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Basic Misinterpreter
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."

BIPED
by Kerry Leichtman

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

Dateline: Sri Lanka
by John P. Mello Jr.

Some observers of the computer scene contend there is no computer humor, but David Busch doesn't seem to have noticed. Our roving joker takes his eye off the infamous Kitchen Table Inc. to talk about himself.

Buyer's Guide to Utilities

Here they are—assemblers, editor/assemblers, monitors, disk zappers, renumberers, tape utilities, file utilities, and more.

Make Butterflies—Not Bugs
by Jake Commander

So you're a new kid on the block and your idea of a utility is something you own in Monopoly. Well, Uncle Jake, who has written a few utilities in his day, will help open your eyes and your mind.
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Monitor and disk drives not included TM Personal Software, Inc.
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 subscriber 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 restrapped 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 doufling 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 thousands, 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
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 warranties, 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 impassionate 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. ■

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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 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 many 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; roomers and compressors; and general utilities will all be featured.

Jake Commander, international program-mer 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 Ad- vanced 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 Byrkit 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 inter- view that, yes, folks, is for real.

And finally, beware of April Fools' Day 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 print-outs. When entering programs published in 80 Microcomuting 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 Kitz’s 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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  - Example: Select records representing those sales made to XYZ COMPANY that exceed $25.00, between the dates 03/15 and 04/10.

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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.

"We have 32 different Data Base Management packages for the TRS-80. AIDS-III is easily the best. It also makes it easier for us to step up to our Model II since the package is available for both computers."
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

MTC CALCIS-III™
Models I & III ...... $24.95
Model II .......... $39.95
MTC's most popular AIDS subsystem. Use for report generation involving basic manipulation of numeric data. Features are:
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- Optional Indentation
- User-specified Columnar Totals
- Columnar values computed using constants and/or column values
- Balance forward calculations
- Use for accounting, inventory, financial and other numeric-based systems.

AIDS OWNERS!
WE HAVE WHAT YOU'VE BEEN WAITING IV...

MTC CALCIS-IV™, that is.
- More Computations
- Save Report Formats on Disk
- Faster, and more!

MTC CALCIS-IV™
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For Model II ........ $59.95

MTC AIDS MERGE-III™
This subsystem will combine up to 14 AIDS-created data files into a single, large file. An optional purge capability removes duplicate entries while performing the merge operation (can even be used to eliminate duplicates in a single file). Machine-code assisted for high-speed performance. MERGE-III™ properly handles files sorted by any combination of fields, including numerics, with each field in ascending or descending order.

MTC AIDS MERGE-III™
For Models I & III ....... $19.95
For Model II ........ $29.95

THE COMPLETE MTC AIDS-III™ PACKAGE
SAVE $$$$  
Includes MTC AIDS-III™, CALCIS-III™ and MERGE-III™

A comprehensive system at a competitive price!

MODEL I & III ........ $99.95
MODEL II ........... $149.95
Add $25 for CALCIS-IV™

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IS COMING!

EPSON PRINTERS
DISK DRIVES
DISKETTES
BOOKS and more!!

PRICE IN EFFECT: THRU
May 31, 1982
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WE ACCEPT
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- MONEY ORDERS
- C.O.D.
- Add $3.00 for shipping & handling
- $3.00 EXTRA for C.O.D.
- Ohio residents add 6.5% sales tax.

Most orders shipped within one business day. Products damaged in transit will be exchanged.

TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation. DATAPLACE is a trademark of VERBATIM. PLAIN JANE, AIDS-II, AIDS-III, CALCIS-III, CALCIS-IV, MERGE-III are trademarks of MTC. © 1981 by Meta Technologies Corporation.
"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, II, 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
**MICRO SYSTEMS SOFTWARE’S DOSPLUS 3.4**

Fast. Smooth. Easy. Maximum features and powerful options:
- Multi-key, multi-array BASIC sort
- Controlled screen entry (INPUT @)
- TOTAL device routing supported in DOS and BASIC
- Last DOS command is repeatable
- DISK DUMP utility and more!

Specify MODEL I or MODEL III ........................ $149.95

**APPARATUS’ NEWDOS/80 Version 2.0**

Enhanced version of NEWDOS/80 featuring:
- Model I double density support
- Directory size is tripled
- Dynamic merge of BASIC programs
- Peripheral handling routing
- Enhanced DISASSEMBLER
- Includes SUPERZAP and more!

Specify MODEL I or MODEL III ........................ $149.00

**EPSON Printers**

**DISK Drives**

**DISKETTES**

**BOOKS and more!!**

**Michael Shryer’s ELECTRIC PENCIL VERSION II**

for Model I and Model III

An expanded version of the critically acclaimed original word processing system! Includes all features of Version I plus many new extensions. Runs under most disk operating systems, has improved video text handling, loads any ASCII file for editing (including BASIC files), single sheet mode for printing on letterhead and more! Simple to use, features 2-key commands. An incredible package at an incredible price!

