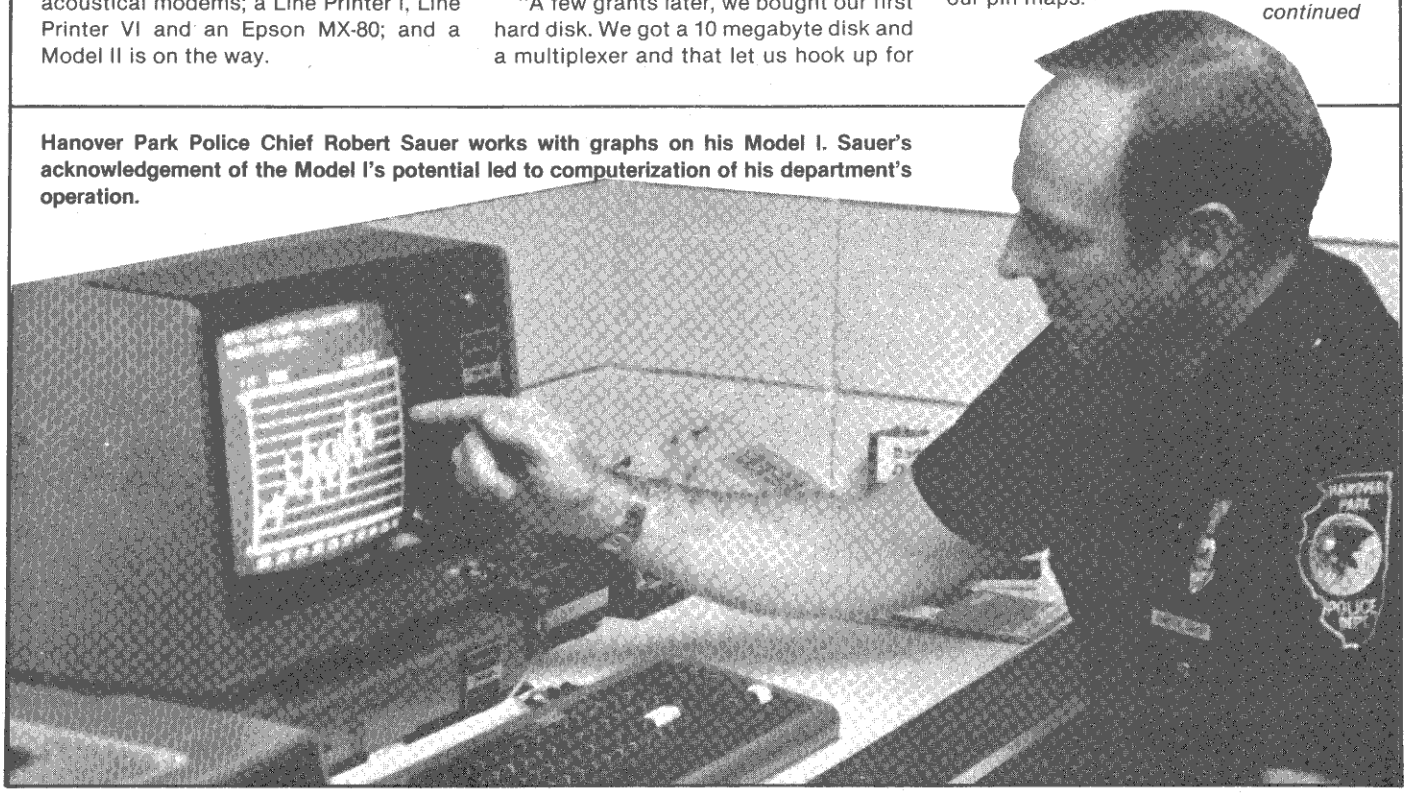
Chief Sauer bought a Model I when they were first available. He put the Level I 4K machine to work figuring manpower allocations, beat planning and some "what if" scenario situations. When he started doing graphic work to make charts, he began to realize the potential of a TRS-80 on the police force. And so the chief applied for federal funding:

"We kind of nickel and dimed it. The first grant got us a few more machines, expanded our operation from tape to disk, got us expansion interfaces and all the related things needed to bring up disk systems. It also bought machines for two other towns giving us the ability to 'talk' to each other. We bought modems.

"A few grants later, we bought our first hard disk. We got a 10 megabyte disk and a multiplexer and that let us hook up for the first time more than one machine to time-share that disk. That worked like a champ opening up all kinds of new horizons. Then we got the three printers."

The federal grants were obtained for the purpose of using micros for crime analysis. One of the first computer applications used by the Hanover Park police was pattern analysis. "We used it to draw maps of the town," said Sauer. "We spotted, on the maps, incidents of particular crimes, or any kind of call for police service. Using these maps, we could determine if we were having problems with a particular area. It was like a spot mapper, a pin map kind of thing. We automated that process and got rid of all our pin maps."

continued



Hanover Park Police Chief Robert Sauer works with graphs on his Model I. Sauer's acknowledgement of the Model I's potential led to computerization of his department's operation.

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POLICE*continued*

The personnel evaluation process was automated next. Putting the TRS-80s onto this task accomplished another of the chief's goals: "Getting the supervisors to use the machines. They had to do their personnel evaluations in it and in the process they also got comfortable with the machines."

With Scripsit as their word processing program, daily bulletins, file maintenance and ordinance writing were put into the growing TRS-80 system.

The advent of micros to the Hanover Park police made life easier for the department and saved the town money. Sauer said: "We have an IBM Systems 34 minicomputer in the village. It's a super machine. It does the budgeting and all that stuff, but one of the things that's very costly to do with the 34 is try out ideas. It costs a lot of money to play around on the 34." To figure the police department's budget Sauer and his supervisors tried out different ideas and methods on the Model Is. Once it was formed to everyone's satisfaction, it was put into the 34.

Hanover Park will be saving even more money when its Model II arrives. The terminal it leases now to plug into the state's sophisticated central computer system for criminology and police management information costs $600 a month.

"What we plan to do is work up an interface to a large CPU that could in turn talk to the state computer and give us the state access without the large cost. We wanted to use our Model Is to do it. But we had format problems with screen size and protocol problems with modems. We could have pulled it off, but software-wise it would have been expensive. So we're going to buy a Model II and do three things with it."

First, they plan to dedicate half of their 20 megabyte disk and use a different operating system on the Model II to enable them to do some high speed computing in-house.

Next, they will hook up to the state and the country's criminal justice data base.

They also will use the Model II as a dumb terminal interface to the IBM 34 to make the IBM accessible to the clerk's office. "We figured out a way to do that." Sauer said. "They have backup problems. So what they will be able to do is dump down to our disk."

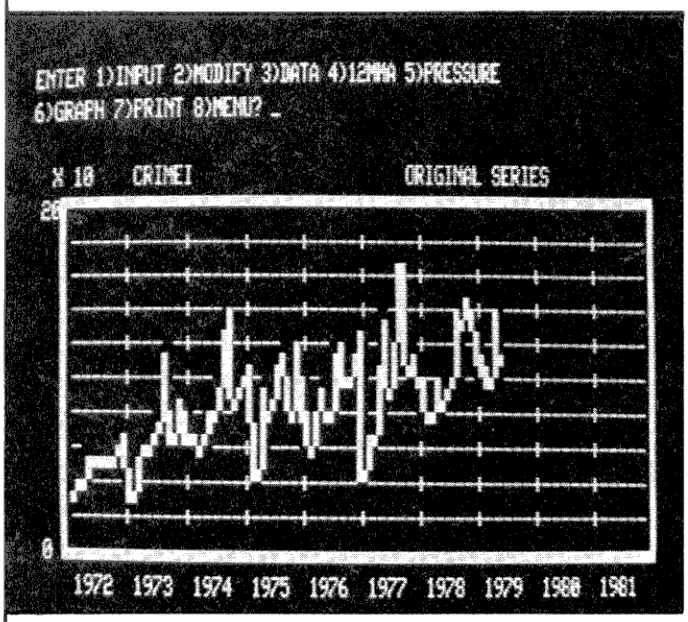
Sauer was so pleased with how his system was developing that, in October 1979, he wrote an article for *Police Chief* magazine about it. The response was staggering. "A whole bunch of departments called and wanted to know what we were doing, Sauer said," I found out there were a whole lot of TRS-80s [in police departments] around the country, but they were somewhat limited in their uses. We had done some things that I guess was kind of unusual."

The chief not only aroused the interest of his fellow officers, but also that of a California company called Search Inc. They are a clearinghouse, of sorts, specializing in automated criminal justice systems. They were also monitoring, for the federal government, several large criminal justice grants. Next thing he knew, Chief Sauer was traveling the country making demonstrations and holding seminars on the use of microcomputers.

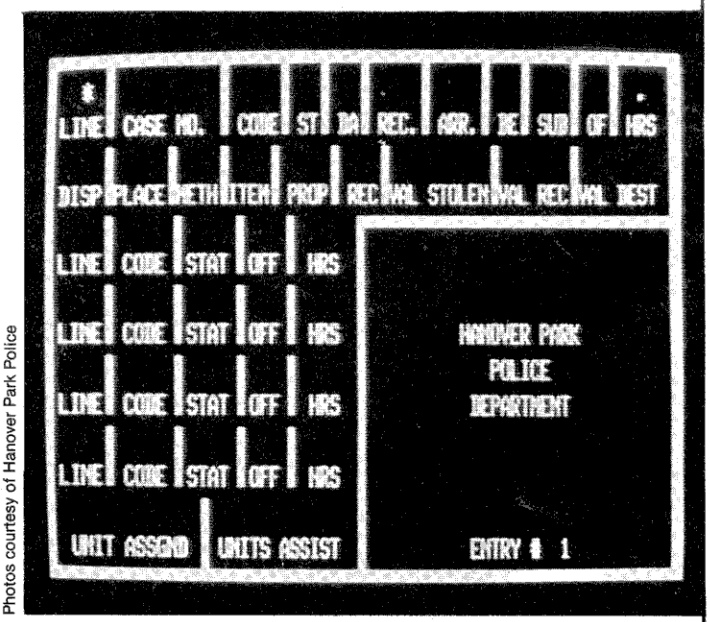
"It really took off," he said, "There was a lot of action, particularly on the federal level, a redirection of interest in getting away from funding big machines and getting into distributive process systems and things like this." Sauer gave advice and even helped some departments obtain software and set their systems up.

For conventional software the Hanover Park police make use of Scripsit, Visicalc, NEWDOS80 and the AIDS III DBM. Most of their special software was written for them by two Illinois men Dennis Gillig of Schaumburg and Mike Schussert of Elmhurst.

Sauer feels the results of Hanover Park's conversion to TRS-80 computerization has been extremely successful. As the system continues to be used, Sauer and his staff continue to find new uses for it. The chief knew he was on to something when he first introduced the Model I to the department. The potential of that one 4K machine led to the development of the department's present system. Said Sauer, "It just doesn't feel like a small inexpensive computer." ■



Photos courtesy of Hanover Park Police



Model I display (left) shows crimes in Hanover Park from 1972 to 1981. The department's Model Is are used for generating crime reports (right).

Tax bill woes cured by micro

G. Bert Latamore
Contributing Editor

For generations officials of small, rural towns have kept their tax records by hand. Year after year they have patiently written out annual property tax lists; year after year they have spent hours in repetitive tax bill computations. Many small towns today still use the methods employed by colonial officials 300 years ago.

Canterbury, NH, selectman James Ashworth discovered that fact the hard way. During his first year in the post, he and two other selectmen spent four hours trying to find a four cent mistake in the tax records.

Ashworth found the selectmen were spending one or two months preparing tax bills for a town where "ninety per cent of the properties remain the same year after year."

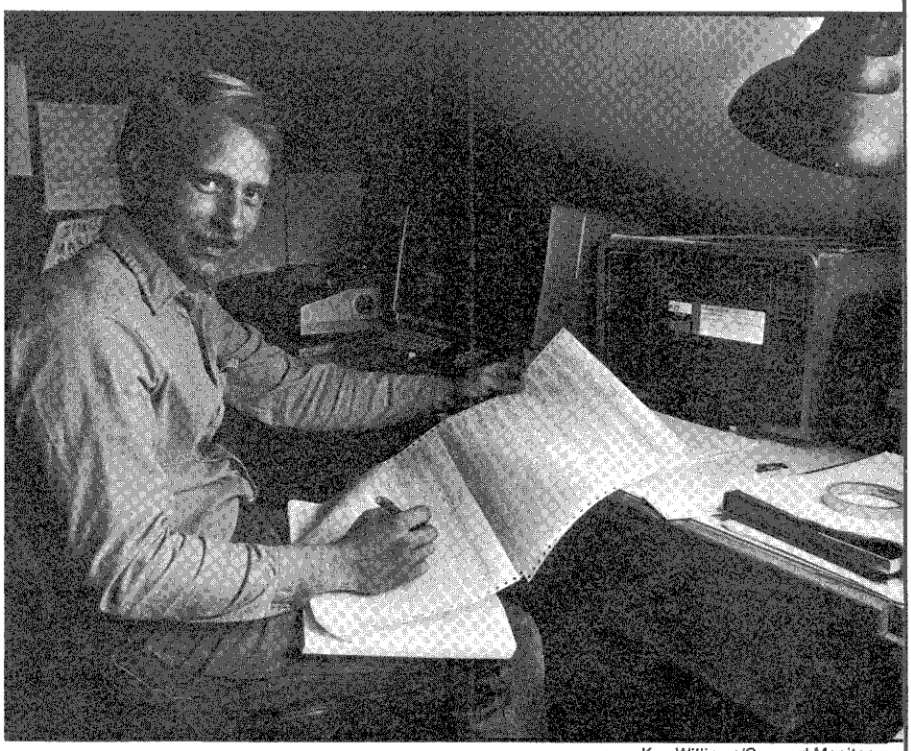
"It was so frustrating to see the same things hand written year after year," he commented. "There had to be a better way."

Ashworth saw computers as that better way. But towns the size of Canterbury do not have the money for computers even in this day of comparatively cheap desktop machines.

Ashworth, who is independently wealthy, decided that if Canterbury couldn't afford a computer, he would buy it himself. The New Hampshire native and former teacher bought a TRS-80 Model II in October 1980 and launched a service providing computerized tax records for small New Hampshire towns. The response has been very favorable.

So far this year, Ashworth said, six small towns have put articles on their town meeting warrants authorizing selectmen to contract with his Municipal Computer Services. He confidently expects all the towns to approve the plans, and he has reason to. Not only will it save town officials a great deal of time, making it possible in many cases for qualified but busy individuals to serve in town offices, it will save them money from the start.

Ashworth charges 40 cents per parcel for entering property tax information into the system and 25 cents per bill for each bill generated, so it costs the town 65 cents per property bill the first year. This is a 20 cent saving per parcel over the average cost of hand preparation of those same bills. Since the information for the vast majority of parcels will not be modified each year, the cost of Ashworth's service will drop to 32 cents a parcel on the second year.



Ken Williams/Concord Monitor

Ashworth: After spending four hours trying to find a four-cent error, he found Model II was for him.

The service also saves the town money because of its speed in figuring and printing tax bills. Once the state sets the town's tax rate, it takes at least two weeks under traditional methods to figure the bills and have them printed. Ashworth can do it all in a day. He says the average small town loses about $100 a day in interest during those two weeks of delay in getting their tax money in. The service pays for itself just by saving that interest.

Ashworth bought a TRS-80 Model II mainly for reliability and the service Radio Shack offers in New Hampshire. He has been very pleased. His machine has broken down twice and both times Radio Shack got it back to him within 24 hours. When he bought the machine, the store in Manchester, NH, promised that if it was down for a long time he could use one of their demonstration models. So far, he hasn't had to do that.

Ashworth depends on a database manager called The Formula from Microprocessor Associates in New York for his processing, and he says he can "highly recommend that program to anyone who is working in data management." It can handle all his needs and allows him to create his own tax forms to meet New Hampshire law using a form generator included in the program. And, he explained, it does these things directly, without requiring him to come up with tricks to circumvent program limitations.

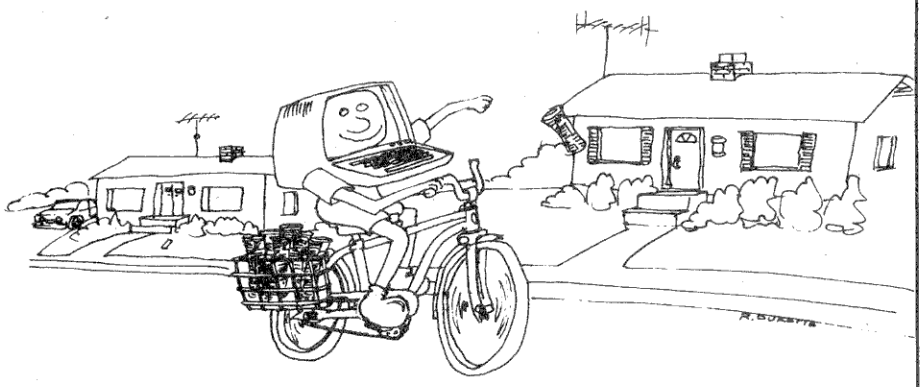
Ashworth's personal motivations for getting into the tax computing business are complex. He says the business will make him "a small amount of money," but he has no particular need for money. He and his wife, Carol, bought their 114 acre farm six years ago after receiving a generous inheritance. They have gone back to the land, enjoying raising sheep and pigs and, recently, building themselves a new home by hand.

Ashworth admits the computer has become something of a hobby with him. "I enjoy working with the computer," he explained. "It's the most challenging thing I've ever done."

Like many people, however, Ashworth and his wife are concerned with the quality of life in their town and the area around it. That was his motivation in running for selectman in the first place. The tax service is a way for him to help small towns who are being squeezed by many financial pressures.

"The towns need it," he said. "I think I can be a service to them." ■

Newsboy's micro runs paper route



Kerry Leichtman
80 Micro Staff

A newspaper carrier used to have three essential pieces of hardware: a bicycle, a canvas carrying bag and a dog-eared customer record book. The bicycle and canvas carrying bag may still be essential, but the customer record book may be on the way out. Sixteen-year-old Rock Hill *Evening Herald* paperboy Bob Berry has replaced his with a micro.

Berry uses his micro to keep the books for his 90-house South Carolina paper route. The program, written by his father, has nine functions including add and delete customers, printout monthly billings and enter payments and credits.

Berry, who has delivered the *Herald* for almost four years, said if he didn't have the computer to take care of the organization and the math, he would have dropped the route long ago.

Rock Hill circulation manager Jack Einreinhof said "It's great that Bob is using something modern to do something as old as deliver newspapers." Customer reaction has been mixed, according to Einreinhof. "I hear that it works fine and yet we have had calls from customers saying they do occasionally get billed at a wrong rate."

Berry also has received complaints he believes are directed more towards computers in general than the odd billing mistake: "I have had several customers that when they have a question with a bill, they say please check your computer. I don't know what kind of effect it's having on my customers' attitudes. Perhaps they're getting a little carried away with the computer-error syndrome."

Despite the intermittent complaints, Einreinhof is amused at Berry's use of the micro, "We are now just getting software for our circulation department's billing, and this little crapper has had it for the last few years. I guess that's just keeping up with the times." ■

Info utility gives raisers edge

By G. Bert Latamore
Contributing Editor

How a farmer approaches the commodities market can mean success or failure for his business. Until recently, most plowmen were unable to keep tabs on this vital exchange but today, farmers need no longer be blind about it.

The Professional Farmers of America provides electronic commodity information to major farmers using Tandy's videotext system.

The Cedar Falls, IA, organization's service, called Instant Update, provides a rundown, updated every 10 minutes, of prices at the Chicago commodities market and at major U.S. ports. It also provides advisory services including morning, noon, and afternoon news and feature reports offering items likely to influence commodities' prices.

It offers an "alert page" which carries stories of special impact or interest; a weather page; a world weather survey, giving farmers some idea of what is happening to their overseas competition; and Washington Watch, containing stories from Professional Farmers' staffers covering the federal government. After the market closes each afternoon, the service provides its "hog and pig report" covering events and trends affecting that market.

Beyond news, Instant Update provides Market Predictions based on fundamental (supply and demand) and technical (special indicator based) standpoints. Marketing Manager Tom McCafferty explained many farmers use the fundamental analysis to get general trends and the technical analysis to look for day-to-day clues in the markets to help them determine the best time to sell their goods.

McCafferty said the service has been successful from the start. Although intended mainly for the midwestern farm belt, it has attracted subscribers from across the continent and as far away as Hawaii, even though users must call the database over normal telephone lines and pay the long distance charges themselves.

McCafferty said they have been continually adding to their service since starting it last summer. Many of the additions have been at the request of groups of subscribers who have wanted, for instance, the prices at Norfolk, VA, or gold and silver prices, a general indicator of the health of the economy.

They are also in the process of adding to the service from the technical standpoint. Until recently, farmers had to have either a Tandy videotext terminal or a TRS-80 microcomputer and Radio Shack's special videotext adaptor package to access the database. However, Professional Farmers is now making the technical changes to allow farmers with Apple microcomputers to use the service also.

Instant Update is one of very few videotext services anywhere in the world that does not have the backing of either a national government or major international firm. And it is one of the few designed to be self-supporting virtually from the start. By its survival and success, it is demonstrating the electronic information age has indeed taken the step into the home and small business in a very real way. ■

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INSIDE LEVEL II

The Programmers Guide to the TRS-80 ROMS

INSIDE LEVEL II is a comprehensive reference guide to the Model I and Model III ROMs which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the SYSTEM command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer including tape formats, RAM useage, relocation of Basic programs, USR call expansion, creating SYSTEM tapes of your own programs, interfacing of Basic variables directly with machine code, and special precautions for disk systems. INSIDE LEVEL II is a clearly organized reference manual. 80 Microcomputing calls it "a volume of valuable information....immensely thoughtful, literate, and cleanly designed." Byte Magazine says: "I recommend this book to serious machine language programmers."