SPECIFY MODEL I OR III

Disk Version ................................. $79.95
Tape Version ................................ $69.95

**LET YOUR TRS-80™ TEST ITSELF WITH THE FLOPPY DOCTOR & MEMORY DIAGNOSTIC**

by David Stambaugh

A complete checkup for your MODEL I or MODEL III. THE FLOPPY DOCTOR-Version 3 completely checks every sector of single or double density 35-40, 77-, or 80-track disk drives. Tests motor speed, head positioning, controller functions, status bits and provides complete error logging. THE MEMORY DIAGNOSTIC checks for proper write/read, refresh, executability and exclusivity of all address locations. Includes both diagnostics and complete instruction manual.

SYSTEM DIAGNOSTICS ............... $24.95
For MODEL III ....................... $29.95

**More Products**

- Add $3.00 for shipping & handling
- $3.00 EXTRA for C.O.D.
- Ohio residents add 6.5% sales tax.
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**

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**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 140, to 25,26 in line 25. In Listing 4a, change 140, to 25, 26 in line 20.

**Dale W. Rupert**
**Bethel, CT**

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**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 before 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**

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**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 or 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..."
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NOTE: There is absolutely nothing phony about this offer. The companies extending these unusual bargains want and appreciate your business. The least expensive method of introducing top-quality products is by direct mail. The companies save money... and so do you. No tricks, no obligation. Just good business...
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 Waiters,
Consumer Information Manager
Radio Shack
Fort Worth, 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 it. 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 grimming 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 apothec infection they may make them now and then. We are not inclined to be Pollyannish up here in the heart of Yankee territory. —Wayne

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/60Hz 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 1/2 the cost of the original modifications.

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 = "0123456789ABCD EF"
40 INPUT:"STARTING LOCATION (HEX ) ";A4
41 L = 0;FOR I = 1TO A4;FOR J = 1TO 4
42 IF MID$(A4,I,1) = MID$(HXS,J,1) THEN L = L + (I - 1)16(J - 1)
43 NEXT J;NEXT I; L1 = INT$(L + 1); PRINT"DECIMAL L = ";L1; L1 = L1; IF L > 32767 THEN L = L - 65536; PRINT";
44 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 = C + 65536

Program Listing 3

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
Data resources continues its commitment to professional quality TRS-80® software with the Silver Edition Software Series...selected programs from talented and popular authors.

AIDS SYSTEMS BY METS TECHNOLOGIES

MTC AIDS III
This easy to use system allows even a novice TRS-80 user to create data files custom configured for many applications, from cash flow analysis and financial journals to price lists and record keeping. It requires NO PROGRAMMING and is complete with features for adding, deleting, sorting, updating and printing.
MODEL I or III .............................................. $24.95
MODEL I ................................................... $49.95

MTC CALCS III
Performs numeric calculations of data contained in AIDS files. Ideal for financial applications.
MODEL I or III .............................................. $24.95

MTC CALCS IV
The same features as CALCS III with more powerful formulars and the ability to store report formats.
MODEL I or III .............................................. $39.95

MTC MERGE III
Combines up to 14 AIDS data files into a single file. Duplicates may optionally be purged, and sorted order of records is maintained.
MODEL I or III .............................................. $19.95

SPECIAL
AIDS III Super Systems
AIDS III & CALCS III & MERGE III
MODEL I or III .............................................. $99.95
AIDS III & CALCS IV & MERGE III
MODEL I or III .............................................. $109.95

B.T. ENTERPRISES
UNITERM/80
By Pete Roberts
This is the state-of-the-art in communications software. It configures itself for either Model I or Model III and can be used with any standard modem, both RS-232 and Bus-Decoding. Especially designed to use the extended commands in NEWDOS/80, but fully compatible with all major DCS systems. For Model I and III .............................................. $89.00

THE MICRO ACCOUNTING SYSTEM
This is the finest accounting system available for your TRS-80. Ideal for small business, this integrated General Ledger, Accounts Receivable. Payable System includes a Checkbook manager. We offer something no other general business package can give you—a money back guarantee. If you are not totally satisfied, return the package within 60 days and receive a full refund. Write for sample reports and full descriptions.
MAS/80 complete ........................................ $489.00

THE FLOPPY DOCTOR
By Dave Stambaugh
FLOPPY DISK/MEMORY DIAGNOSTIC programs are designed to thoroughly check out the two most trouble prone sections of the TRS-80, the disk system (controller and drives) and the memory arrays.
MODEL I ................................................... $24.95
MODEL III .................................................. $29.95

NEWDOS/80 Version 2.0
for MODEL I and III
The hottest Disk Operating System is now available in its latest version. This is the one from Apparat, Inc., the people whose systems have made the TRS-80 the reliable computer. .................................................. $149.00

MODEL I
DOUBLE DENSITY PACKAGE
NEWDOS/80 Version 2.0 and the LINDOUBLER
Everything you need to convert your TRS-80 Model I, to run double density. Complete with software, hardware, and instructions, installs in minutes with NO SOLDERING.
WIRING OR CUTTING ........................................ $229.95
LINDOUBLER Alone ....................................... $149.95

DYSAN DISKETTES
Single density $36.95
Double density $39.95
Dysan 40 track 5¼" soft sectored diskettes packaged 10 to a box.

HEADCLEANER KIT
April only $17.95
Kit contains two cleaning disks with instructions to assure proper operation of all types of 5¼" disk drives.

PAPER
White or Green Bar. ................................. 3300 sheets
9½” X 11” tractor feed ................................. $29.95
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Shipped by truck, freight charges collect.

Data Resources
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Business & Professional Center
8000 East Quincy
Denver, Colorado 80237
(303) 698-1263

AIDS III', CALCS III', MERGE III', ARE TRADEMARKS OF METEchnologies

Prices in effect April 1, 1982 to May 1, 1982 and subject to changes
**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 I-IIII’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’ hardware/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.

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/Vermon area once and I fell in love with it. It is just perplexing that the “Big Cheese” 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.
Mini Diskettes
Box of 10 $26.95
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Shannon Magnetics' soft-sectored 5 ¼” double density, single sided, mini disks in shrink wrapped boxes of ten with jackets, labels and tabs. Fully guaranteed for one year against defects.

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April only $17.95
Vernin kit contains two cleaning disks with instructions to assure proper operation of all types of 5 ¼” disk drives. Removes dirt and debris which can cause read/write errors and lost data without harsh chemicals.

Diskette/Headcleaner Combo
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Combo special includes box of 10 diskettes and Vernin headcleaner kit as described above.

Dysan diskettes
Single density $36.95
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Dysan 40 track 5 ¼” soft sectored diskettes packaged 10 to a box.

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White or Green Bar
3300 sheets of 9 ½ X 11” tractor feed $29.95
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Shipped by truck, freight charges collect.

Diskette File Box
$19.95
Flipsort diskette file box with capacity for fifty 5 ¼” diskettes.

Diskette/File Box Combo
$109.95
Fifty Shannon Magnetic 5 ¼” diskettes as described above packaged in Flipsort diskette file box.

Tandon Disk Drives for TRS-80 Model I or Model III
Single drive with cabinet and power supply $289.00
Two drives in horizontal cabinet and power supply $489.00
Two-drive cabinet only $75.00
Two drive cabinets are designed to fit under Epson or Okidata printer or under the monitor and above the expansion interface with provision for easy access to drive edge card connections. No drive extender cables needed. Call for complete pricing and compatibility information.

Ribbon Cables
Model I or III printer $18.95
2-drive disk cable $19.95
4-drive disk cable $29.95

Shannon Magnetics
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Aurora, Colorado 80017

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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 337
2011 Crescent Drive
Alamogordo, NM 88310

CC Chips

Cheers for Dennis Kitzs 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) memory characters are a real bonus.

Mr. Kitzs' 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. Gillo
Box 409 RRS
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 been 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 Micromurics 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.
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 ScriptIt 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 Cahlerl
38244 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 67
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; over due and circulation records; bibliographic information retrieval; and budgeting.

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

Judith L. Dzedzey
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 II 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 Greenwood 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
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 falls 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 datable 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."

POKEs into system RAM. The following additional lines will correct this problem.

844 IF C1 = #44PRINT@CP+P*6:"O - O - O"
845 GOSUB 2:GOTO 920
848 IF C1 = #55PRINT@CP+P*6:"O - O"
849 GOSUB 1050:GOTO 920

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 casting (unrelated to the other casting 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 relo-


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-3FFFFH). 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 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 Z74 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 DATA 159,143,145,155,143,191,181,176,179,177,176,191
760 CA = 0:IF C1<44THEN 790
790 IF YMSK>"O - O"ORC1>55GOSUB 1110:GOTO 930
1130 FOR J = 1256TO968STEP4:PRINT@J,STRING$ (25,12); NEXT
1190 IF C1 = #6THEN C1 = "DRAWN"
1420 DATA 5,5,5,5,1,1,7,7,5,5,2,2,2,2,2,3,3,8,8,8,2

Program Listing 1
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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 Keich
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, MODII, (80 Microcomputing, December 1981). The way I see it, the incorrect saving of the casting 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:

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 Mod III. See my article for details.)