Includes updates for Model III. INSIDE LEVEL II.....$15.95

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STEP80 allows you to step through any Basic or machine language program one instruction at a time, and see the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The top 14 lines of the video screen are left unaltered so that the 'target program' may perform its display functions unobstructed. STEP80 will follow program flow right into the ROMs, and is an invaluable aid in learning how the ROM routines function. Commands include step (trace), disassemble, run in step mode at variable step rate, display or alter memory or CPU registers, jump to memory location, execute a CALL, set breakpoints in RAM or ROM, write SYSTEM tapes, and relocate to any page in RAM. The display may also be routed to your line printer through the device control block so custom print drivers are automatically supported.

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This machine language program may be used as a smart terminal with time share systems or for high speed file transfers between two disk-based micros over modems or direct wire. It is menu driven and extremely simple to use. Functions include real-time terminal mode, save RAM buffer on disk, transmit disk file, receive binary files, examine and modify UART parameters, program 8 custom log-on messages, automatic 16-bit checksum verification of accurate transmission and reception, and many more user conveniences. Supports line printers and lowercase characters. With this program you will no longer need to convert machine language programs to ASCII for transmission, and you will know immediately if the transmission was accurate. This program comes on a formatted disk.

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The INSTANT ASSEMBLER is a powerful disk or tape-based assembler and debugger for the TRS-80. Now you can assemble directly o memory and immediately debug your program with the built in single stepping debugger. Quickly switch from assembler to debugger and back again without losing the source code. This feature makes INSTANT ASSEMBLER an excellent learning tool for assembly language programming.

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INSTANT ASSEMBLER's debugger provides single stepping with full register displays, decimal or hex entry of addresses, forward or backward memory displays, disassembly of object code in memory, memory display in ASCII format, and hex-to-decimal or decimal-to-hex conversion. The single-stepper will step one instruction at a time or at a fast rate to any defined address.

INSTANT ASSEMBLER occupies less than 8400 bytes of memory. In a 16K machine this will leave you enough memory to write assembly language programs of around 2000 bytes. This and its module-linking feature make INSTANT ASSEMBLER ideal for users with only 16K machines. The instruction manual may be purchased separately for $3, which will apply towards the purchase of the INSTANT ASSEMBLER. In addition to disk I/O, the disk version includes a stand-alone version of the debugger.

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VIEWPOINT

Let your digits do the crunching

by Chuck Kraemer

This being the age of information, I shuffled recently into my new neighborhood computer store, with its still-fresh aroma of carpet compound, and its Apples and Ataris blinking everywhere, and greatly impressed the clerk, I believe, by announcing that I wanted to crunch a few numbers.

Programmer lingo, you know.

Dot matrix or impact? he wanted to know. Basic or Pascal? What peripherals exactly? Did I want a modem? Acoustic coupler OK? What resolution on the CRT? Something about algorithms, mainframes, ICs, CPUs, buffers, and a binary chops. And how about a word processor? Block move? Word wrap? Search and replace?

Fine, I said, and throw in a floppy chip and an integrated disk or whatever and a can of debugger for the input.

And, if the program was too tough, I wondered, was it OK sometimes to count on my fingers?

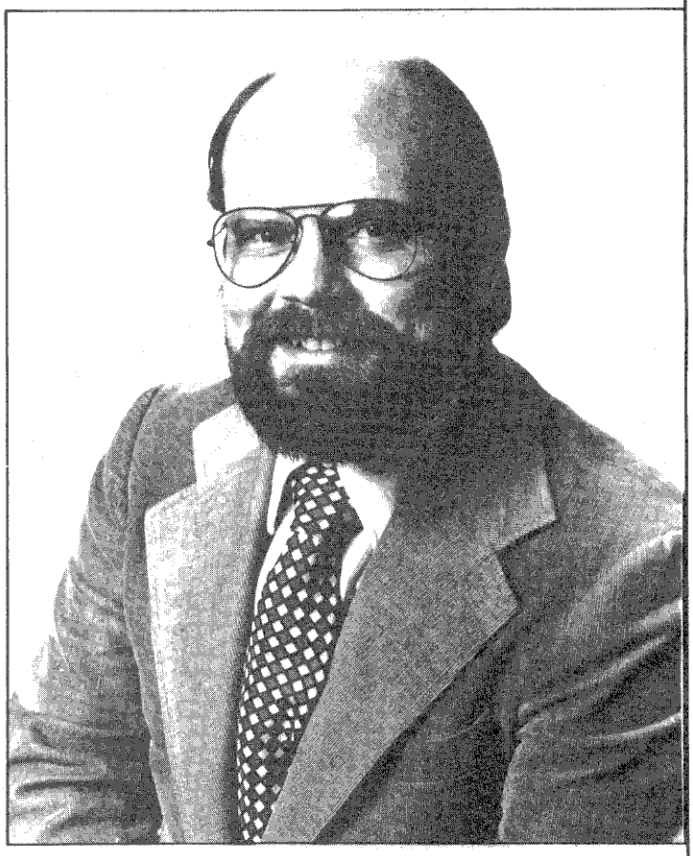
Suddenly the guy steps sideways in front of his Apple, as if to protect it from a worm, and inquires suspiciously just what experience did I have, anyway, with computers.

I said, well, I have an electric typewriter and was learning to make it backspace.

Whereupon he steered me into the electronic game department and tried to sell me one of their starter-models. I think he called it Intergalactic majong.

Whereupon a slight blush spread across my interface and I realized this was the wrong kind of hardware store for me.

So I backed out the door and went home to crunch my numbers on the same old integrated circuits I've used since 1945.



Kraemer: Not ready to byte the Apple.

Except for that dismal semester in 1961, in algebra, they have always worked just peachy, thank you, so you'll forgive me if I don't byte the Apple just yet. Maybe later, after I figure out how to backspace.

Till then, if this is the age of information, I don't want to know.

Chuck Kraemer is a reporter and commentator for WCVB-TV, Channel 5, in Boston, where this essay was aired Jan. 18.

TELEWRITER

the Color Computer Word Processor

the only one with all these features for your TRS-80 Color:

51 column x 24 line screen display ■ **Sophisticated full-screen editor**
Real lower case characters ■ **Powerful text formatter**
Works with any printer ■ **Special MX-80 driver**
Runs in 16K or 32K ■ **Disk & cassette I/O**

requires absolutely no hardware modifications

TELEWRITER

Telewriter is the powerful word processor designed specifically for the Color Computer. It can handle almost any serious writing job and it is extremely easy to use. It has all the advanced features you need to create, edit, store, format and print any kind of text. With Telewriter you can quickly produce perfect, finished copy for letters, reports, term papers, articles, technical documentation, stories, novels, screenplays, newsletters. It is also a flexible and efficient way to take notes or organize ideas and plans.

51 x 24 DISPLAY

The Color Computer is an incredibly powerful and versatile computer, but for text editing it has some major drawbacks. The small 32 character by 16 line screen format shows you too little of the text and, combined with its lack of lower case letters, bears little resemblance to the way text really looks on the page. Reverse video in place of lower case just adds confusion.

Telewriter eliminates these shortcomings with **no hardware modifications required.** By using software alone, Telewriter creates a new character set that has **real lower case letters**, and puts 24 lines of 51 characters on the screen. That's more on-screen characters than Apple II, Atari or TRS-80 Model III. That's more than double the Color Computer's standard display.

FULL SCREEN EDITOR

The Telewriter editor is designed for maximum ease of use. The commands are single key (or single key plus control key), fast, and easy to remember. There is no need to switch between insert modes and delete modes and cursor movement modes. You simply type. What you type is inserted into the text at the cursor, on the screen. What you see on the screen is always the current state of your text. You can move quickly through the text with one key cursor movement in all 4 directions, or press the shift key simultaneously for fast, auto-repeat. You can jump to the top or bottom of the text, the beginning or end of a line, move forward or backward a page at a time, or scroll quickly up or down. When you type past the end of the line, the wordwrap feature moves you cleanly to the next.

. . . one of the best programs for the Color Computer I have seen . . .
— Color Computer News, Jan. 1982

You can copy, move or delete any size block of text, search repeatedly for any pattern of characters, then instantly delete it or replace it with another. Telewriter gives you a tab key, tells you how much space you have left in memory, and warns you when the buffer is full.

FORMAT FEATURES

When it comes time to print out the finished manuscript, Telewriter lets you specify: left, right, top, and bottom margins; line spacing and lines per page. These parameters can be set before printing or they can be dynamically modified during printing with simple format codes in the text.

. . . truly a state of the art word processor . . . outstanding in every respect.
— The RAINBOW, Jan. 1982

Telewriter will automatically number pages (if you want) and automatically center lines. It can chain print any number of text files from cassette or disk without user intervention. You can tell it to start a new page anywhere in the text, pause at the bottom of the page, and set the Baud rate to any value (so you can run your printer at top speed).

You can print all or any part of the text buffer, abort the printing at any point, and there is a "Typewriter" feature which allows you to type straight to your printer. Because Telewriter lets you output numeric control codes directly (either from the menu or during printing), it works with **any** printer. There's even a special driver for the Epson MX-80 that lets you simply select any of its 12 fonts and do underlining with a single underline character.

CASSETTE AND DISK I/O

Because Telewriter makes using cassette almost painless, you can still have a powerful word processor without the major additional cost of a disk. The advanced cassette handler will search in the forward direction till it finds the first valid file, so there's no need to keep retyping a load command when you are lost in your tape. The Verify command checks your cassette saves to make sure they're good. You can save all or any part of the text buffer to disk or cassette and you can append pre-existing files from either medium to what you have in the buffer already.

AVAILABLE NOW

Telewriter turns your Color Computer into the lowest cost hi-power word processor in the world today. It runs in 16K or 32K (32K recommended) and is so simple you can be writing with it almost immediately. It comes with 63 pages of documentation and is fully supported by Cognitec. Telewriter costs $49.95 including shipping (California residents add 6% tax). To order, specify disk or cassette and send check or money order to:

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Del Mar, Ca. 92014

Or call (714) 755-1258 weekdays 7 AM-4PM PST. We will gladly answer your questions.

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See List of Advertisers on page 338

PULSE TRAIN

CBS-ATT videotext test to start Sept. 15

On Sept. 15, two communications giants—the American Telephone and Telegraph Co. and the Columbia Broadcasting System—will start a major test of home computer information technology.

The test (see *80 Micro* news, December 1981), called Venture I, will involve 200 households in New Jersey and run seven months, James Bauer told *80 Micro*.

The director of business development for the project said it will include information from CBS sources. In addition to its world-wide broadcast holdings, CBS owns 60 newsstand magazines and six book lines.

"But we're not going to take material that's appeared in a printed magazine and spit it out," Bauer observed. "We're putting together a fairly large editorial staff that will essentially create unique products for the videotext service."

"I can't tell you the specifics of the information," he added, "but it will be fairly broad, general consumer information—a lot of things that other services up to now have: news, sports, weather, local information, local entertainment."

And the network will have some "unique" things on the system, he said, that are "proprietary."

He explained households will participate in the experiment free of charge. "They're going to be chosen by a market research firm," he observed, "that is going to set up the demographics of people likely to be the initial mass market purchasers of the service."

Two kinds of interactive terminals will be used in the test. One unit can be connected to the back of a tv set; the other is stand-alone and looks like a Hazeltine 1510 terminal.

Bauer explained two devices will be used because one research objective of AT&T is to find out what kind of terminals people prefer for videotext service.

"We're also interested in how much time videotext will take away from normal television viewing," he added.

Commodore's VIC-20 lineup: Printer comes up short.

Commodore short-sheets VIC-20 printer

Computer novices eyeing Commodore International's new printer for its VIC-20 microcomputer should consider carefully the printer's paper size, cautioned Christopher Plumley of Brattleboro, VT, in a letter to Wayne Green Inc.

He explained the VIC-1515 printer uses eight-inch wide paper. Standard-size paper is 8.5-inches wide.

If the 15-pound paper is bought from Commodore, Plumley said, it costs $15 for 1,000 sheets. He maintained it costs him $6.37 per 1,000 for standard-size paper.

Commodore's vice president of marketing, Kit Spencer, admitted eight-inch paper is "not the most common size." But there are other printers using that size paper, he said, such as the Seikosha printer.

Asked if there were other suppliers of the non-standard paper, Spencer replied: "There are other people. I do know that. We checked that out."

"Paper is very much an open market," he added. "We have advised our dealers of both external supplies of paper and ours."

Asked about the $15 per 1,000 price, he responded, "I think you'll find that's a reasonable price to pay."

Data processing hot career for 1982

If your career specialty is data processing, you will be in good shape in 1982, predicted Paul R. Ray & Company Inc. of Fort Worth, TX.

The executive search firm also noted another "hot" career right now is computer program design.

Senior vice president Joseph A. Zant said in a statement, people with data processing experience who move into another discipline have a better shot at top corporate jobs than people without that kind of experience.

He added that a manager with 10 years of electronic data processing combined with good communication skills is now worth $75,000.

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E/Z-SCREEN is the revolutionary new system that makes designing of professional quality screens a snap by letting you design them right on your TRS-80* screen.

Once in place, the E/Z-SCREEN system starts the show by "talking" to you. It automatically produces "user friendly" disk BASIC code, giving you access to a host of screen processing functions.

This and many other E/Z-SCREEN features can save you untold time, effort and can actually make screen design kind of enjoyable! Here's how.

E/Z-SCREEN DESIGN

By using your keyboard, E/Z-SCREEN's formatting commands let you format and modify your screen. Like changing channels, you can keep changing your layout until you're perfectly happy with it. And since what you see on screen is what you get, you never get a layout or write a program you're not completely satisfied with.

Want to center a line? Maybe a few? Just give the command and watch it happen—automagically! You can even repeat information, horizontally or vertically.

Best of all, if you still don't like what you see, you can totally rearrange the screen design—even after you've written your program.

E/Z-SCREEN lets you move any and all fields of information, re-sequence lines, plus much more. And you see it all happen. When you're finally satisfied, save your screen on disk and go on to design another. But after design completion, E/Z-SCREEN really goes to work for you.

THE GRAND FINALE

E/Z-SCREEN automatically generates the screen process code, making your screen work and look like those written for larger industrial computers. The code controls the displaying and reading of data and the printing of text on the screen—for up to 12 screens per program!

What's more, the keyboard operator is truly the program director, in total control of data being entered. Data changes, corrections, and erasures are all made easily by using the various cursor control keys.

A MATTER OF RECORD

E/Z-SCREEN even makes documentation of your program easy by automatically cross-referencing and printing it on paper (if printer is connected to system).

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PULSE TRAIN *continued*

Networking arrives in N.Y. *Times* newsroom

Networking has arrived in the New York *Times* newsroom.

Using the split-screen capability in the newsroom terminals, reporters can write their stories on one side of the screen while calling up information on the other side.

The formation—accessed by reporters through an in-house network called "Copynet"—is from the newspaper's information bank. It includes the full text of the newspaper for the last 18 months and abstracts and digests of articles from the *Times* and 70 other newspapers, magazines and journals published in the United States and abroad.

Micro Winchester Market exploding

From ground zero in 1980, the micro Winchester drive market rocketed to $81 million in 1981 and it's expected to break the billion dollar threshold by 1985, according to a report in the New York *Times*.

Since last January, 30 companies have announced entries into the market, but manufacturers may be facing their first real test this year. After a flurry of orders during the first nine months of 1981, the *Times* said, business has tapered off, as computer makers study the market and begin designing their choices into their machines. This could take another six months, long enough to severely tax upstarts in the industry.

Several other factors have retarded market growth, 3M Data Records Product Division Vice President Alfred E. Smith said in a statement. But those factors—lack of product availability, lack of common interfacing and the need for a realistic back-up solution—are being overcome.

The *Times* identified the following as leading makers of the drives: Seagate Technology Corporation, which has a contract with Apple Corporation, has licensed its technology to Texas Instruments, and is rumored to be close to closing a deal with Digital Equipment Corporation; Tandon Corporation, which has contracts with Tandy and Commodore; and Shugart, now owned by Xerox and will be sole supplier to that concern's "office of the future."

Long term success, however, is not guaranteed for the current crop of successful companies, the *Times* added. If the market develops as the calculator and digital watch markets did, continued innovation is the only guarantee of long term existence. Consequently,

3M's Smith: Barriers down.

companies are working on cartridge rigid disks, semiconductor "thin film" heads, and some floppy disk makers on multiple floppy disk cartridges.

And of course, there's the Japanese. Sony has announced it's working on a 3½-inch rigid disk.

Freelancer of future may be electronic

It may be an inkling to what writing for magazines will be like in the near future.

When editor Stan Miastkowski of *Popular Computing* told Harris Brotman he liked the author's idea for an article on electronic barter, the pair decided to set up an electronic exchange of their own.

Using The Source, an information utility in McLean, VA, Brotman composed his 2,000 word story on his data terminal in Vermont. Then he used The Source's electronic mail feature to send the manuscript to Miastkowski in New Hampshire, where the editor received it on a TRS-80 Model II in four minutes and 20 seconds.

Miastkowski told *80 Micro* Brotman could have transmitted his story directly to *Popular Computing* but there was an advantage to using The Source. Brotman could leave the story in the magazine's electronic mail box to be retrieved later.

Another advantage, noted Source spokesman Mike Rawl, is The Source allows microcomputers from different manufacturers to communicate with each other.

Miastkowski said his magazine uses electronic communication infrequently because many of its authors are inequipped to do it. "Another major problem," he added, "is that many of our authors that get The Source don't know our user number, TCG847."

While writers and editors have been linked electronically within newsrooms for several years, only recently have independent writers, located many miles from their publishers, begun to compose and transmit manuscripts via computers.

"Many writers and publishers," Rawl observed, "are beginning to create informal networks among themselves for the purpose of communicating, discussing ideas, queries, assignments, copy transmission and copy editing."

Brotman envisions a day when "networks of writers and publishers will exist nationwide, proposing story ideas, composing, submitting copy and having editing done."

So does Rawl: "I really believe that in five years probably about half the writers that are out there will be composing and transmitting copy electronically."

Fighting the arcade menace

A one person war against electronic arcade games is being waged by Mrs. Ronnie Lamm of Centereach, NY.

According to a report in the *Boston Herald American* Lamm's crusade against the games has included circulating petitions, making speeches, sending out mass mailings, talking with state officials about legislation to control the games and calling the local fire department to check on overcrowded conditions at popular amusement centers.

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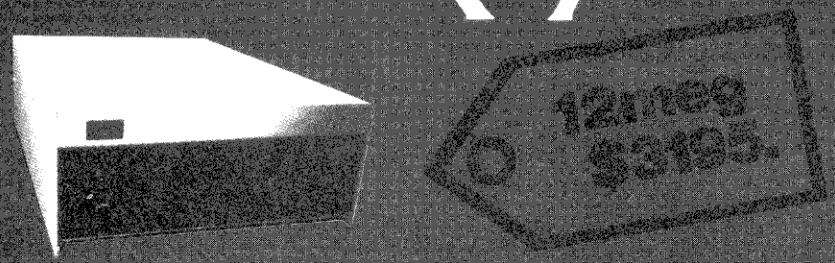

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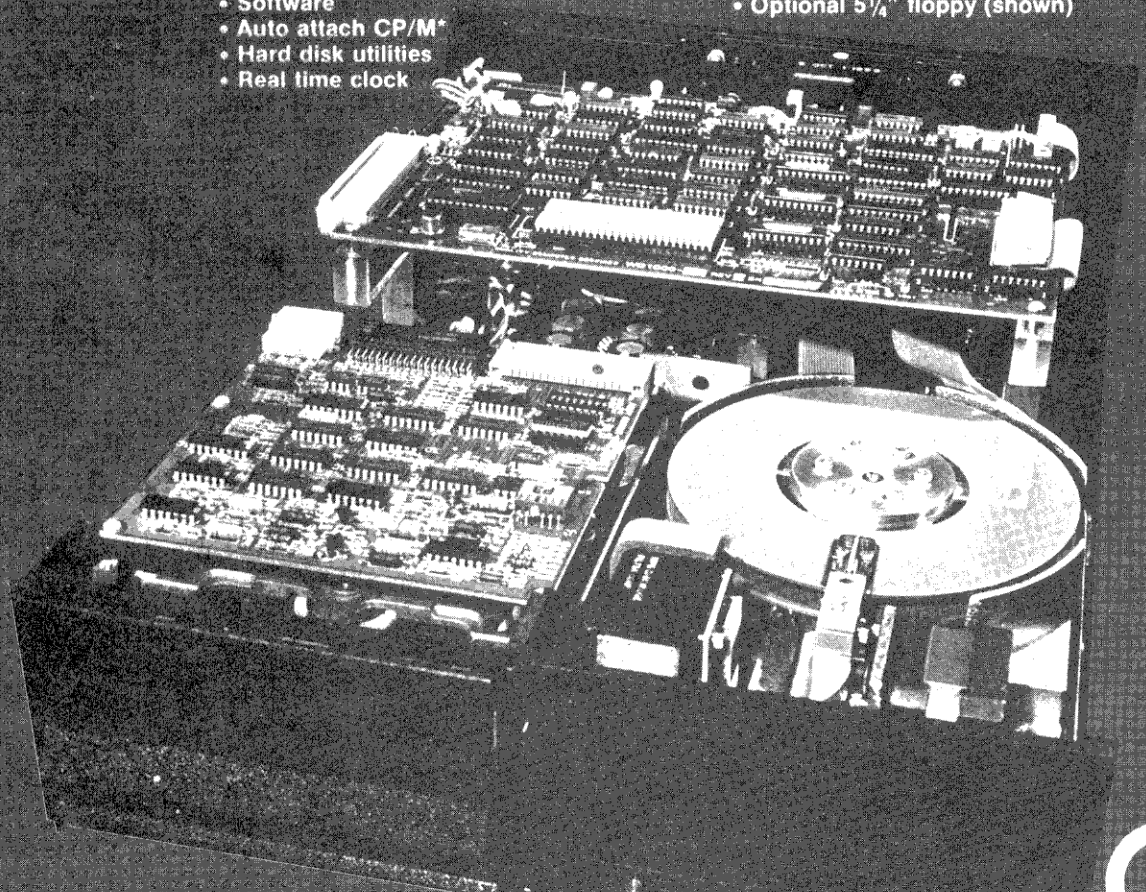

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PULSE TRAIN *continued*

When Lamm started speaking out on the issue, there were 17 applications to open video parlors along a three-mile strip in her community. Twelve applications were denied by local officials; the other five were dropped. Lamm also joined other concerned parents to persuade a neighboring town, Brookfield, to approve a six-month moratorium on arcade permits.