4460 BACK2A JR BACK2
4645 RES 5,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 MODII, 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 MODII, 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 MODII (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 newest MODII, 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
NOW MODEL I AND MODEL III!

Now Model III users can take advantage of the ALPHA I/O system too. Our new MOD III/I BUS CONVERTER allows most port based Model I accessories (such as our ANALOG-80, INTERFA CER 2 and INTERFA CER-80) to connect to the Model III bus. MOD III/I BUS CONVERTER complete with all connectors, only $39.95.

2 Printers?

PRINTSWITCH

PRINTSWITCH on line at all times and select printer 1 or 2 by means of a conveniently located switch. End the problem of constantly plugging and unplugging printer cables. PRINTSWITCH is a compact module that plugs onto the parallel printer port of your TRS-80 and provides an edge connector for each of your two printers. It works with any two types of printers: dot matrix, daisy wheel, plotters, TRS-80 converted Selectric, etc. Assembled, tested, ready to use with connector and instructions. For Model I or III (please specify). ONLY $59.00.

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Highest quality cable and high force, gold plated contacts ensure the utmost in connection reliability.

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- PRINTSWITCH CABLE EXTENDER $24.
- 40 PIN BUS EXTENDER - 2 ft. $22
- 4 ft. $24

Custom cable configurations are also available. Call us.

YOU ASKED FOR IT. "EXPANSABUS II" X1, X2, X3 AND X4. CONNECT ALL YOUR TRS-80 BUS CONNECTORS to the 40 pin TRS-80 bus. Any device that normally plugs into the keyboard edge connector will also plug into the "EXPANSABUS II". The 1-8 bus extender shown with protective covers included. The TRS-80 keyboard connects the bus directly (47,553) for those times when you will ever need. Using the edge connector. Push plugs either between KB and EUI, or in the Screen Printer port. Professional quality, gold plated contacts. Computer grade 40 conductor cable. X1, $29; X2, $34; X3, $39; X4, $57. Custom configurations are also available. Call us.

GREEN SCREEN WARNING

IBM and all the "biggies" are using green screen monitors. We have a difference of opinion. 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 is 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.
- Pre claiming to "reduce glare", in fact they are flat and shiny surfaces (both film and Lucite type) add their own reflective to the glare problem. Some are just a piece of cardboard with a few small rectangular slits cut in the front and back.
- Many companies make a few of the lenticular type, which are more expensive and do not do as much to counteract the diffusing effect of the screen to the monitor. This method makes it even more necessary to remove for normal periodical cleaning. All except ours are flat. Light pens will not work reliably because of the big gap between the screen and the tube.
- Most 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:
- Hits right onto the picture tube like a skin because it is the only CURVED screen MOLED exactly to the picture tube curvature. It is cut precisely to the curvature of the picture tube. The fit is so tight that the static electricity is sufficient to keep it in place. We also include some invaluable reusable tape for a more secure fastening.
- The filter material is that we use is just right, not too dark nor too light. The result is a real non-glare effect.
- We are sure that you will never take your Screen off that we offer an unconditional money back guarantee. 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 the companies, like ours, who are making main by mail should visit their street address have a phone number (for questions and orders) accept COD's, not every one likes to send checks to a PO box. We offer the convenience of charging your purchase to major credit cards.
- How come we are the only green screen people doing it? (Order your ALPHA GREEN SCREEN today. $12.50)

SPECIAL THIS MONTH!

3 power relays under your control

$8.95

DISK DRIVE EXTENDER CABLE, FREE YOUR MINI-DRIVES.

End the daisy-chains mess once and for all. Fits all mini-drives. Percom, Aerocomp, Shugart, Micropcs, MTI, Vista, Peretec, 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 for the dust out. High quality gold plated contacts. Computer grade 34 conductor cable. Tested and guaranteed. Get one for each drive . . . ONLY $8.95

INTERFA CER-80: the most powerful Sense-Control module.
- 24 industrial grade relay, single pole double throw isolated contacts 2 Amp @ 125 Volts. TTL latched outputs are also available to drive external inact state relays.
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- Assembled, tested. 90 days warranty. Price includes power supply, cable connector, superb user's manual. $109.

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(212) 296-5916

Authorized User Information:

Order Date:

Order Number:

Total Amount:

Shipping Method:

Payment Method:

Signature:

Date:

Thank you for your order!
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 KT! products, I have been asked by KT!’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, ball 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 KT! 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 KT!
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 KT!
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 KT!
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 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, KT! 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, KT! 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 8800 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 KT! Super Adventure seems
IT'S HERE ......