A case that may determine how far a community may go to control the games is presently before the U.S. Supreme Court (see *80 Micro News*, January 1982).

The *Herald American* report noted games opponents in other communities have called Lamm to compare notes, and through parent-teacher association conventions and other gatherings, a loose-knit army to oppose the amusements is developing throughout the state and nation.

Lamm maintained there is unacceptable language and antisocial behavior exhibited in the arcades. The games, she added, corrupt youngsters, teaching them gambling, aggressive behavior and theft (see *80 Micro News*, February 1982).

French laws keep Interpol from computer age

There are 3.5 million files at the International Criminal Police Organization—a good target for computerization—if the group were not headquartered in France.

Interpol acts as a massive center for transferring information on crime. Its files contain the gritty details of international skulduggery: offenses and places where they were committed; modus operandi of criminals; documents; fingerprints; photographs; and more than one million names. But according to a report by the Associated Press, French laws regulating computer files are discouraging Interpol from modernizing its record keeping.

The laws require any organization maintaining computer records on people to make them public and have empowered a National Committee on Information and Freedom to inspect the files; correct them; and even destroy them. Information submitted to Interpol, it maintains, is meant to be shared with law enforcement agencies in its 133 member countries, not with the French public.

Other international organizations operating on French soil have been granted immunity from the laws. Interpol is currently negotiating with France for such immunity, but until an agreement can be reached, the organization's general assembly has frozen its program to computerize its records.

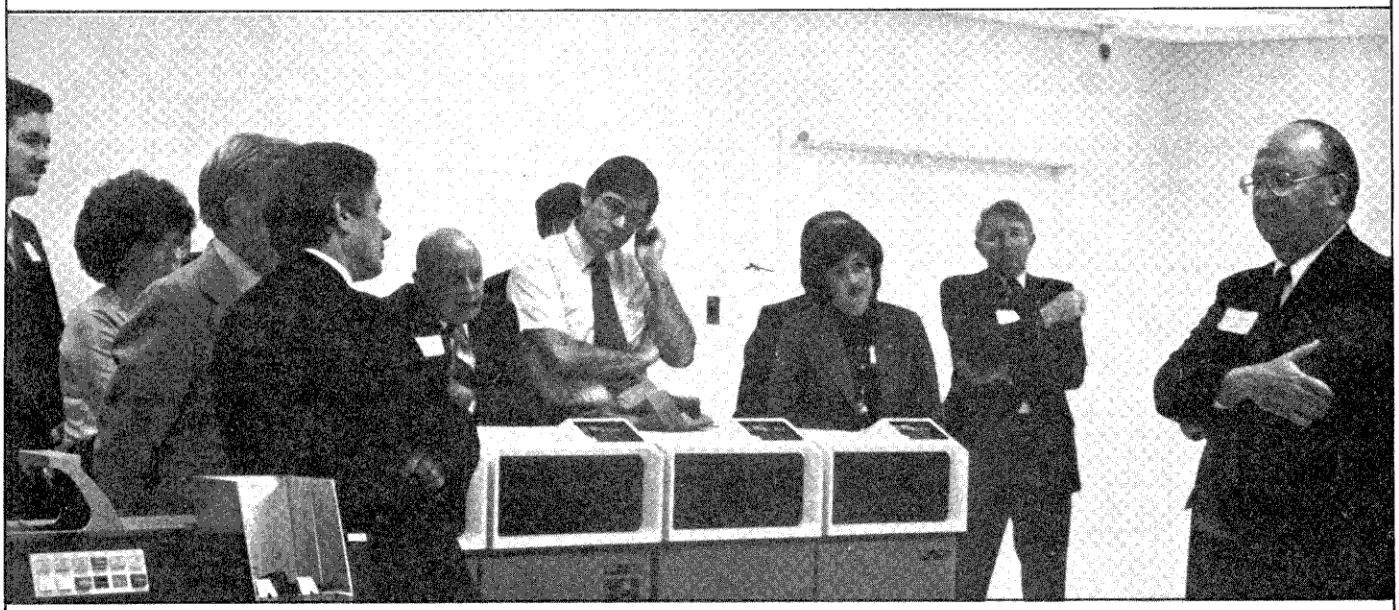
The AP report quoted Interpol's secretary general, Andre Bossard, as saying that although the negotiations were going well, moving the organization's headquarters "is always a possibility."

$50 terminals by 2000 A.D.

By 2000 A.D., videotext terminals will cost as little as $50, according to a study by the Institute for the Future, a California research and consulting group.

The concern also predicted 10 percent of the homes in the United States will have terminals by 1990—when the devices will sell for $200—and 40 percent by the end of the century.

According to the computer newspaper *Infoworld*, figures on videotext compiled at the end of 1981 reveal 42,000 U.S. and Canadian terminals were subscribing to Dow Jones, The Source and CompuServe; 150,000 U.K. terminals were receiving one-way CEEfax and Oracle teletext; and 10,500 terminals were interactive with 500 electronic publishers and 500 users in seven countries over Prestel's international service. ■



NEW CENTER IN SPOKANE. Timothy F. Preece (far right), Kaiser Aluminum's corporate vice president for planning and control, explains the operation of the company's new Northwest Regional Data Center in Spokane, Washington, during a recent open house tour. The center is the first of several the company will set up to coordinate information systems, time-sharing and telecommunications for plants and facilities in the United States and abroad.

NEW!

A comprehensive genealogical program that lets you avoid the rigidities of paper-based family trees. It quickly and easily sets up a data base to hold pertinent information about each ancestor, including name, date and place of birth, marriage and death information, plus a comment line.

YOUR FAMILY TREE will display and print a complete "pedigree" for any selected family member; or a 3-generation ancestral chart may be generated for display or printer, showing the number of known ancestors beyond each branch of the tree. As a novelty feature, the program will display a U.S. outline map showing migration across the country. Access to information in YOUR FAMILY TREE is virtually unlimited, with full search capabilities on any key field—using full or partial information.

16K RAM has space for 45-55 ancestors with brief comments. A 32K cassette-based system will hold about 175 records; a 48K, about 300. In all cases, a disk-based system will hold about 75 less due to DOS overheard.

Available for TRS-80* models I and III on tape or disk, YOUR FAMILY TREE requires a minimum of 16K RAM. Enjoy the benefits of this powerful and flexible charting system now for just $29.95.

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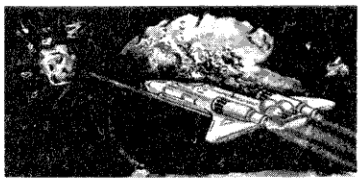

SPACE ROCKS

By Steven Kearns

Huge antimatter rocks appear on the Tactical Display Screen of your spacecraft. You blast away but they just explode into smaller chunks for you to destroy. To add to your woes, alien ships and time bombs appear periodically. If the ships hit you or the timers reach zero—BOOM! Maneuver, fire lasers, jump to hyperspace—anything to avoid the onslaught. For one or two players, with nine skill levels.

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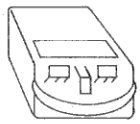

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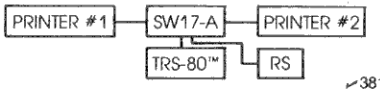

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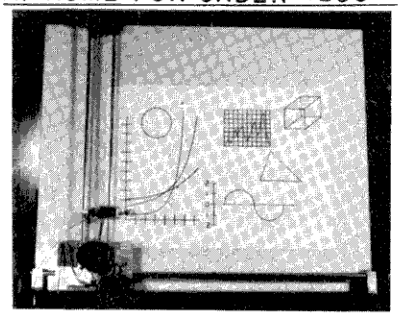

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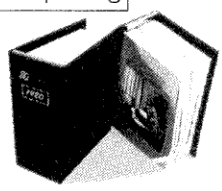

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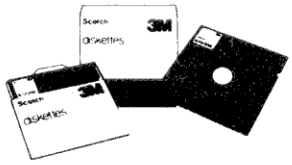

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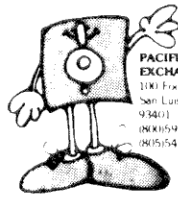

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80 Medical Opinion

by Philip R. Mills, M.D.

"Although apprehensive, another physician and I installed the unit in an hour."

Our clinic uses both the Model I and the Model II for business. (Recently we have been considering the purchase of KTI's TLS-8E fictitious Model II as a throw-away backup system. I am told that the folks at Sri Lanka have just launched a major campaign aimed at the physician market. Apparently they believe that a doctor a day keeps the Apple away!)

In our office the TRS-80 Model I has proven to be a good computer and given us excellent service.

However, it does have several disadvantages for a medical clinic. First, without a hardware card it is not compatible with the excellent business programs designed for CP/M. Second, without an additional hardware card it does not support eight-inch disk drives which are almost mandatory for handling the volume in patient accounts receivable. Third, it has a 64-character line, 18-line video screen. The Model II, of course, has none of these limitations.

Although the CP/M disk operating system is the standard Z80 in business operating systems, surprisingly few Model I or III users are acquainted with it. For the evening hobbyist, lack of CP/M compatibility poses only a minor handicap since several excellent disk operating systems (such as NEWDOS/80 and LDOS) are available with good software support. I am no CP/M fanatic and for most applications find NEWDOS/80 a far more convenient operating system; however, the most sophisticated word processing, accounting, and medical office software is written for CP/M. Now that IBM and Xerox have introduced their CP/M-compatible computer line, CP/M is almost certain to remain the operating system of choice for business applications.

Originally, Tandy considered making the Model I computer CP/M-compatible, and even purchased the rights to market the operating system. For reasons best known in Fort Worth this plan was abandoned.

In their Models I and III, Radio Shack placed RAM at the very beginning of memory. CP/M requires ROM at this beginning location. This is why it is impossible to modify Models I and III with software alone and have it truly CP/M compatible.

To remedy this problem several companies are marketing CP/M cards to install in the Model I and III, making them compatible with conventional CP/M. For the Model III an 80-character line and 24-line screen is even available.

We originally purchased the Model I computer for its word processing capabilities. Within a month we realized we needed CP/M. At that time Lazy Writer was not marketed, and the newly introduced Scripsit was the most sophisticated TRSDOS word processor available. It was simply not sufficient for our needs. The Magic Wand word processing software (now marketed by Peachtree) was superior for our purposes, but was available only for CP/M. At this point we decided to make our Model I CP/M compatible.

We discovered a second advantage to CP/M upon purchasing the Model II. Only a few of our Model I TRSDOS programs were transferable to the better machine. All of our Model I CP/M software programs were compatible with a few modifications. This resulted in a substantial reduction in the cost of new software.

We learned of a CP/M card, manufactured by Omikron, from our local TRS-80 user's group. I ordered the Mapper Card by phone for faster service, but it still took more than two months to arrive. Manufactured by a perfectionist, George Gardiner, its arrival could not be hurried!

Mapper I

Omikron
1127 Hearst Street
Berkeley, Ca 94702
$239

The Mapper I CP/M card is the oldest of the CP/M converters for the Model I. Now three years old and thoroughly debugged, it has a reputation for dependability. Our unit was installed one year ago and has functioned flawlessly since its installation.

And installation is simple. The only tool needed is a Phillips screwdriver to disassemble the CPU. Although apprehensive, another physician and I installed the unit in an hour. The complete directions are well illustrated with photos. The CPU cover is unscrewed and the Z80 microprocessor chip removed. This chip is then inserted in the socket provided on the Mapper Card. The Mapper I Card is then inserted in the old Z80 socket on the CPU. The CPU cover is reassembled with the screwdriver and the installation is complete. No soldering is required (except for five percent of older units manufactured with a marginal power supply requiring a very simple soldering modification to improve its power output). Removal of the unit is just as simple as installation, and when the Model I requires service from a local repair center, the Mapper can be removed without a trace.

The owner's manual is excellent. My version is printed in all caps and dot matrix making it less readable than regular type. This has since been improved.

With the Mapper installed there is a pleasant surprise when you turn the machine on—no screen garbage. Instead, the choice of T = TRS-80 and C = CPM appears. If you press "T" the Mapper is bypassed and the Model I functions normally. If you enter "C" the Mapper bypasses the Model I ROM and the computer behaves as a 48K CP/M machine. The Model I can never be a perfect CP/M computer, however, since its screen size is limited to 64 characters. Also its internal interrupts are different from standard CP/M. Under CP/M the Model I emulates the Soroc "IQ120" terminal.

CP/M is not a perfect system. Simple programs have little incompatibility among various CP/M based computers. Complicated programs with sophisticated video routines require significant modifications among machines. These modifications may be elementary for the experienced, but they seem impossible to the beginner. Do not expect to effortlessly exchange all programs with your Model II or trade with friends who are using CP/M on non-Radio Shack computers.

Two major versions of CP/M are in common use. Version 1.4 is archaic and based on a non-video terminal. It is upward compatible with its replacement version 2.2. Omikron supports both versions but I recommend version 2.2.

Each company marketing CP/M has added its own enhancements. These various CP/M systems are similar, but vary a great deal in detail. Omikron's version of CP/M has several such enhancements

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and utilities. In standard CP/M, disk drives are labelled A:,B:,C:,D:. Each drive may contain a minimal operating system which is installed with the command SYSGEN.COM (the ".COM" is identical to TRSDOS "/CMD"). Since the Mapper supports both five and eight-inch disk drives, the SYSGEN command is modified to LSYSGEN.COM for the larger drives and MSYSGEN.COM for the smaller drives. LFORMAT.COM and MFORMAT.COM are similar modifications to support both size drives.

CP/M makes no distinctions between upper or lowercase keyboard commands. "DIR" or "dir" brings up the directory equally well. This could pose a problem for those few Model I owners who still do not have a lowercase modification. For this reason Omikron has included a software uppercase conversion to enable the operator to read files with lowercase characters.

Other enhancements include OMCOPY.COM. Standard CP/M copy is performed by PIP.COM, which is a slow but versatile file-by-file transfer utility. OMCOPY however, copies by track and sector and is much faster. OMCOPY ALL provides a rapid and complete backup of the entire disk. OMCOPY DATA copies only the data portion of the disk, while OMCOPY SYSTEM copies only the portion of the disk containing the operating system.

XDIR.COM provides a three-column directory listing which is far superior to the one-column listing without pauses standard CP/M 1.4 provides. We renamed this utility D.COM and get the directory by simply typing "D."

The debug utility DDT.COM is not standard CP/M due to the Model I's interrupts as well as the screen size.

Other non-standard utilities include features to customize the system for software with special video and printer applications. Other utilities thoroughly examine the computer's memory and proper functioning of the five and eight-inch disk drives.

For word-processing uses, a buffer, repeat-character routine, and blinking cursor are provided. This changes the Model I from a horse and buggy system to a Volkswagen. It is too slow, has too few special characters, and too small a screen to ever be a Cadillac, though.

All in all, the system is well designed and Omikron should be commended for its excellent job in making CP/M available for the Model I user. I recommend it without hesitation.

One disappointment with CP/M is the absence of a Basic program included as a standard feature. MBasic is available, but must be purchased separately. To decrease the cost of this and other CP/M programs, Omikron has developed a software club called Cougar. The latest edition of Word Star (which is the finest word processing program I have ever used to date) is available for $149 (it lists for $495). Many other standard programs are available at a very low cost. CBasic for example, lists for $150; from Cougar it is available for only $39.

Although the best known, Omikron is not the only company providing CP/M hardware. Several other companies are marketing CP/M cards to install in the Model I or III and make them compatible with conventional CP/M. Some offer double density and 64K options. For the Model III even the 64-character-line screen limitation has been removed. If any of you have had experience using other systems I would be happy to hear from you.

Mapper II

The Mapper II is another card from Omikron. It solves the problem of the Model I or III's limited five-inch disk storage. This installs in the Expansion Interface. It is even more simple to install than the Mapper I. (We installed both units at the same session.) Mapper II costs $149.

With the Mapper II installed, the Model I or III addresses eight-inch disk drives. This feature is supported by NEWDOS80 and other major DOS systems. It is not supported by TRSDOS. Of course, the Mapper I CP/M supports eight-inch drives. Eight-inch drives make a surprising difference in the power of the Model I. Faster disk access time speeds program execution. It is amazing how much information an eight-inch, single-density disk holds when compared to a five-inch drive.

We use 80-track drives in the clinic, but have found alignment to be very critical. For heavy business use our experience has been negative. Eight-inch drives, on the other hand, are extremely reliable, and not much more expensive than the 80-track drives.

For simple word processing without a dictionary, eight-inch drives may be unnecessary. For dictionary programs, however, eight-inch drives are very helpful. For accounts receivable they are mandatory.

Prior to installation of the Mapper II card, we had trouble with track errors due to Radio Shack's inadequate data separator. The Mapper II contains a high-quality data separator and our errors have vanished.

Although we have tested *many* complicated programs, we have found only one incompatibility. With the Mappers installed, early editions of Super Utility Plus hang while loading. The author of Super Utility Plus, Kim Watt, has fixed this bug. Regular Super Utility has always worked perfectly with our Mappers.

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Recently a local hospital purchased an IBM computer to facilitate x-ray filing. After a month of inputting data there was a momentary power failure. With the power failure went the entire month's work.

When our office manager heard about this computer disaster, she urged us to take precautions to prevent a similar occurrence at our clinic. We decided to purchase the Mayday 60 + 2S. This provides a very steady voltage, protects against line surges, and has a battery backup, so that during power failure an orderly shutdown can take place.

The unit itself took two months to arrive. It is an excellently made piece of equipment. The documentation was confusing and difficult for us to understand at first, but it became clear after the second reading. We misunderstood the instructions and blew fuses three times before we finally turned it on correctly.

It arrives with a 12-volt battery. The battery is shipped without acid for obvious reasons, but the acid is shipped in a container with a spout that makes pouring safe and simple. It took us about 30 minutes to have the unit up and going.

For operation, a grounded three-prong outlet is necessary. We discovered some of our outlets were *ungrounded* three-prong sockets. The unit refused to work until the correct electrical outlet was available.

When used with the Model I, the familiar and distracting screen waves vanished. The Model II has a better internal power-supply filter, and we can detect no difference in its operation with the Mayday installed.

It has provided a large advantage for the Model II in another way. Since our eight-inch disk drives are Qume double-sided drives, and have an independent power supply, the Mayday provides a one-switch power source protecting us from accidentally operating the Model II computer without the accessory drives operating.

The unit has one distracting feature; it makes a steady, irritating hum, even when turned off. Since it cannot be unplugged without blowing an internal fuse, we simply leave it humming.■

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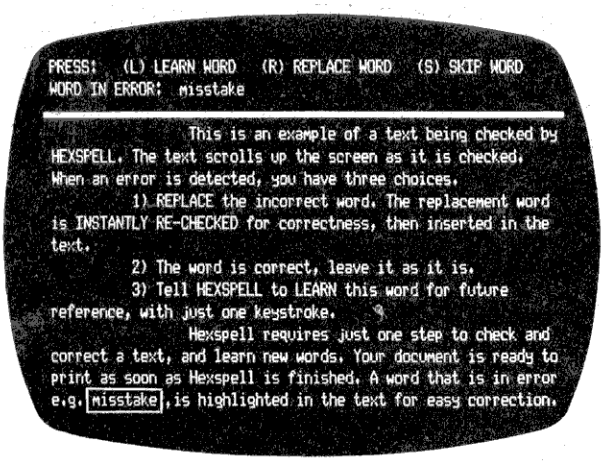

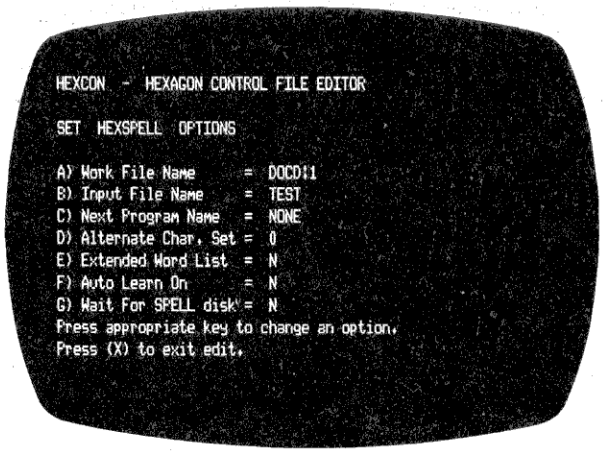

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RELOAD 80

This month's RELOAD 80 will deal briefly with assembly language source code—code generated by an editor/assembler. We will not consider op codes or the like, but merely loading problems.