ALPHA JOYSTICK for MODEL III

Only $49.95

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.
Fully assembled, complete. Ready to plug-in and use.

TOLL FREE ORDER LINE (800) 221-0916
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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.

JUST IN! LATEST RELEASE FROM BIG FIVE

DEFENSE COMMAND

The Galaxy Invaders have returned in this exciting new twist on the ever popular Invasion theme.
You are in command. You must protect the vitally important nuclear fuel canisters from fleets of attacking aliens.
Plays on Mod I & Mod III, with or without Alpha Joystick. With sound!
16K protected TAPE Mod I + III . $15.95
32K protected DISK Mod I + III . $19.95

TOLL FREE ORDER LINE (800) 221-0916

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.
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 TRACKCESS 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

Dear Name:

Glad you asked. The disk supplied with the game recognizes TRACKCESS, Super Utility, and all other byte-by-byte copying programs but when it senses them it seize control of the computer, overrides the operating system, and relays information to your CRT, foiling 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 4 1/2.

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 the 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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Tuttle (501) 323-9391
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BERKELEY MICRO COMPUTERS
Boulder (121) 564-1122
COMPUTER INFORMATION EXCHANGE
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COMPUTER SERVICE CENTER
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DOMINICAN REPUBLIC
RADIO SHACK
Santo Domingo (809) 565-9241
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 drives 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.

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-improving characteristic of magnetic data recording.

The DOUBLER II, which is fully compatible with the previous DOUBLER, is supplied with DBLDOs™, a TRS80® compatible disk operating system.

The DOUBLER II sells for $27.95, including the DBLDOs diskette.

Circuit misoperation 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 misoperation 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.

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 year.

True, Model I TRS80® diskettes can be read on a Model III. But first they must be converted and recorded for Model III operation.

And you cannot write to a Model I TRS80® diskette. Not with a Model III. You cannot add a file. Delete a file. Or in any way modify a Model I TRS80® diskette with a Model III computer.

Furthermore, your converted TRS80® diskettes cannot be converted back for Model I operation.

TRS80® is a one-way street. And there’s no re-treating. A point to consider before switching the company’s payroll program from Model I to Model III.

Real software compatibility should allow the direct, immediate interchangeability of Model I and Model III diskettes. No read-only limitations, no conversion-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 to your Model III, and you can run double-density Model III diskettes.

There’s no conversion, no re-recording.

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

And vice-versa.

Just have the correct OS-80 disk operating system — OS-80, OS-80D or OS-80III — 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.”

Required 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 TRS80, you can work at the track sector level, defining and controlling data formats — in BASIC — to create simple or complex data structures that are executed via TRS80 DOS 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-80III — for the Model III of course — supports both single- and double-density operation. OS-80D and OS-80III each sell for $49.95.
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-disc 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 (#26-4507) 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 hard-goods 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 2500 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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Skybusters II is an aerial war game pitting two nations against each other. Battle your opponent's forces, and graphically displayed explosions give each battle a vivid reality. The scores for both countries are constantly updated at the bottom of the display. Experience the thrill of war at its best with Skybusters II. Requires 32K RAM, Applesoft in ROM and game paddles. Documentation is included.

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Ball Turret Gunner is a deep space, laser attack game. As a member of the Ball Turret Gunner crew, you are at the console of the spaceship: your mission—to destroy the enemy! Multiple levels of difficulty, optional sound effects, superb graphics and complete documentation enhance this program. Model I only.

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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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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.
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.

Sincerely,

Debra L. Boudrieau
Director of Marketing
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 because 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. S = 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:

1% 1183 MS 960 Z2! 412 R5h 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 1%, M$, Z; 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 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 can be used to rotate the 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 changing 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
$59.95

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.

DIFLOWER/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 YIN 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 Dvokar 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.

DICAL/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. UPCODE/FLT converts all lowercase output to uppercase (some printers cannot handle LC) and ADLFL/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.

---

80 Microcomputing, April 1982 • 41
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 visible non-system files, all /CMD files, all /BS 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 NEWSOS80 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.
Centerreach, NY 11720
Models I & II, 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 NEWSOS 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 NEWSOS, 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, NEWSOS 2, LDOS, NEWSOS80 Ver. 1 and 2, DOUBLELDOS and TRSOS50. 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-off-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: TRSOS50 and NEWSOS 2. Only one works with LDOS. In mode 1 you just type “ERASE file/bs 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 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 grams 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 NEWSOS80. Only two are compatible with NEWSOS50. The first one is simple—just type ERASE. The second is more user-friendly. It asks for a name or a number and then deletes the file.

“All the programs are well documented with many examples.”

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 grams 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).