Unlike Basic, Assembly language source code must be assembled into machine language before it can be executed. To write the code and then to assemble it requires an editor/assembler. The most obvious is Radio Shack's EDTASM.

Owners without disk drives who wish to buy LOAD 80 obviously have no choice. They must buy the cassette LOAD 80 and must own a cassette-based editor/assembler. Disk drive owners, however, encounter compatibility problems when deciding to buy tape or disk. Your editor/assembler may be limited only to reading disk source code. It may also be particular about which editor/assembler created the source code.

Disk Drive Users

Apparat markets one of the most popular disk-based editor/assemblers on their NEWDOS Plus operating system for either the Model I or Model III. It consists of a series of patches to the old Radio Shack tape-based EDTASM, which enables it to read and write files to disk.

There is, however, a compatibility problem between the Apparat and Radio Shack versions of EDTASM. The Radio Shack version will not read source code generated by the Apparat version; the reverse is also true. Apparat's format was designed as an extension of the tape protocol and had been around for three years when Radio Shack came out with their version. We can only guess at the reason behind Radio Shack's decision to lock out the reading of files generated by Apparat's assembler. In any case, the Apparat format has become the standard, and is the one we use in LOAD 80 disk files. *This means disk users must have an Apparat-compatible editor/assembler to read LOAD 80's source code files.*

You may ask why we don't assemble the source code and save you all the hassle. We deliberately don't do this so machine-language programmers can customize programs for their own use. We do, however, attempt to substitute a Basic version whenever possible.

To sum up: To load a source code file, you need an editor/assembler. If you have disks and wish to buy LOAD 80 on cassette, you must have an editor/assembler which can read cassettes. If you wish to purchase LOAD 80 on disk, you need an Apparat-compatible editor/assembler.

A Patch

There simply isn't time here at *80 Micro* to patch, repair or modify the programs we print. But occasionally, on our own, we get interested enough to work on a submitted program.

This short patch makes the program Neatlist from the January 1982 issue compatible with Level II, Disk Basic and with the Model III all at the same time.

The program was compatible with only one exception. In line 65504 I is initialized to 17127, two bytes below the start of a Level II Basic program. Neatlist begins examining the Basic code at this address. It therefore bombs when the Basic program is moved higher, as happens under Disk Basic or on the Model III.

Fortunately, existing ROMs and operating systems use the two bytes at 16548 and 16549 to point to the beginning of a Basic program. Since the format of these two bytes is the same as the format of I (a least significant and most significant byte making up a two-byte integer), we can set I equal to the start of the Basic program by POKEing the values on top of I. Subtracting two from I will then initialize I correctly. Listing 1 is the patched version of line 65504 of Neatlist.

Please note that the best way to ascertain program compatibility is to read the documentation in the magazine.■

```
65504 CLS:CLEAR600:DEFINTA-Z:DIMK1(125):LM=5:RM=72:S=1:T1=5:I=1:
POKE VARPTR(I),PEEK(16548):POKE VARPTR(I)+1,PEEK(16549):I=I-2:GO
SUB65510:PRINT@520,"";:INPUT"TITLE";A$:GOSUB65524
```

Program Listing 1

April LOAD 80 Directory

Program	Title	Page	Comments
1	BASICK	86	NONE
2	BAM	167	Needs EDTASM
3	RSL	188	Needs EDTASM
4	ZUBRTNES	208	NONE
5	DIRECTRD	214	NONE
6	DISKRD3	214	NONE
7	COMMAND	244	Needs EDTASM
8	MASDIR3	250	NONE
9	SHOPPING	270	NONE
10	RULER	302	NONE
11	CP80	306	Needs EDTASM

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14. OTHERWISE clause on case statements
15. Identifiers may contain '$' and '—' characters
16. Automatic type conversion in arithmetic expressions and assignment statements
17. Constants may be expressed in decimal or hexadecimal
18. Characters within strings may be specified by ascii code. Allows non-printable characters in strings.
19. Type transfer operator to override type matching requirements
20. ESCAPE allows exit from anywhere in a procedure
21. LOCATION function returns the address of a variable
22. SIZE function returns the amount of memory required for a variable

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54. Text Editor Manual
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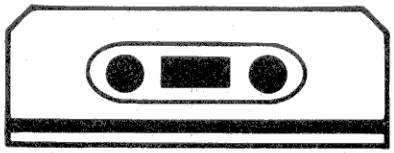

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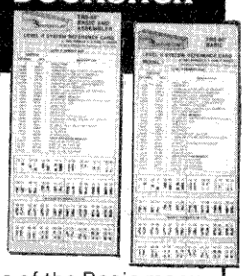

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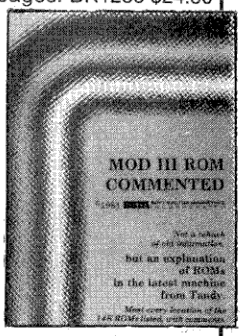

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by J.M. Keynes

"For every winner there is an equal and opposite loser. . ."

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Recently, speculators bet millions that this stock would go to at least 72.25 in which case they would break even. That's right, just break even. You see they bought an option to buy 100 shares of this stock (the name is Amax...symbol AMX) for $70 per share anytime before the option expired, in this case 45 days. The price for the option was 2 or $200 for an option on 100 shares. If the stock remains below 70, the option will expire worthless and the speculator will lose everything. There have been takeover rumors about Amax and the speculator hopes that the stock will rise quickly if the rumors are true. At $72.25 per share he breaks even after commissions (which are very high relative to the money involved). Should Amax be taken over within 45 days at 90 the speculator can sell his option for about 20 ($2000) and turn a huge profit.

One of my friends recently invested $675 in ten Dean Witter options. He guessed right because when the Sears takeover was announced, his $675 was worth $15,000. Such windfalls keep the speculator eager to catch lightning in a bottle one more time. Old "Crap Shootin' Charlie" will likely blow it all back feeding his gambling propensities; he reminds me of "Sure Thing Sam."

Sam is a barber. One day, when the shop was closed, he told his wife that he was going to the races. "What will you use for money?" queried his wife. "Ah, I got enough to get in and make one $2 bet," said Sam.

Sam arrived at the track just before the first race. He looked over the racing form and spotted a two year old gelding that was 20 to one and had a chance. He bet the $2 to win. The horse won!

Now Sam had $40. A 30 to one shot in the second race caught his eye. He bet $40 to win. The damn thing won easily! The $2 bankroll had swelled to $1200. Sam had the golden touch. He picked the winner in the next seven races and bet the bankroll to win on each race. The kitty mounted to $500,000 and Sam was going home when he heard the horn sound announcing the entry of the horses for the last race. Sam downed his fifth vodka gimlet while he went over the form. The race was six furlongs and a horse named Black Beauty could go the distance in 1:09 flat which was at least two seconds better than any of the others. An absolute cinch! The other betters agreed. Black Beauty was even money. "Why not?" thought Sam. "I'll be a millionaire." As Sam walked to the ticket seller a tingling feeling swept over his body. "$500,000 to win on number two," said Sam, showing none of his inner anxiety.

Black Beauty broke in front and was five lengths ahead at the 1/16 pole. Only 330 feet to go and Sam would be a millionaire. . .that is if Ding Dong, a 15 to one longshot, who must have grown wings didn't catch him. It was a photo finish. Sam waited. . .and waited. The pictures came down. Ding Dong won by a whisker. Sam went home. As he entered the back door his wife said, "Well Sam, how did you do at the track today?" In a monotone Sam said, "I lost $2." Sam may be fictional but his behavior is typical of the compulsive gambler.

Stock Option Speculation

When the speculators bid up the price of stock options to an outrageous level it may be tempting to "book" their action and sell to them. This is called option writing and can be dangerous. When you write an option (agree to sell someone a stock you don't own) your profit is limited by the amount you realize from the sale. Your risk is unlimited. When my friend made the $14,335 profit on the Dean Witter options, someone lost it. The game of buying and selling "naked" (you don't own the stock) options is a zero sum situation. For every winner there is an equal and opposite loser minus commissions.

I discourage naked option writing. The risks are too great. But there is a way to take advantage of the gambler's irrational behavior and incur little risk. It is called covered option writing. You buy the stock and simultaneously sell someone an option to buy it from you, usually at a higher price. This is not a strategy to employ every day—to wit: the poor performance of the covered option writing mutual funds. Unlike them, you don't have to be in action all the time. If you exercise patience you can find situations which stack the odds heavily in your favor. If you watch

Computer study of a covered option write with the following parameters: Buy Howard Johnson sell July 15 calls.

500 shares at $14.50 per share.
Write option for $3 with a striking price of 15

75 days to expiration. Margin rate at 14%

Return on cash investment of $5871.29

	ACTUAL %	ANNUALIZED %	BREAK EVEN
UNCHANGED	23.4822	114.28	
EXERCISED	24.0248	116.92	11.7426
MARGIN RETURNS			
UNCHANGED	56.7348	276.11	
EXERCISED	60.0341	292.166	11.9511

MARGIN DEPOSIT $2246 $10,000. Invested for 5 years at 292.166 % will grow to $9.27574E+06

Figure 1

the options market closely, you can spot potential takeover candidates long before the news is out. When you see the price of an option rise dramatically within one or two days while the common stock price remains unchanged, you know that someone thinks they have inside information. When I spot such action I run the Program Listing and determine what action to take.

A classic example occurred in early May 1980. Howard Johnson common stock had been hovering close to $15 per share and the July 15 options had been selling from 1 1/4 to 2. Within two days the July 15 options increased to 3 while the common stock declined slightly to 14 1/2. I ran the option program and when I saw the printout I began to buy the stock and sell the July 15 options (all options expire on the third Friday of the month). I liked the soundness of the stock (it was "A" rated) and felt it unlikely that the stock would decline to under my break even point of 11 3/4 within 75 days. As it turned out, the speculators did "know" something as Howard Johnson's was taken over for over $25 per share. The speculator got rich and I managed a tidy profit for my clients.

A few months later they were wrong about American Cyanamid. The stock was at 28 and the October 30 options sold for 5. The stock was still at 28 by October so the speculator lost. This is a good example of the only investment I know where if the price of what you bought remains unchanged, you profit handsomely. You made nothing on the stock you bought at 28, but the option premium of 5 all winds up in your pocket, save the commission. We bought American Cyanamid (ACY) for $28/share and sold the October 30 options for $5. The options had 90 days to expiration. Run these figures in the program and see how we came out. If you are too lazy to do it, I'll tell you. The annual return was 80 percent. Had the stock moved up to 30 or more, our return would have been higher.

The Other Side

The above are successes. Now let us deal with what all investors should consider the day they put up their money. What if something goes wrong? How much risk should you take? What if the worst happens? The most serious and costly problem investors have is their inability to deal with failure rationally. The day we invest we delight in thinking about winning and "counting our chickens" with scarcely a thought about disaster and what we will do if it happens. "I'll watch things closely and make a decision if something goes wrong," you say. With this outlook you are courting trouble. In fact, you are guaranteeing it sooner or later! I call it the "I'll watch it another day" syndrome. Thousands have been watching General Motors "another day" for several years. Some have watched it closely all the way from 113 down to under 40. All are thinking the same thing: "I don't want the cheese; just let me out of the trap!"

If you are in such a situation and don't know what to do, examine this reasoning: You bought 1,000 shares of XYZ at $40 and now it is at $25. Do you sell? Picture yourself out on the street with $25,000 cash in a sack, and pretend you own no XYZ. Would you take that sack of cash to your broker and tell him to buy 1,000 shares of XYZ? If your answer is "Hell no!" then you are a seller, because someone will put you on the street with $25,000 in cash in return for your XYZ stock. You need never face such a problem if you come to grips with reality the day you invest your money.

Program Listing

```
10 CLEAR: CLEAR1000: CLS
20 U$="#.##": T$="####.##": S$="###.##": V$="##.#": X$="######.##": Z$="###
###"
30 PRINT"YOU HAVE TWO OPTIONS...
40 PRINT: PRINT"2. INSTANT COMMISSION SCHEDULE ON STOCKS OR OPTIONS.
50 PRINT: PRINT"3. DETERMINE PROFITABILITY OF A COVERED OPTION WRITE.
60 PRINT"EXAMPLE:  BUY 200 SHARES OF TANDY AT 33 AND SELL SOME "
70 PRINT"SPECULATOR AN OPTION TO BUY THE 200 SHARES FROM YOU AT $35
80 PRINT"FOR $4.00 PER SHARE.
90 PRINT:INPUT"CHOOSE YOUR NUMBER & PRESS 'ENTER'.";MU: IF MU=2THEN1200
100 CLS: PRINT"COVERED OPTION WRITING ANALYSIS.": PRINT: PRINT:
 INPUT"NO. OF SHARES 100,200,300,500, OR 1000.";N:IFN<100 THEN N=100
110 INPUT"STOCK PRICE (EXPRESSED AS IN DECIMAL).";S: E=S*N
120 INPUT"OPTION STRIKING PRICE";SP
130 INPUT"OPTION PRICE EG. 2 3/8 = 2.375.";O: F=O*N
140 INPUT"DAYS TO EXPIRATION";D
150 INPUT"CURRENT MARGIN RATE";IR: IR=IR/100
160 INPUT"COMMISSION DISCOUNT";C: C=1-(C/100)
170 GOSUB 1150
180 INPUT"DIVIDENDS PER SHARE TO EXPIRATION";DD: DD=DD*N
190 CLS: PRINT: INPUT"FOR PRINTOUT=2";A4
200 IFA4=2THENLPRINT"COMPUTER STUDY OF A COVERED OPTION WRITE":
 LPRINT"WITH THE FOLLOWING PARAMETERS: ": LPRINT" "
210 IFA4=2THENINPUT"ENTER STOCK SYMBOL AND OPTION DATA";W$:
 LPRINT" ": LPRINTW$
220 IFA4=2THENLPRINTN;" SHARES AT $";S;" PER SHARE.":
 LPRINT"WRITE OPTION FOR $";O;" WITH A STRIKING PRICE OF ";SP: LPRINT" "
230 PRINTN;" SHARES AT $";S;" PER SHARE.":
 PRINT" WRITE OPTION FOR $";O;" WITH STRIKING PRICE OF ";SP
240 IFA4=2THENLPRINTD;" DAYS TO EXPIRATION.";" MARGIN RATE AT ";IR;"%": LPR
INT" "
250 PRINTD;" DAYS TO EXPIRATION.";" MARGIN RATE AT ";IR;"%
260 PRINT
270 GOSUB 510
280 CM=Z+OC
290 G=CM*C
300 I=E-F+G-DD
310 IFS<SPTHEN330ELSEIFA4=2THENLPRINT"THE MAXIMUM RETURN WILL
 BE REALIZED PROVIDED THE STOCK": LPRINT"REMAINS ABOVE ";SP;
".";" CASH INVESTMENT $";I: LPRINT"CASH RETURN","ACTUAL",
"ANNUALIZED","BREAK EVEN"
320 IFS>SPTHENPRINT"THE MAXIMUM RETURN WILL BE REALIZED`PROVIDED THE STOCK"
: PRINT"REMAINS ABOVE ";SP;" CASH INVESTMENT $";I:
 PRINT"CASH RETURN","ACTUAL","ANNUALIZED","BREAK EVEN": PP=1: GOTO 400
330 GR=E-I
340 J=GR/I*100
350 K=J/D*365
360 IFA4=2THENLPRINT"RETURN ON CASH INVESTMENT OF $";I: LPRINT"","ACTUAL %"
,"ANNUALIZED %","BREAK EVEN": LPRINT"UNCHANGED",J,K
370 PRINT"RETURNS ON CASH INVESTMENT OF $";I
380 PRINT"","ACTUAL %","ANNUALIZED %","BREAK EVEN
390 PRINT"UNCHANGED",J,K
400 S=SP: GOSUB 510
410 SO=SP*N
420 ER=SO-I-Z
430 II=I+Z
440 AA=ER/II*100
450 AB=AA/D*365
460 BE=I/N
470 IFA4=2THENLPRINT"EXERCISED",AA,AB,BE
480 PRINT"EXERCISED",AA,AB,BE
490 GOTO 880
500 REM CALCULATE STOCK COMMISSIONS
510 IFS<=10THEN Z=33.92: GOTO 830
520 IFS<11THEN Z=34: GOTO 830
530 IFS<12 THEN Z=36.25: GOTO 830
```

Program continues

Program continued

```
540 IFS<13 THEN Z=38: GOTO 830
550 IFS<14THENZ=39.50: GOTO 830
560 IFS<15THENZ=41.25: GOTO 830
570 IFS<16THENZ=42.90: GOTO 830
580 IFS<17THENZ=44.46: GOTO 830
590 IFS<18THENZ=46.25: GOTO 830
600 IFS<19THENZ=48.00: GOTO 830
610 IFS<20THENZ=49.60: GOTO 830
620 IFS<21THENZ=51.27: GOTO 830
630 IFS<22THENZ=52.72: GOTO 830
640 IFS<23THENZ=54.50: GOTO 830
650 IFS<24THENZ=56.23: GOTO 830
660 IFS<25THENZ=57.89: GOTO 830
670 IFS<26THENZ=59.29: GOTO 830
680 IFS<27THENZ=60.43: GOTO 830
690 IFS<28THENZ=61.57: GOTO 830
700 IFS<29THENZ=62.56: GOTO 830
710 IFS<30THENZ=63.75: GOTO 830
720 IFS<32THENZ=65.70: GOTO 830
730 IFS<34THENZ=67.90: GOTO 830
740 IFS<36THENZ=70.15: GOTO 830
750 IFS<38THENZ=72.44: GOTO 830
760 IFS<40THENZ=74.72: GOTO 830
770 IFS<42THENZ=77.01: GOTO 830
780 IFS<44THENZ=79.30: GOTO 830
790 IFS<46THENZ=81.59: GOTO 830
800 IFS<48THENZ=83.88: GOTO 830
810 IFS<50THENZ=84.77: GOTO 830
820 Z=88.52
830 IFN=200THENZ=Z*1.9
840 IFN=300THENZ=Z*2.7
850 IFN=500THENZ=Z*4.1
860 IFN=1000THENZ=Z*7
870 RETURN
880 REM
890 MR=E/2-F+G
900 BM=E-F+G-MR
910 IC=BM*IR/365*D
920 I=MR+IC-DD
930 GR=E-BM-I
940 J=GR/MR*100
950 K=J/D*365
960 BB=(BM+I)/N
970 IFA4=2THENLPRINT"MARGIN RETURNS"
980 PRINT: PRINT"MARGIN RETURNS": IFPP=1THEN 1010
990 IFA4=2THENLPRINT"UNCHANGED",J,K
1000 PRINT"UNCHANGED",J,K
1010 S=SP: GOSUB 510
1020 SP=SP*N
1030 I=I+Z
1040 GR=SP-BM-I
1050 J=GR/MR*100
1060 K=J/D*365
1070 IFA4=2THENLPRINT"EXERCISED",J,K,BB
1080 PRINT"EXERCISED",J,K,BB
1090 RR=G+Z: FY=(K/100)+1: TT=10000: FORO=1TO5: TT=TT*FY: NEXTO
1100 IFA4=2THENLPRINT" ": LPRINT"MARGIN DEPOSIT $";:
 LPRINTUSINGZ$;MR;: LPRINT"   $10,000. INVESTED FOR 5 YEARS":
 LPRINT"AT ";K;"% WILL GROW TO $";TT: LPRINT" ": LPRINT" ": LPRINT" ": LPRI
NT" "
1110 PRINT: PRINT"MARGIN DEPOSIT $";: PRINTUSINGZ$;MR;:
 PRINT"    $10,000 INVESTED FOR 5 YEARS
1120 PRINT"AT ";K;"% WILL GROW TO $";TT
1130 INPUT"ADVANCE PAPER=2 RETURN TO MENU=1";IO:
 IFIO=2THENLPRINT" ": GOTO1130ELSE10
1140 REM CALCULATE OPTION COMMISSIONS
1150 NO=N/100
1160 LL=NO*6
1170 IFF<=2500THENOX=(F*.013)+12+LL: OC=((OX*1.1)+1)*1.07: RETURN
1180 OX=F*.009+22+LL: IFF<=5000THENOC=((OX*1.1)+1)*1.07: RETURN
1190 OC=((OX*1.15)+1)*1.07: RETURN
1200 CLS: PRINT"COMMISSION,S FOR STOCKS (100,200,300,500, OR 1000 SHARES)":
 PRINT"OR OPTIONS SELLING FOR $1. OR MORE.": INPUT"NO. OF SHARES?";N
1210 INPUT"PRICE PER SHARE (DECIMAL).";S
1220 GOSUB 510
1230 INPUT"HOW MANY OPTION PRICES?";PR: FORI=1TOPR:
 PRINT"ENTER OPTION PRICE #";I;: INPUTFD(I): F=FD(I)*N
1240 GOSUB 1150
1250 OC(I)=OC
1260 NEXTI
1270 PRINT"COMMISSION ON ";N;" SHARES AT $";S;" IS $";:
 PRINTUSINGX$;Z
1280 Y=N/100: FORI=1TOPR: PRINT"COMMMISSION ON ";Y;" OPTIONS AT ";FD(I);" I
S $";: PRINTUSINGS$;OC(I): NEXT
1290 PRINT: PRINT: PRINT
1300 INPUT"RETURN TO MENU=1  MORE COMMISSIONS=2";BS:
 IFBS=1THEN 10 ELSE 1200
```

Winning Strategy

Here is how the big winners behave. We are about to buy a stock selling for $20/share. We think it will go to 60, but...we are prudent people and realize that we may be wrong! There is no law that says our little gem won't decline to $5. Many have. If that happens we want to make sure that we don't still own it and suffer accordingly. On day one we set a bail out point. We decide how much risk we are willing to take, perhaps 20 percent or four points. We tell the broker to buy 100 XYZ at 20 and concurrently enter a "stop loss" order to sell if it declines to 16. We have no idea how much profit we may make, but we know one very important thing—how much we can lose. If the worst occurs, we have lost a battle but not the war. No more suffering. No more nail biting. Just sensible, albeit not as exciting, investment strategy.

You should apply the above to covered option writing in the following manner. I will use the actual trade in "ACY." You bought 500 at 28 and sold five options for 5. Your break even point is 23 plus commission or about 23 3/8. The day you buy the stock and write (sell) the option you give another order to the broker. "Sell 500 ACY at 23 3/8 stop, and, if the stop is hit, cover (buy) the options." If this happens, what do you lose? The stock lost 4 5/8; however, the option we sold for 5 will now have declined to between 1/8 and 3/4 depending on how much time is left before expiration. If the option is at ¾ then you cover (buy) for a profit of 4¼ (5 minus ¾.) Total loss of 4 5/8 minus 4¼ plus ½ for commission or maximum probable loss of 7/8 of a point versus maximum profit potential of 6½ points after commission. . .and a net profit of 4½ if the stock remains unchanged for 90 days, as was the case.
remains unchanged for 90 days, as was the case.

Covered option writing is no cinch. You should only consider it when aberrations in option prices occur on stocks which are of good quality. It is an onerous task to check all the options daily if you have to do it by hand. Fortunately my computer scans the option prices daily and points out only those which have moved out of their normal range vis-a-vis the common stock. If you would like to obtain recommendations I have arranged to have an answering machine set up on weekends only. You may call toll free 800-327-3389 (those in Florida must call 305-655-3627). Run them with the Program Listing and keep track of the results on paper, in which case, I guarantee you can't lose. ■

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Copernica Mathematica

by Bruce Douglass

"I am primarily concerned with how neurons within a ganglion talk to each other."

As a neuroscientist, I am primarily concerned with how neurons within a ganglion talk to each other. How do they communicate with each other, and as a network modify and transmit information among themselves?

Only very recently was an optical technique developed allowing neuroscientists to gather data about these questions (see the references). Many other properties of ganglia are fairly well known and understood.

This column is a simple ganglion simulation of the effect of several neurons on a single neuron. It also rather accurately models how a single neuron behaves.

The Single Neuron

Well, how does a neuron behave? A neuron (see Fig. 1) is made up of several parts; axons, dendrites, hillocks, among others. The center of the neuron is called the cell body or *perikaryon.* It receives impulses from other neurons via *synapses* onto either the perikaryon or *dendrites* (projections extending out from the perikaryon). A synapse is a connection between two neurons. Almost all synapses are unidirectional chemical-mediated junctions. That is, information only travels in one direction (towards the dendrite to the perikaryon); the message is sent by releasing a chemical substance called a *transmitter.* This transmitter diffuses across the synaptic junction and "knocks on the door" of the other neuron. If it "knocks" loudly enough, the neuron being talked to will send out a message of its own. This message is sent down its *axon,* which is a long projection from the perikaryon that begins at the *hillock* of the neuron. The axon then *innervates,* or talks to, other neurons or organs.

A brief explanation of the message is in order. Special proteins in the cell membranes pump sodium (Na+) out in exchange for potassium (K+). The ratio of two sodiums for three potassiums generates a charge across the membrane, which now acts like a capacitor.

Sodium leaks constantly; these proteins keep pumping it out. Channel proteins allow sodium to enter as if the membrane weren't even there, but most of the time these are kept tightly shut. When an excitatory transmitter chemical reaches the membrane of the dendrite or perikaryon, it opens these channels (apparently by removing calcium). When a little more sodium gets in, it affects the membrane potential charge slightly. If, however, enough sodium can get in, all hell breaks loose, and all the channels open, allowing sodium to rush in.

These chemical channels have a kind of time lock. They close after a short period of time. The sodium pumps get their act together to expell the sodium from the cell. When the channels open, the membrane potential changes from a normal negative 70 millivolts (outside with respect to inside) to positive 30 mV. Before the channels open, there is only a slight change in potential. If the change is great enough, the neuron fires an action potential (which I will explain in a moment). This is called an "all or none" phenomenon, since it occurs at full strength or not at all.

Small changes in membrane potential are called subliminal potentials, since they are below the threshold necessary to elicit a neuronal response.

Most neurons talk to other neurons in a subliminal manner. But there are several ways subliminal potentials can add or *summate* to reach the threshold potential necessary to elicit a response. These are spatial and temporal summation.

Spatial summation occurs if two or more neurons innervate a given neuron close enough for the chemical transmitters to add their effects. Temporal summation occurs when two or more innervations (they may all be from the same neuron) come close enough together in time for their effects to summate. Since the sodium pumps expel the sodium influx causing the subliminal potential, the local potential returns to normal after a brief period of time. If another or several more potentials are received quickly enough, they may add their effects. Spatial and temporal summation may both occur at the same time.

Innervations are not all excitatory. Many substances make the membrane potential more negative rather than more positive. These make it more difficult to elicit a response from the neuron, and are called *inhibitors.*

The wide change in membrane potential from negative 70 mV to positive 30 mV is called *depolarization.* The sodium pumps returning the membrane potential to normal is called *repolarization.* Figures 2 & 3 show how a membrane potential travels down an axon, away from the

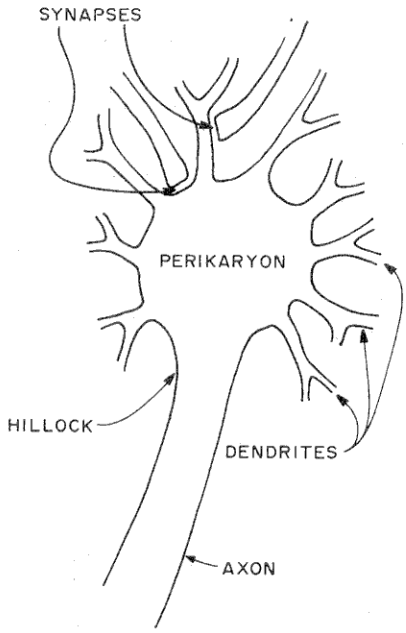


Fig. 1. A typical neuron cell

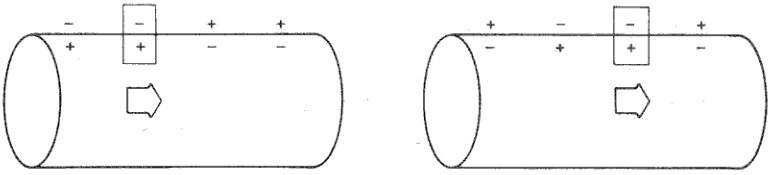
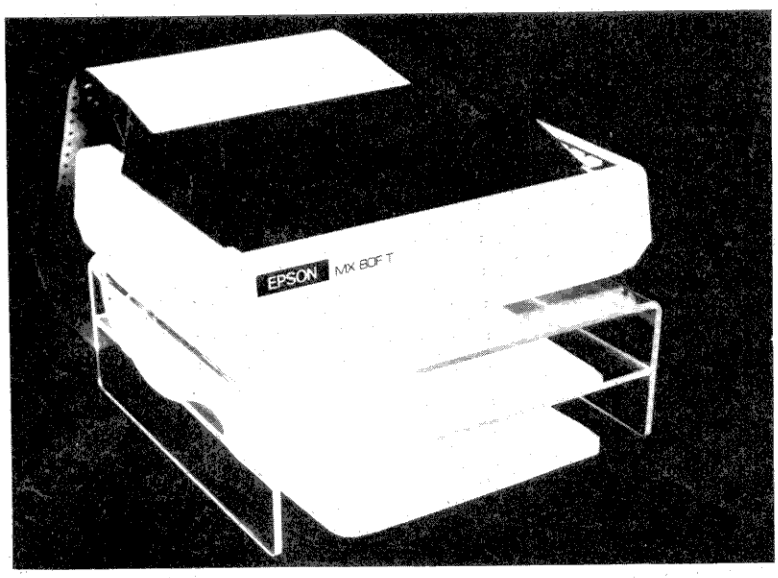


Fig. 2. Action Potential moving down the axonal membrane

MX-80/100 OWNERS



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Program Listing

```
10 REM      ******      GANLGION SIMULATOR      ******
20 REM      ******     BY BRUCE P. DOUGLASS     ******
30 REM      ******      DEPT. OF PHYSIOLOGY     ******
40 REM      ******      SCHOOL OF MEDICINE      ******
50 REM      ******        UNIV. OF S. D.        ******
60 REM      ******      VERMILLION, S. D.       ******
70 CLEAR 200:DEFINT I-N:DEFSTRA:IS=15360:ID=16320:AM="PRESS <ENT
ER> TO BEGIN":A1=CHR$(176)+CHR$(142)+CHR$(143)+CHR$(141)+CHR$(17
6):A2=CHR$(131)+CHR$(172)+CHR$(188)+CHR$(156)+CHR$(131)
80 RANDOM:AT=STRING$(7,32):AS=STRING$(11,32):K(1,0)=32:K(2,0)=42
:K(3,0)=62:K(4,0)=72:K(5,0)=32:K(6,0)=42:K(7,0)=62:K(8,0)=72
90 J1(1)=7:J1(2)=29:J1(3)=116:J1(4)=208:J1(5)=11:J1(6)=46:J1(7)=
184:J1(8)=224
100 K(1,1)=13:K(2,1)=11:K(3,1)=11:K(4,1)=13:K(5,1)=27:K(6,1)=29:
K(7,1)=29:K(8,1)=27
110 REM J1() IS THE POSITION ID'S FOR BIT-ANDING FOR LATER DETER
MINATION OF SPATIAL SUMMATION
120 CLS:PRINT @78,CHR$(23);"GANLGION SIMULATOR"
130 PRINT@206,"BY BRUCE DOUGLASS";
140 FOR I=IS TO IS+63:POKEI,191:POKEI+960,191:NEXT I
150 FOR I=IS+62 TO ID STEP 64:POKE I,191:POKEI+2,191:NEXT I
155 PRINT@904,"PRESS <ENTER> TO CONTINUE";
160 PRINT@532,A1;:PRINT@596,A2;:FOR I=1 TO 60:SET(57+I,26):SET(5
7+I,27):NEXT I
170 FOR I=1 TO 60:RESET(57+I,26):RESET(57+I,27):NEXT I
180 IF INKEY$=""THEN160
190 CLS:PRINT"THIS PROGRAM SIMULATES THE ACTIONS OF IMPINGING
NEURONS ONTO ANOTHER NEURON IN A GANLION.  TO ACTIVATE A
NEURON, PRESS THE NUMBER CORRESPONDING TO THAT NEURON"
200 PRINT:PRINT"IF THE NEURON IS ABLE TO FIRE, IT WILL. IF
IMPINGING NEURONS CAUSE THE DEPENDENT NEURON TO REACH
THRESHOLD, IT WILL ALSO FIRE."
210 PRINT:PRINT"FOR THE IMPINGING NEURONS' EFFECTS TO SUMMATE,
THEY MUST BE CLOSE TOGETHER, EITHER IN TIME, LOCATION
OR BOTH. IF THE SUM OF THE SUBLIMINAL EFFECTS IS SUFFICIENT,
THEN THE DEPENDENT NEURON WILL FIRE."
220 PRINT:PRINT TAB(16);AM;
230 IF INKEY$=""THEN230
240 REM  START OF SIMULATION - DRAW FIGURES
250 CLS:FOR I=1 TO 4:IT=RND(3):IF IT=1 THEN A(I)="I":L(I)=-1 ELS
E A(I)="E":L(I)=1
260 PRINT A1;I;A(I);AT;:NEXT I:PRINT@64,"";:FOR I=1 TO 4:IT=RND(
2):IF IT=1 THEN A(I+4)="I":L(I+4)=-1 ELSE A(I+4)="E":L(I+4)=1
270 PRINT A2;AS;:NEXTI
280 PRINT@768,"";:FOR I=1 TO 4:PRINTA1;AS;:NEXT
290 FOR I=1 TO 4:PRINTA2;AS;:NEXT
300 FORI=1 TO 4:PRINT I+4;A(I+4);AS;STRING$(I,32);:NEXT I
310 FOR I=0 TO 3:IP=16*I+130:I(I+1)=IP:J(I+1,1)=INT(IP/64)*3:J(I
+1,0)=(IP-INT(J(I+1,1)*64)/3)*2:NEXT I
320 FOR I=0 TO 3:IP=770+16*I:I(I+5)=IP:J(I+5,1)=INT(IP/64)*3:J(I
+5,0)=(IP-INT(J(I+5,1)*64)/3)*2:NEXTI
330 REM J(I,0)=X(I),J(I,1)=Y(I) FOR DRAWING LINES TO NEURON
340 E=26.6667:FOR T=0 TO 6.3 STEP .035
350   X=E*COS(T)+52.5:Y=10*SIN(T)+20.5:SET(X,Y)
360 NEXT T 'K(,) CONTAINS POINTS ON NEURON TO DRAW LINES
370 PRINT@965,"'I' MEANS INHIBITORY, 'E' MEANS EXCITATORY";
380 FOR I=1 TO 8:X1=J(I,0):Y1=J(I,1):X2=K(I,0):Y2=K(I,1)
390 GOSUB 580:NEXT I 'DRAW IN LINES
400 X1=79:Y1=20:X2=127:Y2=20:GOSUB580
410 REM NOW THAT FIGURE IS DRAWN, RUN THE SUCKER!
415 KU=-70
420 A=INKEY$:IF A<>"" THEN B=VAL(A) ELSE B=0
430 PRINT@472,KU"  ";
440 FORI=1TO8:IFP(I)>0THENP(I)=P(I)-1
450 NEXT
460 POKE 16442,0:POKE16443,0:IF B>8 THEN B=0
470 IF B=0 THEN IF KU>-70THENKU=KU-1:GOTO420 ELSE IF KU<-70THENK
U=KU+1:GOTO420
480 IF B=0 THEN 420
490 REM DETERMINE IF NEURON CAN FIRE
500 IF P(B)<2 THEN K1(B)=1:GOSUB570:GOSUB580:GOSUB650:GOTO 520
'FIRE ACTION POTENTIAL
510 IF P(B)<5 AND P(B)=>2 THEN IF RND(P(B))>P(B)/2 THEN K1(B)=1:
GOSUB570:GOSUB580:GOSUB650: ELSE K1(B)=0:GOTO530  'FIRE IF PROBA
BILITIES ARE GOOD
520 P(B)=5
```

Program continues

perikaryon.

The change in membrane potential affects the potential of the membrane around the area initially affected. This causes it to depolarize. This area depolarizes the area adjacent to it, and so on. Meanwhile, the initial area cannot be depolarized again until a certain amount of the original membrane potential is regained; during this time it is said to be *refractory*. The refractory period is usually broken into two parts, absolute and relative. During the absolute refractory period, it is impossible for the neuron to fire. During the relative refractory period, a neuron can fire only if it receives a stronger-than-normal stimulus. The *action potential*, as this moving wave of depolarization is called, can only move in one direction, since the membrane that came before it is refractory. That is why the information transfer in neurons is unidirectional.

How Do you Model Neurons in a Computer?

The simple simulation here models many of the characteristics of real neurons. To indicate action potentials traversing down the axon, I have used two routines. The connection between the large neuron and the smaller ones is shown by a line between them. An action potential is depicted by blanking out the line and then redrawing it. If the large neuron is sufficiently excited, the line extending to the right (its axon) will be blanked out and redrawn.

You may excite the small neurons by pressing the number associated with that neuron (1–8). The neuron fires if it can, determined by its refractive period (how long it has been since it fired last). This is a repeating function if the key is held down. But remember, once it fires, it has an absolute refractory period during which it cannot fire. When this absolute refractory period is over, it has a relative refractory period, during which it may or may not fire.

The small neurons may excite or inhibit the large neuron. This property, determined randomly at the onset of the simulation, is indicated by I or E next to the neuron. If it inhibits the large neuron, it will be more difficult to make the neuron fire. If it excites the larger neuron, it makes it easier to fire an action potential.

The Program

A simple variable list in Fig. 4 will aid you in understanding how these properties are modelled.

The simulation starts at line 420 with the INKEY$ loop. The method for determining spatial summation assigns numbers to each small neuron representing the area of innervation on the large

neuron. These numbers are chosen so, when ANDed together, the result is non-zero only if the areas are adjacent.

The AND does a bit-wise comparison of numbers and returns a 1 in a bit position only if both of the numbers contain a 1 in that bit position. Therefore, it wasn't too hard to choose numbers such that they allowed to test for adjacent areas. Further, not all neurons innervate equally. Generally, neurons that innervate closer to the hillock of the axon innervate the neuron more strongly. The numbers are arranged so those closest to the axon have the largest AND. This can be demonstrated graphically quite simply:

00000111	00011001	01110100	11010000
(1)	(3)	(5)	(7)
00001011	00011110	10111000	11100000
(2)	(4)	(6)	(8)

In this figure, you can see the binary numbers in each box. The number in parentheses is the bit position (1-8) corresponding to the box location. All bits from adjacent boxes are set in a given box. Thus, two adjacent boxes share two bit positions on. If they are not adjacent, they will have no shared positions on. For example, boxes 1 and 2 share bit positions 1 and 2. Boxes 3 and 5 share bit positions 3 and 5. Boxes 2 and 3, adjacent in a kitty-corner fashion, also have two bit positions in common. This is because they are both adjacent to boxes 1 and 4. Boxes 2 and 5 have no bit positions in common. Note that the ANDs of adjacent boxes increase in value as you go from left to right. Thus, we can weigh the boxes at the right more than those at the left.

"A model's purpose is to simulate only the characteristics essential to what you are considering at the moment."

This is exactly the strategy used in the simulation. Look at the last few lines of the program. The bit positions are ANDed together and multiplied by the state of the neuron (K1(I)). If it is not on, the state variable is zero; if it is on, the state is a one. The numbers used for the boxes in the above figure do not exactly correspond with those in the simulation: I rearranged the boxes. Looking at the video display of the ganglion, 1 is adjacent to 5 and 4 is adjacent to 8. The bit-ANDing numbers are the same as those used in our figure above, however.

The refractory state of the small neurons are kept in the array P (I). When a neuron is excited to fire, it is set to 5. This low value produces a short refractory period. You may change the command P(B) = 5 to 10 or 15, or whatever suits your fancy. The neuron cannot fire when P(I) is greater than two. This corresponds to the absolute refractory period. If P(I) is between zero and two, line 510 calculates the probability that the neuron will fire. If P(I) equals zero, the neuron will fire every time.

Simulation Limitations

Not all the ganglion's characteristics are modelled here. In fact, that is the definition of a model. If all characteristics were modelled, then you would have a copy. A model's purpose is to simulate only the characteristics essential to what you are considering at the moment. This simplifies very complex phenomena. Of

Program continued

```
530 REM  OK, NOW DOES THE DEPENDENT NEURON FIRE???
540 IF KU>-70 THEN KU=KU-1 ELSE IF KU<-70 THEN KU=KU+1
550 IF KU>-30 THEN X1=79:Y1=20:X2=127:Y2=20:GOSUB 610:GOSUB580:K
U=-30
560 GOTO 420
570 X1=J(B,0):Y1=J(B,1):X2=K(B,0):Y2=K(B,1):GOTO620
580 REM DRAW LINE ROUTINE
590 SG=SGN(X2-X1):S=(Y1-Y2)/(X1-X2):T=Y1+.5:FOR J=X1 TO X2 STEP
SG
600   SET(J,T+S*(J-X1)):NEXT J:RETURN
610 REM BLANK OUT LINE ROUTINE
620 SG=SGN(X2-X1):S=(Y1-Y2)/(X1-X2):T=Y1+.5:FOR J=X1 TO X2 STEP
SG
630   RESET(J,T+S*(J-X1)):NEXT J:RETURN
640 GOTO 640
650 REM ANDING IN THE STATE IN REAL TIME
660 FOR K1=1 TO 8:KN=INT((J1(B)ANDJ1(K1))*K1(K1)*J1(B)*L(B)/300)
+4*L(B):KU=KU+KN:NEXT:IF KU>20 THEN KU=20
670 RETURN
```

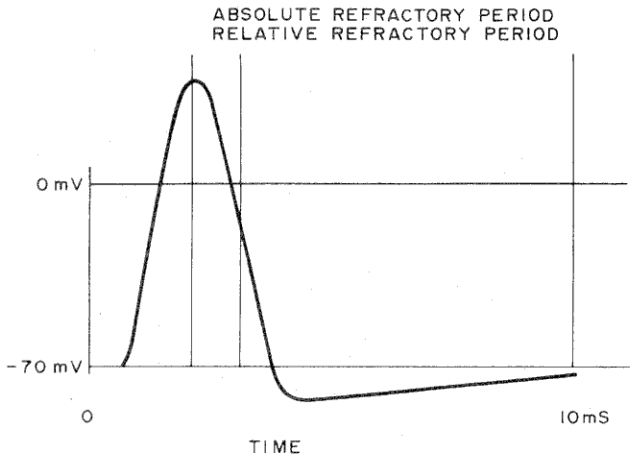

Fig. 3. Change in membrane potential during an action potential

A1-A3	Graphics Strings
J1(I)	Position codes for spatial summation
A(I)	I or E states for the neuron
L(I)	Numerical equivalent of excitation or inhibition
J(I,0), J(I,1)	(X,Y) coordinates for the small neurons
K(I,0), K(I,1)	(X,Y) coordinates on the large neuron
KU	Sum or state membrane potential of the large neuron
P(I)	Refractory states of the neurons
K1(I)	States of the neurons (1 = on, 0 = off)
POKEs	Reset the key buffer
Lines 500-510	Determine if the small neuron in question can fire

Fig. 4. Program variables

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cause, you must determine what is essential and what is not. This requires a firm understanding of exactly what you want to look at in your model.