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Erase gives you three different modes for killing files. All three are compatible with NEWSOS80. Only two are compatible with NEWSOS50.
A beautiful match, the Smartmodem and the TRS-80. Your TRS-80 can talk with other computers, over the telephone lines. And with no acoustic losses or distortions. Access time-sharing systems and information utilities such as the Source, CompuServe, and MicroNet. Direct hook-up with no interference noises. The Smartmodem hooks to the telephone line just like a modular telephone, simply insert in a wall jack. "Love at first sight"—your TRS-80 and the Smartmodem!

Brawny—because it does so many things. Auto-dial and auto-answer features built in. With the Smartmodem, your TRS-80 can automatically dial the telephone, answer the telephone, receive and transmit, and hang up the telephone. Completely unattended. Pulse dialing or Touch-Tone.** The Smartmodem can be connected to any telephone system in the U.S., because it allows pulse dialing, Touch-Tone dialing or a combination of the two. FCC approved. Program controllable in any language using ASCII character strings. This is a unique feature of the Hayes Smartmodem.

Brainy—because it does them all so simply. Seven LED indicators on the front panel give you visual signals of the status of the Smartmodem:

- MR — Modern Ready
- SD — Send Data
- CD — Carrier Detected
- etc.

The audio monitor feature lets you "listen in" on the call being dialed and the connection made. You are immediately alerted to busy signals, wrong numbers, etc. Over 30 different commands can be entered directly from your TRS-80 keyboard, including the unique "Set" commands which allow you to select and change various optional parameters such as dialing speed, escape code character, length of time for a dial tone, and number of rings to answer. There are 17 "Set" commands. The Smartmodem is completely compatible with the Bell-103 type modems, the type of modem most time-sharing systems have. Operation can be in full or half-duplex, with a transmission speed of 0-300 baud.

The Smartmodem is ready to "get-together" with your TRS-80. TRS-80 Model II and TRS-80 Color Computers have RS-232 serial ports and can immediately interface with the Smartmodem. Expansions that permit use of the Smartmodem with TRS-80 Model I and Model III are available through your TRS-80 dealer.

Match your TRS-80 with a Hayes Smartmodem for a sophisticated, high performance data communication system. Available at computer stores nationwide (except TRS-80 dealers) — call or write for the location nearest you. And don't settle for anything less than Hayes.

Hayes Microcomputer Products, Inc. 5835 Peachtree Corners East, Norcross, Georgia 30092 (404) 449-8791

Hayes Stack™ Microcomputer Component Systems

Your TRS-80 computer and the Hayes Stack™ Smartmodem.

Beauty, Brains, and Brawn!
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 have 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.

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.

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 alphacharacters 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 the data in the fields without clearing the entire screen. Break breaks and Enter signals play 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 or 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.
MODEL II
Business and Personal Word Processor

Wizard of Words™

$259

80 Microcomputing
80 Pine Street
Peterborough, NH 03458

April 1, 1982

Re: 80 Microcomputing Ad

Gentlemen:

The Wizard of Words is ready!
The Wizard of Words is for the Model II system.
The Wizard of Words is easy and friendly. It offers a combination of features not found on any other word processor for the Model II:

* You can justify the right margin or center your text.
* You edit your text with 22 single keystroke commands.
* You choose slow or fast text scrolling on the screen.
* You can put command prompts on-screen when you want.
* You can move blocks of your text in and out of files.
* You preview documents: what you see is what you get.

The Wizard of Words has a great print processor. You can automatically number and title pages, use trimmed letterheads, adjust your top and bottom page margins, select different paper sizes, and choose continuous form or single page printing.

NO OTHER WORD PROCESSOR DOES AS MUCH AND IS AS REASONABLY PRICED AS THE WIZARD OF WORDS ON THE TRS-80 MODEL II.

Sincerely yours,

Robert R. Gibson

(Wizard of Words)

G·A·P inc.
727 Terminal Bldg.
Lincoln, NE 68508
(402) 476-7202
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, no 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 supersharp with an inexhaustible 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.

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 fleeps 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 what 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.

You drive your ship, or your own speed, and the computer generates the maps, 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.

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 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 0 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, cruisers and fyers which either solidly own an area (in the case of bases) or move independently of the mothership in search of enemy units (in the case of the cruisers and fyers) 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.