In the present simulation, I left out many characteristics that you may consider essential, depending on exactly what aspects of neural ganglionic behavior you wish to view. For example, the connectivity map depicted is extremely simplified. A ganglion with only nine neurons would still have perhaps hundreds of interconnections, including:

- Multiple innervations of the large neuron by each small neuron.
- Multiple innervations of neurons by other small neurons.
- Recurrent innervations of a neuron by itself.

A single neuron may make as many as 10,000 synaptic connections. I simplified this into only one. A given neuron synapses with many other neurons in the ganglion. I have eliminated all of those. Think about the effect this has on the model: If small neuron one innervates

"This interconnectivity is one of the things that make neural behavior so difficult and interesting to study."

small neuron two, it alters the probability of neuron two firing to innervate the large neuron. This interconnectivity is one of the things that make neural behavior so difficult and interesting to study.

I also omitted recurrent innervation, in which a given neuron innervates itself. Usually, this type of connection is inhibitory. You might think of it as extending the refractory period.

Even with the omissions, the simulation is informative and may be useful as a CAI tool for instruction in neural behavior in simple ganglionic networks. ■

Douglass, B. and Hasting, D. Spectrophotometric Methods For Mapping Neural Networks *1981 Proceedings from the Lawrence Symposium (to appear)*

Grinvald, A., Cohen, L., Lesher, S., and Boyle, M. Simultaneous Optical Monitoring of Activity of Many Neurons in Invertebrate Ganglia Using a 124-Element Photodiode Array *May 1981 Journal of Neurophysiology pp. 829*

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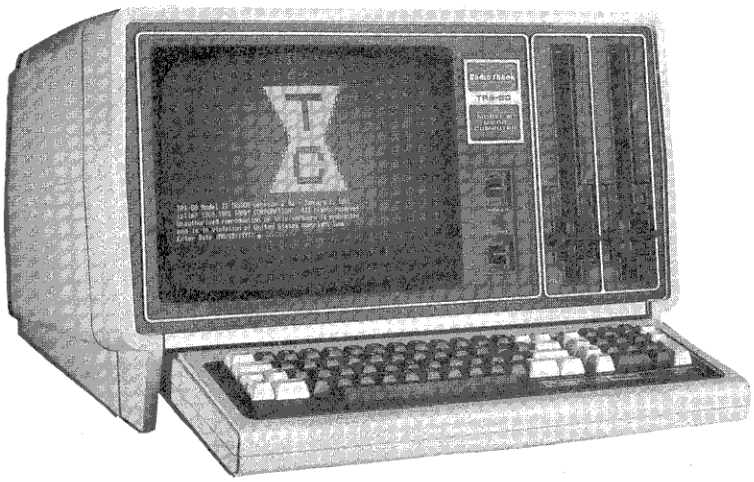

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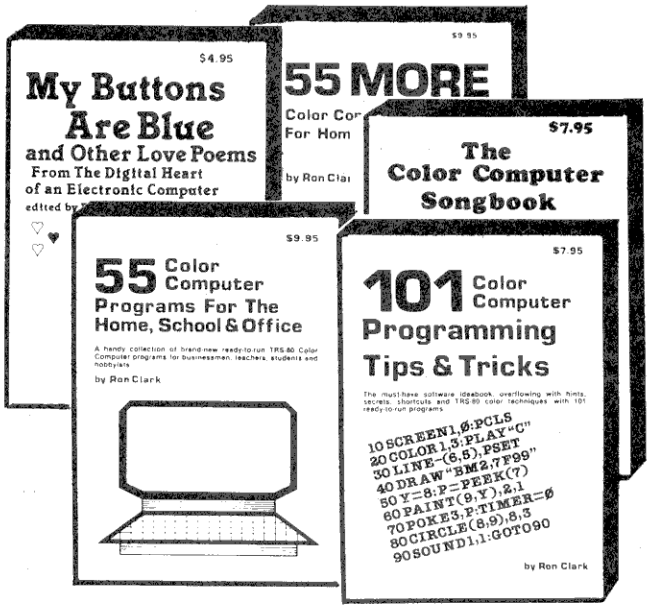

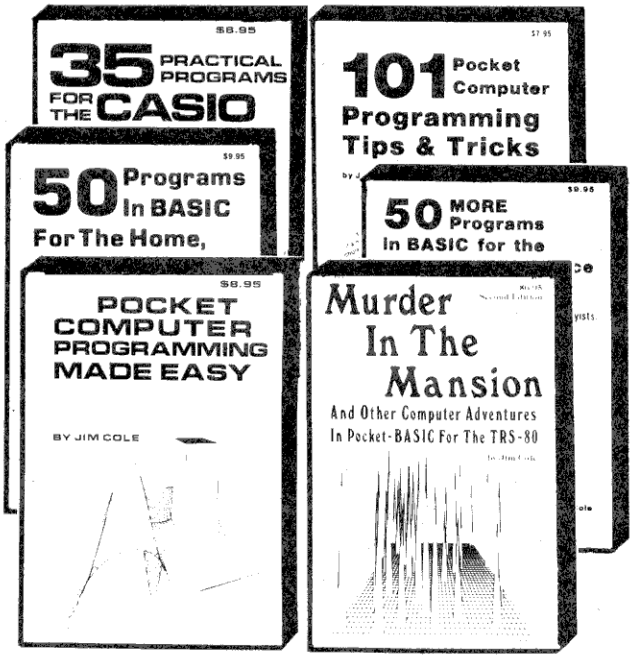

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priced from $150 to $250. For information contact Joseph T. Ney, Certified Public Accountant, 1656 Upland Road, Huntington, WV 25701.

Reader Service ✓564

Portable Communications System

The Omni System is a fully portable communication aid for the non-vocal or vocally impaired, severely handicapped individual, as well as a computer keyboard substitute for the dexterity impaired.

The system includes a display board, LCD readout, printer, 16K programmable memory, remote environmental control, audible alarm, voice synthesizer, typewriter interface and computer access.

The display board ($1000) provides the capacity for direct communications of selected messages in word, phrase, symbol or picture form. Environmental control enables the user to turn on or off electrical equipment or dim or brighten lights. An audible alarm enables the user to summon an attendant and an emergency alarm sounds should the switching device be held in an open position.

The reader/printer attachment ($1500) provides alphabetic interpretation of symbols or pictures while the LCD readout enables the user to proof and correct script before sending it to the printer.

The system can be interfaced with the TRS-80 through the RS-232 port. Additional vocabularies or technical languages may be added to the system through the CRC programming service.

For more information contact the Communications Research Corporation, 1720-130th Avenue North East, Bellevue, WA 98005, (206) 881-9550.

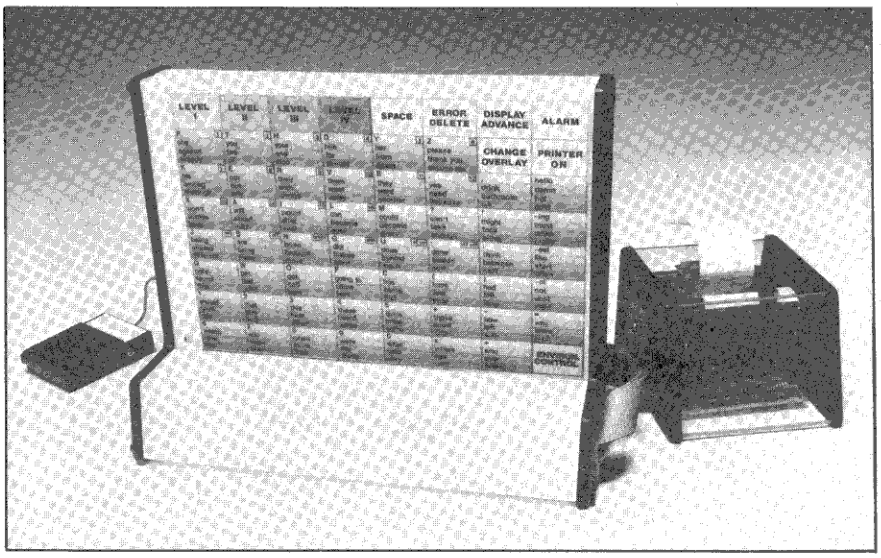
Reader Service ✓561

Scientific Decision Making

Decision Aide 1.1 is a self-prompting program that takes the user step-by-step through a rigorous thought process culminating in the application of dimensional analysis, a useful decision algorithm. Detailed written instructions are provided with the program.

Decision Aide 1.1 is written in Level II Basic for the Model I with a minimum of 16K. It is priced at $10. Address inquiries to M. Spotz, 2617 Village Lane, Silver Spring, MD 20906.

Reader Service ✓ 579



The Omni System

A Database Alternative

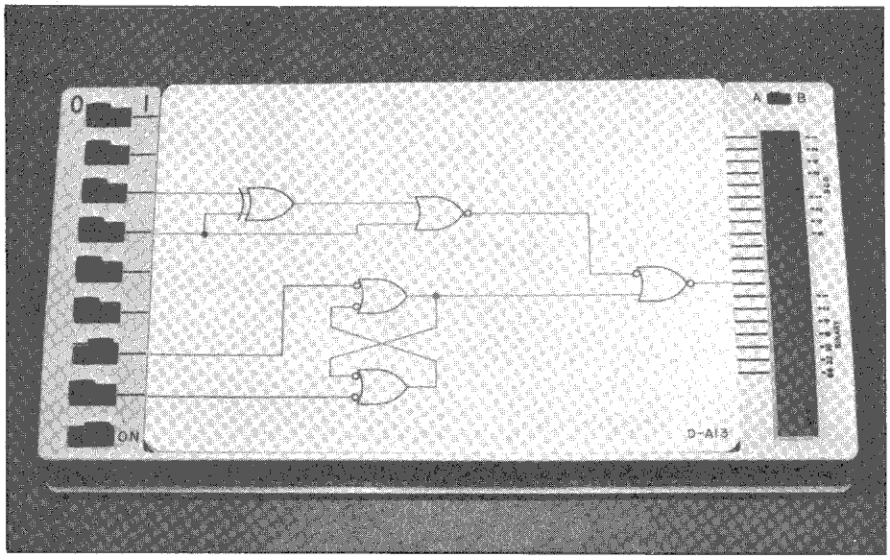
If you are tired of database retrieval, you can now access disabase with the PABAB (Pick A Base, Any Base) software package. Simply boot up PABAB and answer the question WHICHABASE? with Disabase or Database. If you answer Disabase, you're sent to the disk's disabase; if you answer Database, you're sent to the disk's database. To jump back and forth between the two, type Doseabases, thereby accessing a little bit of disa and a little bit of data. The manufacturer says that even the least computer-minded business executive can master PABAB in a matter of months.

PABAB costs $199.95 and proof-of-purchase seals from any two Sugar Pops packages, and is available from Mismanagement Systems, 6809 Lotsaluck Road, Palo Alto, CA 94303.

Logic Trainer

The Broder Logic Trainer (Model 100) reduces the time it takes to learn the circuit function of gates and flip-flops.

The training package includes lessons in logic, diodes, bipolar transistors, and FET (non-linear). The student must solve



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See List of Advertisers on page 338

the trainer problems by correctly manipulating eight switches.

This product is available from L.J. Broder Enterprises Inc., 11105 Shady Trail, Suite 115, Dallas, TX 75229, (215) 241-3727.

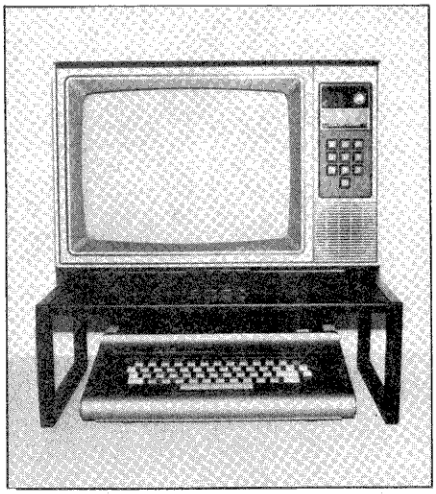
Reader Service ✓569

Granny's Old-Fashioned Word Processing System

Granny's Old-Fashioned Word Processing system instantly turns your TRS-80 into an ordinary typewriter. The package, for the writer who wants to go electronic but doesn't want to give up old ways, includes no editing capabilities; the user must print all copy and edit it by hand. GROLFWORP also permits no permanent files; the user must produce a printout or lose whatever he's typed.

Other features include: no delete, no scrolling, no justification, no insertion capabilities, no bold or underscore functions, and tabs that work only occasionally. Special I/O routines randomly jam the paper in the printer, smudge the pages and print lines one on top of the other.

Granny's Old-Fashioned Word Processing System costs $1495, and is available from Granny, Little White Cottage Lane, Picket Fence, NH 03458.



The Desktop Video/Printer Stand

Video/Printer Stand

The Desk Top Video/Printer Stand converts the micro users' present desk or table into a specialized computer work station.

When used as a video stand the Color Computer or Videotex monitor is raised to eye level. The stand's metal construction easily supports any portable color television.

If used as a printer stand, the users' disk drives, tape recorder, or fan-fold paper fit under the printer.

Priced at $39.95, the stand is available from E.S. Advanced Effort Saver Products Inc., 6501 Cow Pen Road, Building D-207, Miami Lakes, FL 33014, (305) 821-9961.

Reader Service ✓ 557

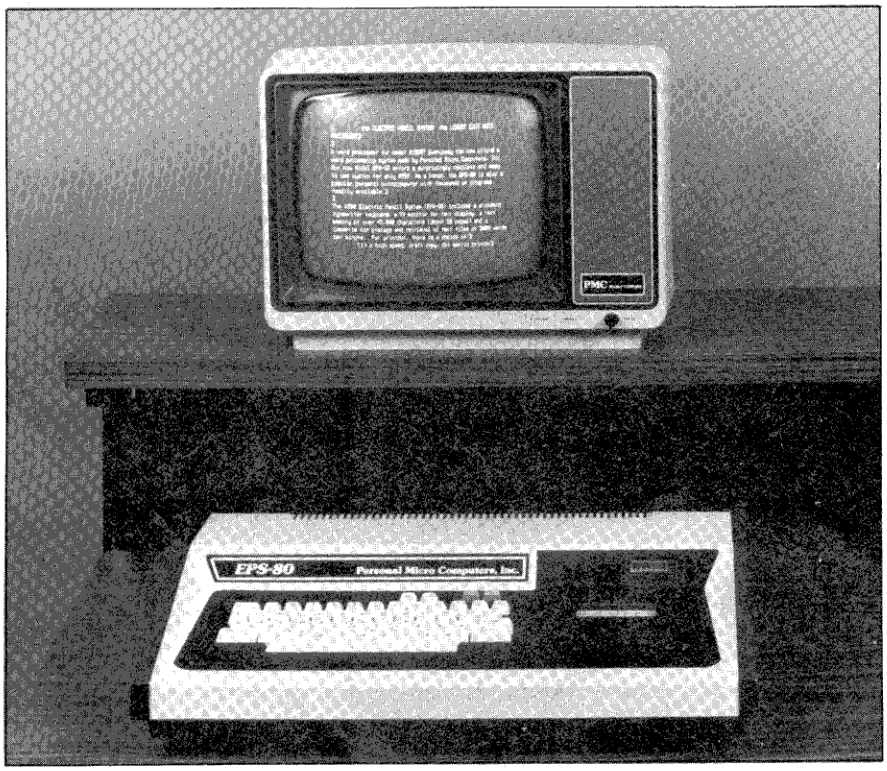
Word Processing Enhancement Program

Auto-Writer turns your word processing system into a data base management system. This five program word processing enhancement program allows you to create a mailing list, or any data base, then use all the features of your word processor to maintain and edit that list.

Some of the features include: joining a mailing list to a form letter with a wide variety of options, sorting name and address files by any key (even when the name or zip is buried in a line), and personalizing form letters as you run them by inserting key words or phrases.

For information on additional Autowriter features contact Walonick Associates, 5624 Girard Avenue South, Minneapolis, MN 55419, (612) 866-9022. The Autowriter is available for the Model I and III with two disk drives and 48K for $72.83.

Reader Service ✓571



The EPS-80

Word Processing With the EPS-80

The Electric Pencil Word Processing System, the EPS-80, contains a PMC-80 computer with standard keyboard, green phosphor television monitor, a text memory of over 45,000 characters (about 20 pages), and a built-in high speed cassette deck for storage and retrieval of text files at 5000 words per minute. Two printers (the ETF-80 and the DMP-85) are available for an additional price of $600.

The PMC-80 is software-compatible with the TRS-80 Model I, Level II. For more detailed information on this system contact Personal Micro Computers Inc., 475 Ellis St., Mountain View, CA 94043, (415) 962-0220.

Reader Service ✓591

Diascriptive Reading

Diascriptive Reading is a seven-disk, diagnostic, prescriptive, tutorial reading program. It is designed to aid the read-

ing teacher, eliminate paper work and provide individualized instruction for each student.

The program covers six skill areas: vocabulary, sequence, main idea, fact/opinion, details and inference.

The program is available for the Model I, Level II or the Model III, Level II on cassette or disk for $245. Contact Educational Activities Inc., Microcomputer Dept., Box 392, Freeport, NY 11520, (800) 645-3739, for additional information.

Reader Service ✓552

Radio Shack's New Pocket Computer And Peripherals

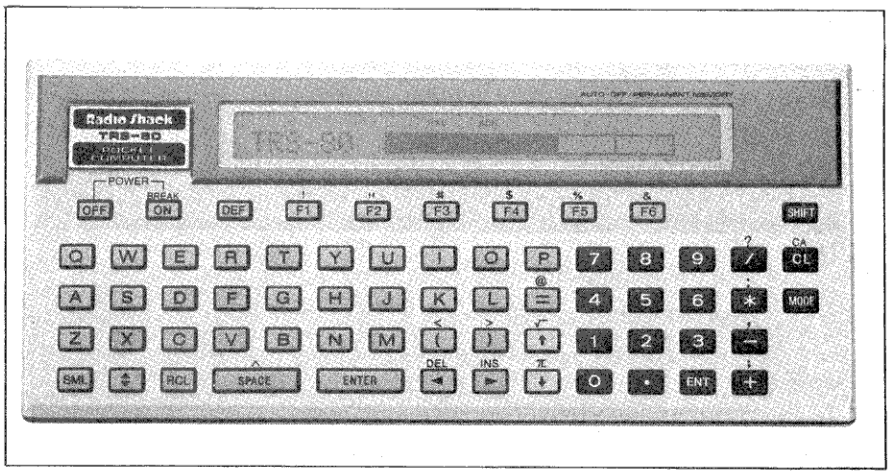
The PC-2 Pocket Computer (B 279,95 # 26-3601) is now available and can be outfitted with a variety of peripherals.

It features a Basic interpreter with 42 statements, 34 functions, and six commands; full string handling ability with 80-character string length and two-dimension arrays; 26-alphanumeric liquid crystal display with upper and lowercase characters; fully addressable seven by 156 dot matrix LCD graphics; 2640 byte expandable memory with plug-in RAM or ROM Memory Modules (4K, $69.95); built-in real time quartz clock; and a 60 pin input/output interface connector.

The PC-2 Printer/Plotter and Dual Cassette Interface ($239.95) provides four color graphics (red, blue, green and black) and stores and loads programs and data using one or two cassette recorders. The Printer Plotter adds 25 commands and statements to Pocket Computer Basic. The Dual Cassette Interface allows automatic program overlay, chaining and data storage without having to change tapes.

For more detailed information on the Pocket Computer and its peripherals contact your Radio Shack dealer.

Reader Service ✓587



The PC-2 Pocket Computer

The TRS-80 DT-1

The TRS-80 DT-1 is a video terminal suited for communication with the Model 16 Multi-Use Office System or with other host computers.

The DT-1 offers a non-volatile memory retaining the terminal configuration even with no power and no battery backup. It is completely code-compatible with four standard terminal protocols. It can emulate a Televideo 910, a Lear Siegler ADM-5, an ADDS 25 or a Hazeltine 1410 terminal. The 12-inch diagonal CRT displays 24 lines of 80 upper and lowercase characters per line. The terminal also offers dual-speed repeat, two printer ports, and special features.

Priced at $699, the terminal is available from your Radio Shack dealer.

Reader Service ✓588

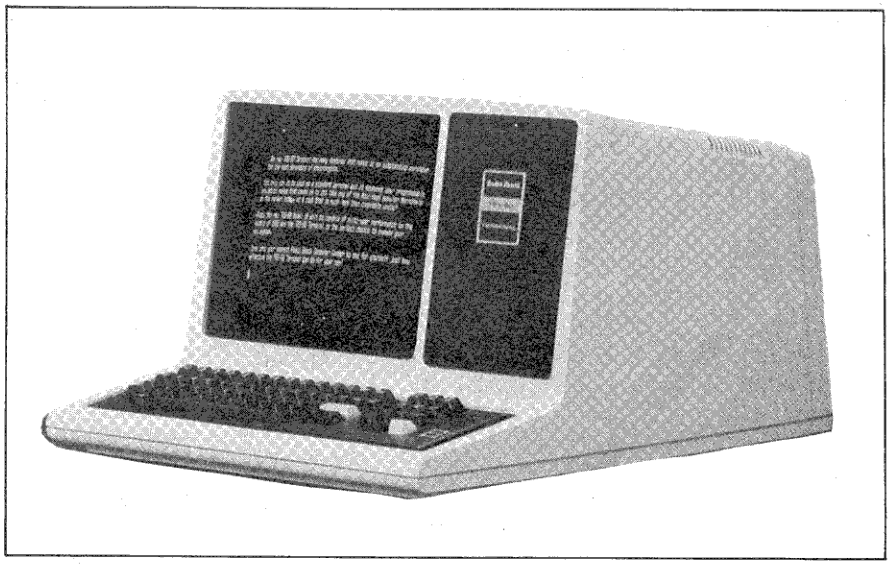
SORTOF

SORTOF is a program that sorts any list by the third letter of each item. For instance, the list "treat, dog, person, pocket, block" is sorted "pocket, treat, dog, block, person." An option allows you to print the list with the third letter first. The above list, for example, would be printed as "cketpo, eattr, gdo, ockbl, rsonpe." You can then do a second-level sort of this list: "cketpo, ockbl, gdo, rsonpe, eattr" (or "etpock, kbloc, ogd, onpers, ttrea"). Eventually, if you go through enough levels of sorts, you end up with the original list. The program lets you sort backwards, forwards, or both ways at the same time.

SORTOF is available on cassette only for 99 cents from Yet Another Software House, 9900 Crankemout Circle, Club Foot, MI 49035.

Simplify Business Modeling

Bisplan is designed to simplify business modeling. Its uses include: planning a new business endeavor, projecting the direction of an existing business, generat-



The TRS-80 DT-1

ing depreciation schedules, providing proposal information for loan applications, and classroom use.

Once data is entered it may be reviewed, changed or ultimately used to produce four measures of the proposed business venture. The measures are: a cash flow analysis, a profit and loss statement, a balance sheet, and the initial investment required.

For additional information contact Mariah Computing, Box 513, Columbia, MO 65205. Bisplan costs $20 and is available for the Model I and III with at least 32K.

Reader Service ✓568

Check Register Accounting System

Maxi Cras, a personal accounting system for individual, family or small business use, is designed to eliminate costly data entry mistakes.

This disk-based system handles an unlimited number of checks and deposits each month. Up to 233 income and expense accounts are supported. Checks can either be written by hand or automatically.

Maxi Cras also organizes data from the check register and provides printed reports and statements including: account distribution data, a printed check register, and account activity analyses. Maxi Cras interfaces easily with Visicalc and operates with the Model I or III with two disk drives and a printer.

Contact Adventure International, Box 3435, Longwood, FL 32750, (800) 327-7172. The System is priced at $99.95.

Reader Service ✓ 563

Games for the Color Computer

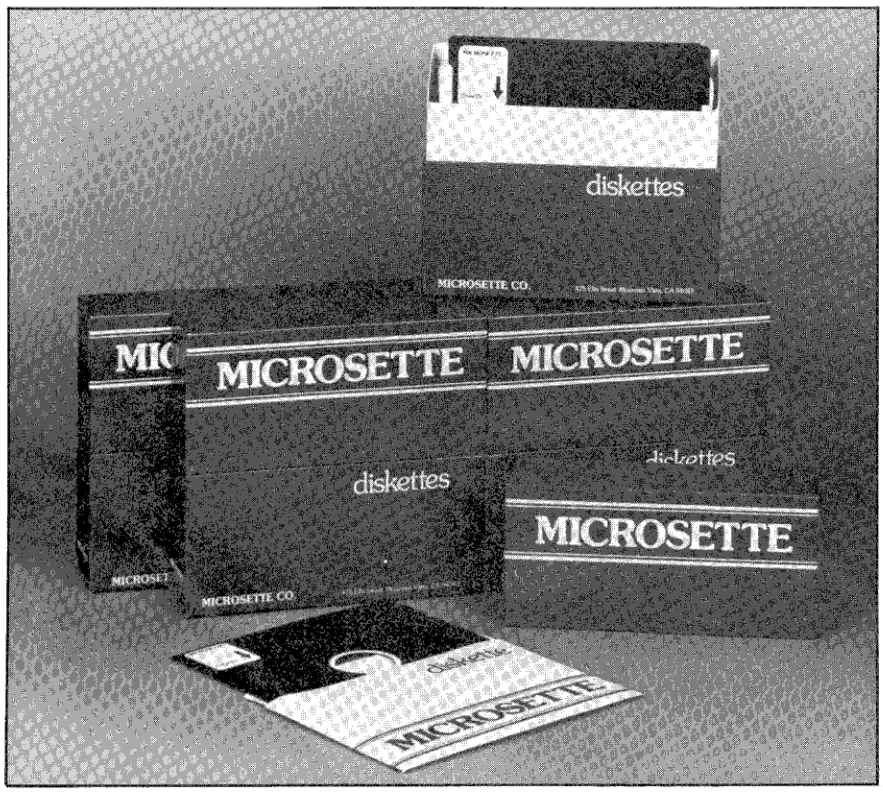
Two new games are available for the Color Computer.

Mazerace is a board-type game involving both chance and strategy. The playing field is an 18 by 18 hexagon matrix, partially filled with obstacles. Mazerace, $22.95 on disk and $17.95 on cassette, uses high resolution graphics and requires joysticks and extended Basic.

Storm, a graphics arcade style game, features 135 levels of play, fast action and sound. It costs $24.95 on cassette or $29.95 on disk.

Both games are available from Computerware, 1472 Encinitas Blvd., Box 668, Encinitas, CA 92024, (714) 436-3512.

Reader Service ✓ 555



Microsette Mini-Disks

Pascal Compiler for CP/M

Alcor Pascal is a complete implementation of Jensen and Wirth standard Pascal, with over 20 language extensions. It generates reentrant ROMable code and can compile large programs (over 4000 lines) with limited memory (48K).

A full screen text editor is included with the compiler. Programs may be compiled into native code, interpreted P-code, or consist of mixtures of native code and interpreted code.

The linking loader supports separate compilation of modules and can create TRSDOS and CP/M command files. A runtime library of more than 20 routines provides access to the hardware.

The Compiler package retails for $199 and the Advanced Development Package containing the p-code optimizer and native code generator is $125. Contact Alcor Systems, 13534 Preston Rd., Suite 365, Dallas, TX 75240, 214-226-4476, for additional information.

Reader Service ✓ 580

GAGDOS

GAGDOS (Giggle and Guffaw Disk Operating System) is the perfect April Fools' gift for your TRS-80-owning friend. Just pop it into his disk drive when he's not looking, and watch the fun as it wipes out any other disk he happens to put in.

This DOS makes mincemeat out of most word processing programs, and takes accounting packages apart bit by bit. Guaranteed to turn him into a frenzied maniac as you roll on the floor with laughter. GAGDOS comes with fake labels for several popular disk operating systems.

GAGDOS costs $599 and is available from Slap-Happy Sam's Snickering Software Emporium, 1802 Naynay Way, Salt Lake City, UT 84101.

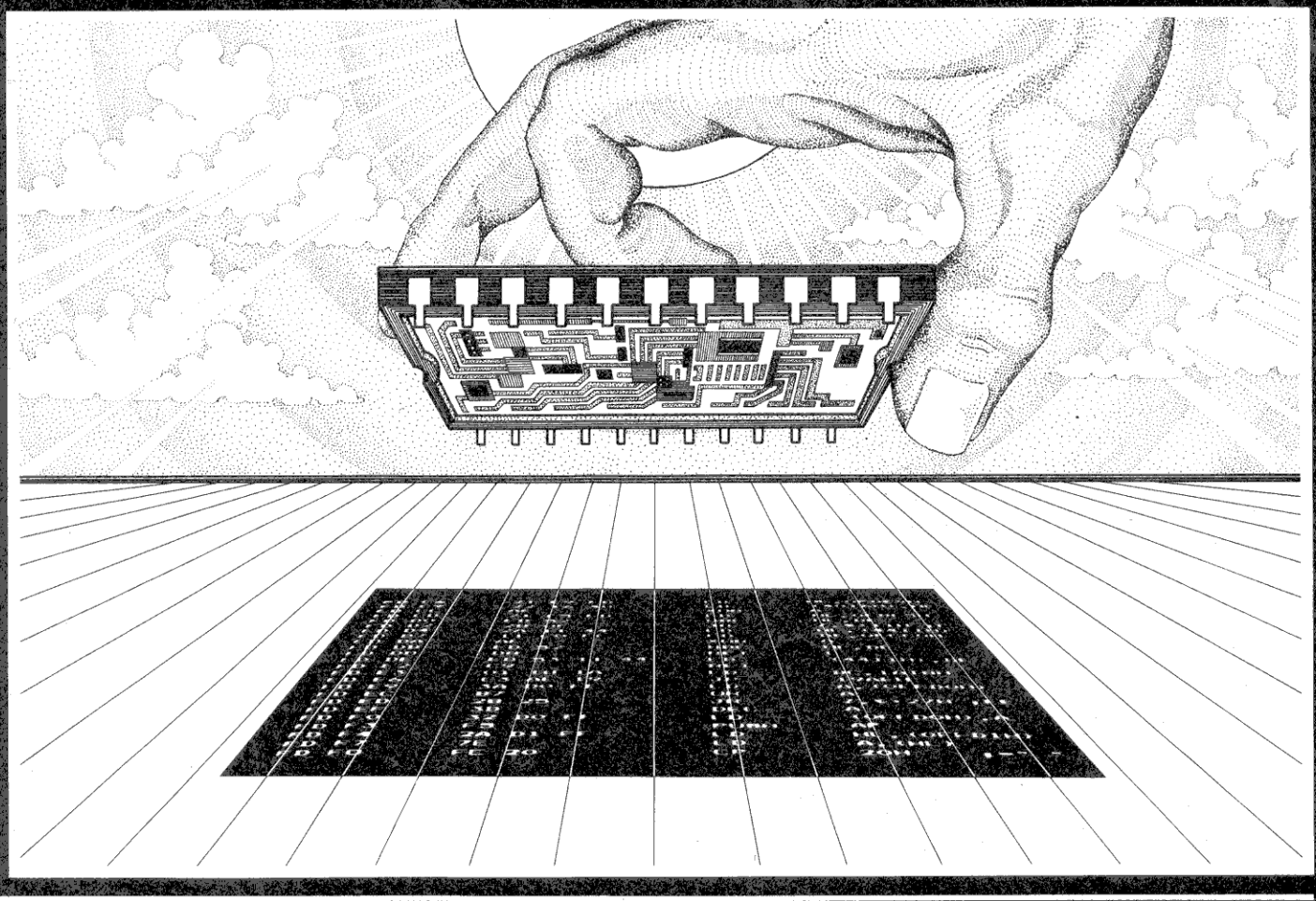
Microsette Mini-Disks

Microsette MD-5, 5¼-inch disks are certified error-free on one side. They are for all soft-sectored, single or double density applications. The burnished disk surface ensures longer head life and durability. The disks feature a reinforced hub.

The MD-5 disks are sold in units of 10 ($2.50 apiece) or 50 ($2.20 apiece). For further information contact Microsette Company, 475 Ellis St., Mountain View, CA 94043, (415) 968-1604.

Reader Service ✓ 560

MACRO-MONITOR ...THE SHADOW



What secrets lurk deep within the heart of your microprocessor? Only THE SHADOW knows. Advanced Operating Systems shines the light on the intricate workings of your *TRS-80 Model I or Model III microcomputer. MACRO-MONITOR, THE SHADOW, is a machine language program by Jake Commander which allows you to disassemble and examine program instructions from any part of your computer's memory. THE SHADOW even enables you to single-step through your computer's ROM.

With THE SHADOW, you can load a machine language program from disk or tape and begin execution at a user-specified breakpoint, one instruction at a time, with a user-defined time delay between instructions. It will disassemble each instruction as it is being executed and route it along with all current register values to your video screen or printer. The user may also search through memory for a specific character string (ASCII or Hex) up to 16 bytes in length.

THE SHADOW permits machine language programs to be relocated within memory with all internal calls and jumps changed to execute in the new location. The program also provides a visual display of tape LOADS and SAVES.

THE SHADOW is completely user-relocatable in RAM making it an extremely valuable tool for all programmers.

Now available at your local software retailer, or call (800) 348-8558 to order. (Indiana residents, call (219) 879-4693) MasterCard and VISA accepted.

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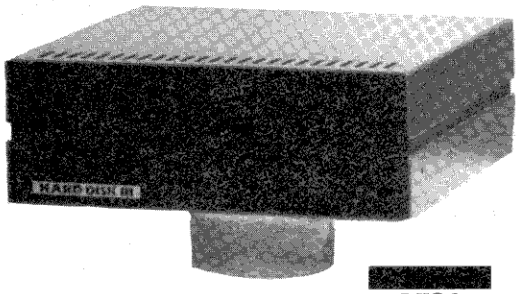

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[1]DISK III single drive assembly includes: one 40 track 5¼" double density drive, power supply, controller, mounting hardware, applicable cables, and manual.

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LEXICON MODEM	125.00

Forth for the Color Computer

ColorForth is a version of fig-Forth for use on the Color Computer.

ColorForth does not require Extended Basic but does require 16K. This software includes an editor and CSAVEM command, useful for those who do not have Extended Basic. (Note: Extended Basic is required for the disk version.)

A cassette and disk version are supplied for $49.95. Contact Armadillo Int'l Software, Box 7661, Austin, TX 78712, (512) 459-7325, for more information.

Reader Service ✓ 565

Add I/O Capability To the Color Computer

The Color Port plug-in cartridge adds I/O capability to the Color Computer.

The unit adds two fully programmable eight-bit bidirectional ports with full handshaking. The unit can be configured by the user for interfacing to peripherals. Full interrupt capability is supported, and important computer voltage and logic control lines are brought out to the standard edge connector.

A socket in the cartridge allows either 2K bytes of RAM or of EPROM, allowing software for the control of I/O operations to be stored separately from the main user memory space. Provision is also made for selection of both autostart of the memory in the cartridge and of synchronous reset of the cartridge and the computer.

The Color Port Cartridge sells without memory for $129.95. 2K RAM chips are available for $19.95 each. 2K EPROMs are available for $12.95. For additional information contact Maple Leaf Systems, Box 2190, Station C, Downsview, Ontario, Canada M2N-2S9.

Reader Service ✓553

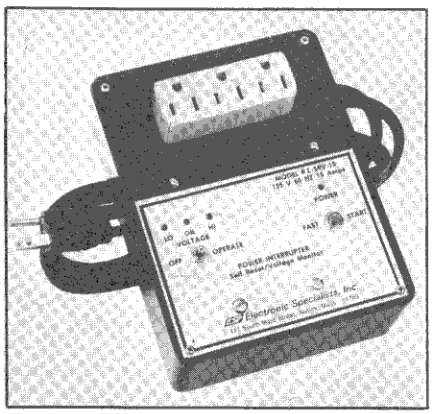
The Gobbler Challenge

The Gobbler is a fast moving, arcade-style game designed for one or two players.

The game features beginner-to-expert skill levels and is written in machine language for fast execution. Sound is also provided.

The Gobbler is available for the Model I and III for $16.95 cassette and $19.95 disk from Superior Software Inc., Box 11676, Kansas City, MI 64138.

Reader Service ✓566



Power Line Interrupter

Self-Reset Power Line Interrupter

The Power Interrupter disconnects ac power from controlled apparatus. A four-minute time delay, followed by automatic self-reset, helps avoid wide voltage fluctuations associated with power line malfunctions. An optional line voltage monitor is available.

Connected to the ac line with a standard three-prong plug, the Self-Reset Power Interrupter can accommodate a 15 amp resistive load or a 10 amp inductive load.

The Model PI-SR-15 Self-Reset Interrupter is priced at $185.95 and the Model PI-SRV-15 Self-Reset and Voltage Monitor Interrupter at $205.95.

Both are available from Electronic Specialists Inc., 171 South Main Street, Box 389, Natick, MA. 01760, (617) 655-1532.

Reader Service ✓ 575

Logo for the Dead

Logo for the Dead lets you continue your computing activities from the Other Side.

The package includes a unique telecommunications feature which lets you turn your TRS-80 into an electronic Ouija board. Then, using Logo's graphics capabilities, you can work with a friend or relative on this side of the Great Beyond to write programs. The software requires that your body be hardwired to an analog-to-digital converter, which is then interfaced to your computer. A special Terminal (very terminal) program lets you talk with the users through Deadnet, an EBBS (Ectoplasmic Bulletin Board System).

Logo for the Dead is available for 10 percent of your estate from NecroSoft Inc., 6502 Charnelhouse Blvd., Cleveland, OH 44101.

Desk Console

A Desk Console is now available for the Pocket Computer and SHARP PC-1211 with printer.

Made of black plastic, the console measures 8.5-inches by 16-inches by 2.75-inches. It has room for three cassette boxes, a full set of 3 by 5 cards, two paper rolls, a spare printer ribbon and the interface cable.

The Desk Console sells for $19.95. Interested persons should contact Fox/Walker, 4650 Arrow Highway Building G-17, Montclair, CA 91763, (714) 621-3400.

Reader Service ✓ 573

Desk Console for the Pocket Computer

Color Computer Smart Terminal Software

Colorterm uses the Color Computer's high resolution graphics to provide a 51 or 64 column by 21 line display, and lowercase with descenders.

It operates as a terminal at 300 or 110 baud, has on-line scrolling, user-programmable keys, a type-a-matic feature and four-way cursor control. It stores host input in a buffer that can be examined and saved to tape, on or off line. The buffer can also be printed out. Any data format may be used; macro buffers provide easy sending of often-used messages with Colorterm. Data can be encoded; user files can be uploaded to the host; and a window of any size can be preserved while new material scrolls through the remainder of the screen. The program can even rewrite some of its own subroutines to operate independently in programs that run above 9168.

Cassette and manual cost $34.95 from Martin Consulting, 94 Macalester Bay, Winnipeg, Manitoba R3T 2X5, Canada.

Reader Service ✓ 572

Improved Graphics Resolution

The Grafyx Solution is an add-on circuit board containing 12,288 bytes of additional read/write memory that does not conflict with the TRS-80 address space. Upgrading requires no soldering.

The Solution gives the Model III a screen resolution of 512 by 192 — 98,304 individually accessable points. Alternate resolutions (256 by 192, 128 by 192 or 128 by 96) are also possible.

The included graphics package allows you to set and reset points, lines, rectangles, and to complement or clear the screen with simple Basic commands. In addition to a number of demonstration programs, an 80-character display for business forms and word processing is possible with the supplied Column80 program. The board comes with software to save or load a graphics screen and to send a high resolution graphics screen to a printer with graphics capabilities.

For additional information contact Micro-Labs Inc., 902 Pinecrest, Richardson, TX 75080, (214) 235-0915. The Grafyx Solution is priced at $299.95.

Reader Service ✓ 559

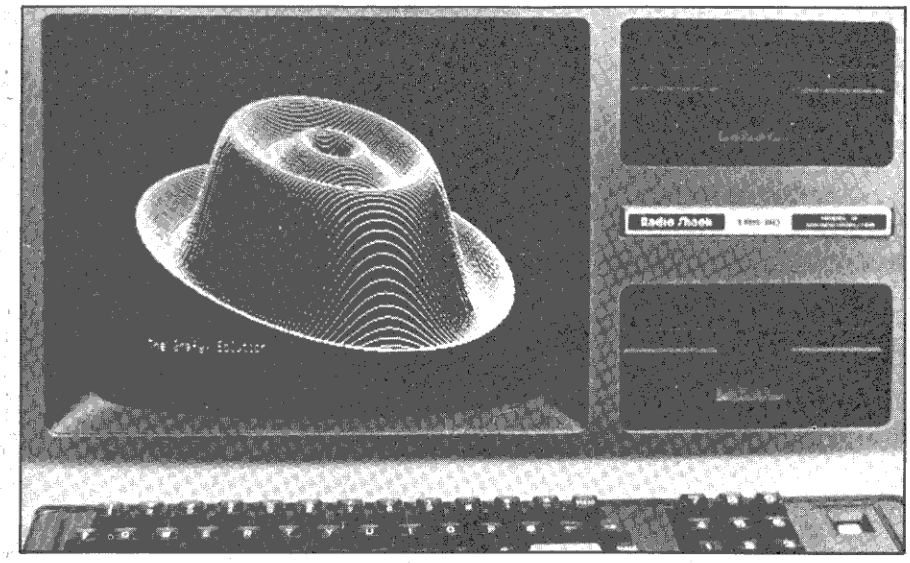
The LemonAid Loader

The LemonAid Loader, for the Model I, compresses, peaks and shapes cassette output to reduce loading errors due to noise or tape variations, without critical CTR volume settings.

The loader plugs between the cassette recorder and the computer, and works on both self-saved, and prerecorded tapes. It was especially developed for use with the Radio Shack CTR-80 and 80A tape recorders and like recorders. A speaker or earphone can be plugged in for audio monitoring of saves and loads also.

Priced at $12.99, the loader is available from Lemons Tech Services, 325 North Highway 65, Buffalo, MO 65622.

Reader Service ✓ 574



The Grafyx Solution

Extra Cash With Your TRS-80

VisiCrook is a general accounting package that automatically rakes five percent off your company's gross sales and then juggles the books for you. It includes a special business planning program that gives you a variety of possible scenarios based on factors you control—kick-back schemes, blackmail income, bribery expenses and payoffs to government officials. An option for those subscribing to electronic banking services lets you launder money through selected banks in Mexico, Argentina and Switzerland. Special access codes make this package ideal for accountants in large corporations.