---

**Table 1. Benchmark Comparison**

<table>
<thead>
<tr>
<th>DOCUMENTATION</th>
<th>BENCHMARK</th>
<th>Profile II</th>
<th>Profile +</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the level of user sophistication?</td>
<td>beginner</td>
<td>competent</td>
<td>poor</td>
</tr>
<tr>
<td>Quality of supporting documentation</td>
<td>sufficient</td>
<td>excellent</td>
<td>excellent</td>
</tr>
<tr>
<td>(lacks index)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EASE OF USE**

| General use of entire DBMS | 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 | 15 |
| (alphabetic, numeric, protected, + and -) | (all as previous + date fields) |

**Maximum number of records possible (key field only)**

| 20,000 | 20,000 |
| (with 4 drives) | (with 4 drives) |

**Maximum number of records possible (with 500 characters per record)**

| 1800 | 2400 |
| (with 4 drives) | (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/report | 4 screen/report |

**SORTING/SEARCHING OF THE FILE**

| Number of layered sort levels possible | 0 | 0 |
| Can associated fields be clustered into search groups | yes | yes |
| Maximum sort length | 30,000 characters | 30,000 characters |
| Maximum number of sort criteria | 36 fields | 36 fields |
| Number of sort comparison criteria | 4 | (GT,LT,GE,LE,Range) | (GT,LT,GE,LE,Range) |

Table continues
MISSION: TO DEFEND... AND SURVIVE!

Stellar Escort

by Jeff Zinn

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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 DBM's 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.

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 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, invulnerability, decays, size of blaster and power gun 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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builder: $9.95
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 lexicographer, 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 that 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 pact were not disclosed.
The terms of the accord were not disclosed.
The terms of the consent 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

puter 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 Washitewa Ave.
Ann Arbor, MI 48104
$40

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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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.

With the new board installed, the system worked perfectly. It was particularly gratifying to be able to ask for DIR:08 (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 DOSes, 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 lower case 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 8-1/2-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 ballistric printhead with true descendents. It handles paper widths from 1.5 to 9.5 inches (tractor feed only—an optional single-sheet feeder is available for 8-1/2 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 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.
PKS/UPKS—Compresses strings to save disk space.
ETIMS—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.
HEXS—Converts numbers to hexadecimal strings.
RESTORE—Allows you to set READ pointer to location of choice.

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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:

```
ABCDEFHIJKLMNOPQRSTUVWXYZabcdeghijklmnopqrstuvwxyz123456789*/\"#%'
ABCDEFHIJKLMNOPQRSTUVWXYZabcdeghijklmnopqrstuvwxyz123456789*/\"#%'
ABCDEFHIJKLMNOPQRSTUVWXYZabcdeghijklmnopqrstuvwxyz123456789*/\"#%'
```  

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 programmed 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 (64 by 64 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 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 AJ 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, n

"I BOUGHT IT"
"My biggest loss of programming time using Snappware's AUTOMAP and AUTOFILE is spent inserting my diskette."
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When working with direct files or creating a formatted screen, Autofile and Automap are indispensable aids.

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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.

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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 the market. However, the advertising is a little misleading on several features. The RS-232 port must be used for modern 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 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 nice 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 1000-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.
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"My biggest loss of programming time using Snappware's COLLEGE EDUCATED GARBAGE COLLECTOR is spent inserting my diskette."

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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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Micromouth
Micromint Inc.
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$150 Kit, $175 assembled (Model I)
$200 assembled (Model III)
by Dennis Bathory Kitsz

I'm the TRS-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 Digitaker.

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 Digitaker 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 calls the sign-on phrase (the only one in a female voice), "This is Digitaker." 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 + B) 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), are as 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.
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 (grato), 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)

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 on 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, now 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 vaah—BLEAAAAh!—woo—woinggnggg). 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 Miniset 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 Miniset 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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**Computer Programming in Basic**  
A Self Instruction Course in 4 Volumes  
Ian Williamson, Rodney Dale & Tim Eliott  
Cambridge Learning Enterprises  
Cambridge, MA  
Softcover  
by Kenneth Delp  
and Bruce Eldridge

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.

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**  
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$29 disk  
by David G. Bartlett

Tanktics  
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 succeeded in keeping the best part of their board games and letting the computer do the tedious parts for you.
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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.

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DESIGN SOLUTION INC.
BOX 1225, FAYETTEVILLE, AR 72701
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.

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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| LDOS + EDAS                                | $179.00 | $29.00 |
| LDOS + FED (FILE EDITOR)                   | $149.00 | $20.00 |
| LDOS + LED (LDOS EDITOR)                   | $139.00 | $20.00 |
| LDOS + FED & LED                           | $160.00 | $50.00 |
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| **"LC" LANGUAGE**                         | $229.00 | $50.00 |
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| **ULTRA TREK**                             | $129.00 | $19.95 |
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*Offer good during April 16 & May, 1982

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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...

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

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.

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!
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Are you the seeker of lost treasures in an enchanted realm of magical beings? Perhaps you’re an astronaut, thousands of light years from earth, searching the galaxy’s rim for the fabulous treasures and advanced technologies of a long-dead civilization. Maybe you’re the plunderer of ancient pyramids in a maddeningly dangerous land of crumbling ruins, and trackless desert wastes.