VisiCrook, tested by a panel of former IRS agents, is guaranteed to be foolproof. It can be used by a variety of businesses, from pharmacies to construction firms to porn shops, and will be delivered in a brown paper sack on the street corner of your choice.

VisiCrook costs $4.95 and is available from Covert Software, 8085 E. Lightfinger Drive, Jersey City, NJ 07303.

Silly Syntax A Game with a Twist

Silly Syntax is written for the Color Computer with 16K and Extended Basic.

This menu-driven game, depending upon which cassette is loaded, can be an educational family game or a unique adult entertainment game. Topics currently available are Fairy tales, Science Fiction and Adventure, Current Events, Sing-A-long, X-Rated and Gothic Romance.

For information contact Sugar Software, 2153 Leah Lane, Reynoldsburg, OH 43068, (614) 861-0565.

Reader Service ✓567

Waterbill

Waterbill is a complete billing/accounts receivable program designed especially for small to medium sized water companies.

The program generates bills based on meter-reading entries for each account, in any of ten different rate schedules for different types of water, sewer and special uses. Also included are routines to print late statements, account listings (alphabetically or numerically), summaries of water and sewer usage by rate types, delinquent cut-off lists, and a complete

audit trail of all transactions.

The system requires a Model II and a line printer capable of condensed print. Up to 4000 accounts can be stored on four disk drives. Prices start at $1500.

For further information contact Computer Sales and Service Co., Radio Shack Dealer F-410, 211 W. Main St., Dillon, SC 29536, (803) 774-6903.

Reader Service ✓ 577

Tips and Tricks For the Programmer

101 Color Computer Programming Tips and Tricks is a collection of useful, practical and efficient programming techniques and shortcuts.

Each of the 101 tips and tricks features a complete ready-to-run program. Functions and statements in both Color Basic and Extended Color Basic are included.

This 128-page paperback book is available from ARCsoft Publishers, Box 132, Woodsboro, MD 21798, (301) 845-8856. It is priced at $7.95.

Reader Service ✓570

Dual-Headed Drives

The Dual Sided Disk Kit allows dual-headed drives to be used on the Model I with no drive modifications.

A single directory is used for both sides of a disk, and files can overflow from one side to the other. Single and dual-headed drives of any track size can be mixed.

The kit consists of a special three-drive disk cable plus a patched version of TRSDOS 2.3 or NEWDOS 2.1. Disks created on the modified system are fully compatible with TRSDOS and NEWDOS.

The kit costs $79.95 and is available from Computer Design Labs, Box 219, Garden Grove, CA 92642.

Reader Service ✓ 582

Disk Doubler II

The Disk Doubler II kit converts eight-inch single-sided disks for both two-sided and double-sided use.

Using the tools of the kit, you can quickly measure, mark and punch new openings in the right places.

The Doubler II is available for $12.95 from Jim Quinn Computer Division, 9120 Clearlake Way, Lakeside, CA 92040, (714) 561-2540.

Reader Service ✓ 558

Plug-Compatible Serial Interface

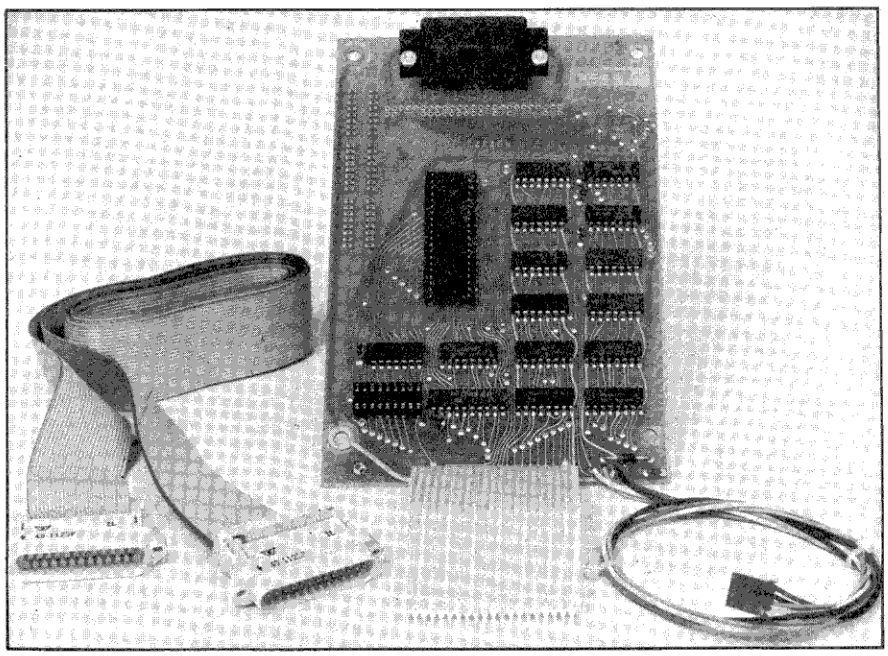
The VR-RS232C is a plug-compatible serial interface for the Model III.

It features: a programmable baud rate generator from 50–19200 baud; fully interrupt driven; programmable pin out to eliminate special cables (modem output standard); reverse polarity protection; programmable UART; and user prototyping area for special applications (such as 20ma current loop, relays or lamp drivers).

The VR-RS232C is compatible physically and electrically and comes standard with a five foot modem cable. Internal installation can be made with simple hand tools.

Priced at $75, the interface is available from the VR Data Corporation, 777 Henderson Blvd. N-6, Folcroft, PA 19032, (215) 461-5300.

Reader Service ✓ 576



The VR-RS232C Serial Interface

Coaches You on Rubic's Cube

The Rubic Cube Coach Program solves the cube and helps you do the same.

The program has four modes of operation: competition, try to beat the computer in solving the cube; experiment, practice your techniques in solving the cube; timing, watch the computer solve the cube; and help, the computer helps you solve the cube.

This program is priced at $14.95 and is available from H & S Computer Company, 1024 Alamosa Drive, Claremont, CA 91711, (714) 621-7747.

Reader Service ✓554

Marking Labels

LABELMAKR provides a useful utility for the home or office by turning mailing labels into marking labels.

This easily-used program prints professional looking labels quickly. The instruction manual's start-up procedure includes a simple method of calibrating the MX-80 printer for precise loading of label forms. During this time (less than a minute) the program boots, loads, and is ready for operator entry. The program offers 16 different label formats.

LABELMAKR, priced at $19.50, is available from the Electronic Time Service Center, Box 651, 35026-A, Turtle Trail A, Willoughby, OH 44094, (216) 946-8479.

Reader Service ✓ 551

Draw Objects in Three Dimensions

The 3D Drawing Board is a tool for education, entertainment and various pro-

DUNZHIN

by Randall Don Masteller

Dunzhin is Med Systems' first adventure/role playing game. Written by Randall Masteller, author of several non-computer D&D-type games, it is the first adventure/role playing game to combine fast, "from above" graphics, FAST response time, and COMPLETE computer implementation. There are no "rule books" to consult, and no waiting for the computer to "think".

Dunzhin places you in a huge dungeon of many levels. There are many treasures, but only one, deep in a hidden chamber, will win the game for you. Every game is different, but you can save a game in progress. You can also save the character you become as you gain experience in battling the goblins and demons waiting around every corner.

TRS-80 MODEL I 48K DISKETTE: $29.95 TRS-80 MODEL III 48K DISKETTE: $29.95

MED SYSTEMS SOFTWARE • P.O. BOX 3558 • CHAPEL HILL, NC 27514
TO ORDER, CALL: 1-800-334-5470

jects which require three-dimensional drawings.

The program helps you draw objects, rotate them, and change their size, elevation, and distance. The drawings can be saved to tape or disk for future use.

The drawing board is priced at $24.95 for cassette and $29.95 for disk and can be purchased from Computerware, 1472 Encinitas Blvd., Box 668, Encinitas, CA 92024, (714) 436-3512.

Reader Service ✓556

Stationary for Micros

Clean Edge is letterhead, tractor-feed stationary in continuous form style. The easily removed tractor edges leave no unsightly pin holes.

The paper is available in several standard sizes and styles, with printing ranging from black to multi-color. Special papers, embossing, and other non-standards are also available.

For additional information contact Rabco Enterprises, 806 Freedom Circle, Harleysville, PA 19438, (215) 368-4866.

Reader Service ✓ 562

Signing Tutor

Learn to communicate with the hearing-impaired with this program for the Model I and III.

This learning aid teaches the one hand sign-language alphabet (finger spelling) using graphic pictures for each letter. This program allows you to type in any phrase up to 255 characters long. The letter being signed will be highlighted and repeated as many times as you wish.

This Signing Tutorial is available on cassette only for $19.95 from En-Joy Computer Programs, Box 1535, Goleta, CA 93116.

Reader Service ✓ 585

TCOM Plus

TCOM Plus is an enhanced version of the Ten Commandments data base. You can modify any of the original ten and add up to 200 of your own, customizing the Commandments to your own needs. Easy-to-use functions offer versatility not possible with stone tablets.

TCOM Plus is written in Sinai Basic and runs with GODDOS version II:17. Contact Moses' Micro Warehouse, 68000 Main St., Egypt, PA 18032.

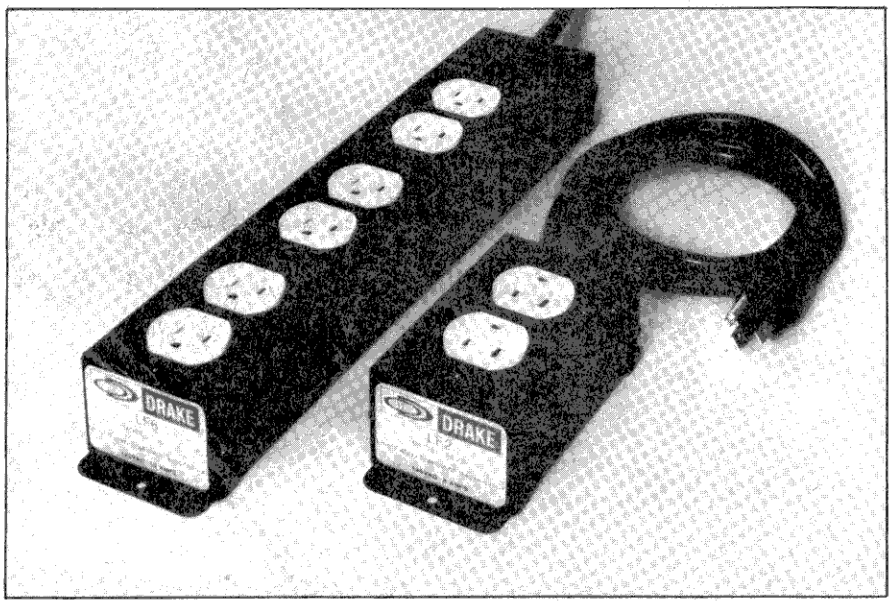
Protect Sensitive Electronic Equipment

The LF2 and LF6 Line Filters protect electronic equipment from power line transient damage and audio frequency interference.

Both filters offer common mode and differential mode surge suppression for power line spikes. RF interference is suppressed using both inductive and capacitive components. The LF2 ($39.95) has a single duplex outlet while the LF6 ($59.95) has three duplex outlets, a switch and indicator lamp.

The filters are available from R.L. Drake Company, 540 Richard Street, Miamisburg, OH 45342, (513) 866-2421.

Reader Service ✓ 550



The LF2 and LF6 Line Filters

Circuit Analysis Program

AC Analysis analyzes ac analog circuits and it performs a full nodal analysis of ac linear circuits, including frequency response and all internal voltages. It is intended to provide an alternative to breadboarding and extensive measurements, for the electronic engineer.

This program can analyze circuits of up to 64 nodes and 127 branches in 48K systems. It is written in machine language and runs in 16K memory with reduced circuit size (31 nodes).

Larger circuits can be broken up into stages that are later linked together. Using this method, circuits of infinite size can be analyzed and compared by the computer. The program automatically performs a full worst-case analysis. Both phase and amplitude are tested and the worst case flags are saved for later use.

The program requires a Model I or III with at least 16K RAM. Available in disk or cassette for $75 from Tatum Labs, Box 722, Hawleyville, CT 06440, (203) 426-2184.

Reader Service ✓ 581

Farming Software

Farmkeep is a multi-purpose farm record-keeping software system.

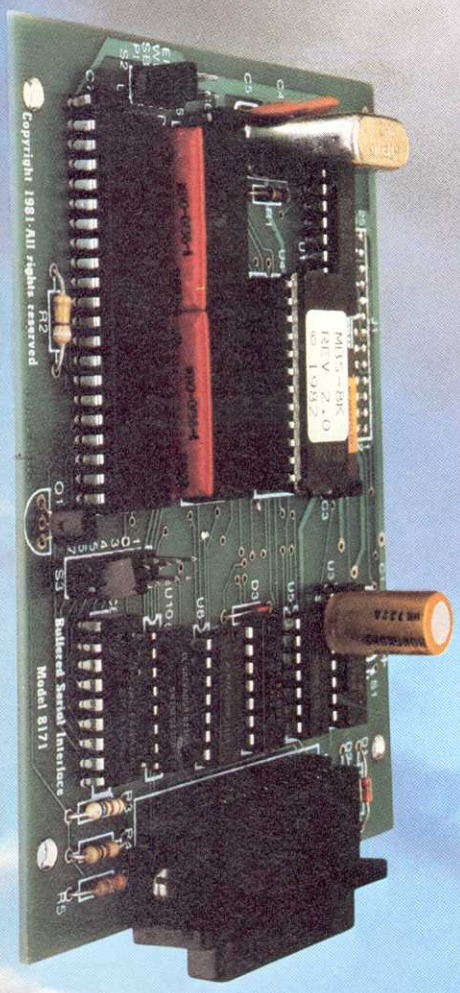
Following the simple entry of the information contained on check stubs or invoices, Farmkeep automatically keeps track of all the pertinent records a typical farm requires, including fuel, animals, labor, resale items, capital items, patronage records and bank account balances.

Among the reports generated by Farmkeep are: 1040F, 4797, Income and Expense Summary, Check-Writing, Account Audits.

Farmkeep requires a 64K computer with 500K of disk storage. For more information contact: Specialized Business Systems Company, 10-11 North Galena, Freeport, IL 61032, (815) 235-1945.

Reader Service ✓ 578

HOW TO USE YOUR EPSON WITHOUT WASTING COMPUTER TIME:



Your computer is capable of sending data at thousands of characters per second but the Epson can only print 80 characters per second.

This means your computer is forced to wait for the printer to finish one line before it can send the next. A waste of valuable time.

THE NEW MICROBUFFER™ ACCEPTS DATA AS FAST AS YOUR COMPUTER CAN SEND IT.

Microbuffer stores the data in its own memory buffer and then takes control of the printer. This frees your computer for more productive functions.

PARALLEL OR SERIAL.

Microbuffer model MBP-16K is a Centronics-compatible parallel interface with 16,384 bytes of on-board RAM for data buffering.

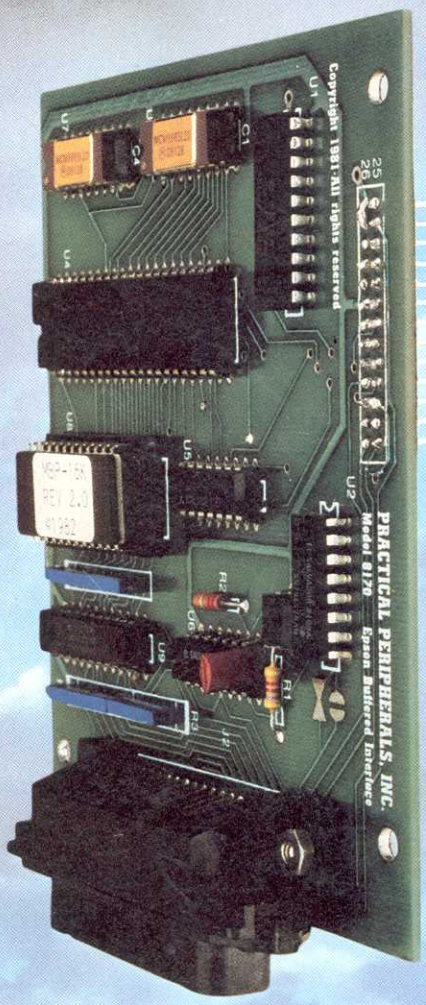
The MBS-8K is a full-featured RS-232C serial interface with both hardware and software (X-On/X-Off) handshaking, baud rates from 300 to 19,000 and an 8,192 byte RAM buffer.

SIMPLY PLUG IT IN.

Either model fits the existing auxiliary interface connector inside the Epson MX-80, MX-80 F/T or MX-100 without modification, and is compatible with standard Epson cables and printer control software, including GRAFTRAX-80.

JUST $159.00*

When you think how much time Microbuffer will save, can you afford *not* to have one? Call us for your nearest dealer.



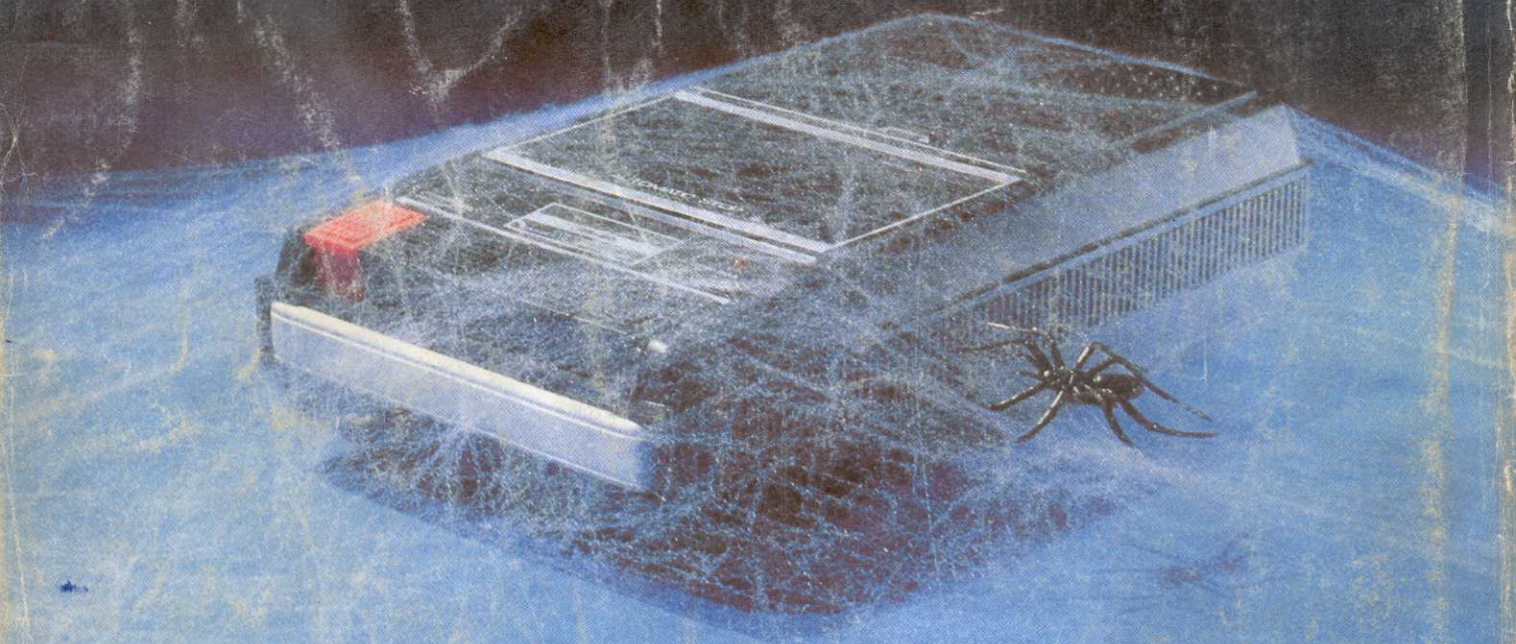
PRACTICAL PERIPHERALS, INC.

31245 LA BAYA DRIVE, WESTLAKE VILLAGE, CA 91362 • (213) 991-8200

✓11

*Suggested retail price for either model.

TIRED OF WAITING?



Frustrating isn't it! No matter how much you speed up your program it still seems to take forever to save data onto a cassette. Wouldn't it be great if someone could design a mass storage system with the speed of a disk, but at half the cost? *Exatron* did, the *Exatron Stringy Floppy (ESF)*.

Totally self-contained, the ESF is an extremely fast, reliable, and economical alternative to cassette or disk storage of programs or data. All of the ESF's operations are under the computer's control, with no buttons, switches, knobs or levers to adjust or forget.

The ESF uses a miniature tape cartridge, about the size of a business card, called a wafer. The transport mechanism uses a direct drive motor with only one moving part. Designed to read and write digital data only, the ESF suffers from none of the drawbacks of cassettes - without the expense of disks.

Several versions of the ESF are available, for the *TRS-80, Apple, PET, OSI* and an *RS 232* unit. Even the slowest of the units is 15 times faster than a cassette, and all are as reliable as disk drives - in fact a lot of users say they are *more* reliable!

excellence in electronics

exatron

To get further information about the ESF give Exatron a call on their Hot Line *800-538 8559* (inside California 408-737 7111).

If you can't wait any longer then take advantage of their 30 day money-back guarantee, you've nothing to lose but time!

181 Commercial Street
Sunnyvale, CA 94086

✓3

TRS-80, Apple and PET are trademarks of Tandy, Apple and Commodore respectively.