Imagine.
you wish to soar to other worlds, to behold wonders never beheld by mortal eyes, to dream unrestrained to the furthest limits of your imagination.

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The ADVENTURE SERIES by Scott Adams has been reviewed by every major microcomputing magazine, receiving only the highest praise for its mind-puzzling challenge & refreshing originality. Tens of thousands of adults and children have matched wits with the Adventure Master. Now, it's your turn. If you crave the challenge and panorama of the exotic, touched with sparkling humor, then the Adventure Series is for you.

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Another winner from Radio Shack.

Line Printer VIII

Line Printer VIII
Tandy/Radio Shack
Fort Worth, TX
$799

Richard K. Wallace
3708 B Arizona St.
Los Alamos, NM 87544

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 cpi.

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 cpi. 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 9½ 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

<table>
<thead>
<tr>
<th>DEC</th>
<th>SYMBOL</th>
<th>DATA/WORD PROCESSING MODE</th>
<th>GRAPHICS MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>08 nn</td>
<td>BS</td>
<td>Backspace nn dot columns</td>
<td>Ignored</td>
</tr>
<tr>
<td>10</td>
<td>LF</td>
<td>Full Line Feed</td>
<td>9/48 inch LF</td>
</tr>
<tr>
<td>13</td>
<td>CR</td>
<td>Carriage Return</td>
<td>Carriage Return</td>
</tr>
<tr>
<td>14</td>
<td>SO</td>
<td>End Underline</td>
<td>Ignored</td>
</tr>
<tr>
<td>15</td>
<td>SI</td>
<td>Start Underline</td>
<td>Ignored</td>
</tr>
<tr>
<td>18</td>
<td>DC2</td>
<td>Select Graphic Mode</td>
<td>Ignored</td>
</tr>
<tr>
<td>19</td>
<td>DC3</td>
<td>Ignored/Select DP Mode</td>
<td>Ignored</td>
</tr>
<tr>
<td>20</td>
<td>DC4</td>
<td>Select WP Mode/Ignored</td>
<td>Ignored</td>
</tr>
<tr>
<td>27 1-9</td>
<td>ESC</td>
<td>Proportional Spacing</td>
<td>Ignored</td>
</tr>
<tr>
<td>27 14</td>
<td>ESC</td>
<td>Start Elongation</td>
<td>Start Elongation</td>
</tr>
<tr>
<td>27 15</td>
<td>ESC</td>
<td>End Elongation</td>
<td>End Elongation</td>
</tr>
<tr>
<td>27 16</td>
<td>ESC</td>
<td>Positioning,</td>
<td>Positioning,</td>
</tr>
<tr>
<td>n1,n2</td>
<td>SPC</td>
<td>Dot Column</td>
<td>Dot Column</td>
</tr>
<tr>
<td>27 17</td>
<td>ESC</td>
<td>Select Proportional Char.</td>
<td>Ignored</td>
</tr>
<tr>
<td>27 19</td>
<td>ESC</td>
<td>Select Ordinary Char.</td>
<td>Ignored</td>
</tr>
<tr>
<td>27 20</td>
<td>ESC</td>
<td>Select Condensed Char.</td>
<td>Ignored</td>
</tr>
<tr>
<td>27 21</td>
<td>ESC</td>
<td>Full Reverse Line Feed</td>
<td>Ignored</td>
</tr>
<tr>
<td>27 22</td>
<td>ESC</td>
<td>Half Forward Line Feed</td>
<td>Ignored</td>
</tr>
<tr>
<td>27 23</td>
<td>ESC</td>
<td>¼ Forward Line Feed</td>
<td>Ignored</td>
</tr>
<tr>
<td>27 24</td>
<td>ESC</td>
<td>Repeat Print Data</td>
<td>Repeat Prt. Data</td>
</tr>
<tr>
<td>n1,n2</td>
<td>RS</td>
<td>n1 = # repeats, n2 = data</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>RS</td>
<td>Ignored</td>
<td>End Graphics</td>
</tr>
</tbody>
</table>

Table 1. Printer Central Codes
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 vertically 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 (1/4 line) and twelve (1/2 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 character control 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

```
ABCDFGHJKLMNQRSTUWXYZ 0123456789 Condensed Mode
ABCDFGHJKLMNQRSTUWXYZ 0123456789 Condensed-Elongated Mode
ABCDFGHJKLMNQRSTUWXYZ 0123456789 Normal Mode
ABCDHIMNOSTUWXYZ 0123 Normal-Elongated Mode
ABCDFGHJKLMNQRSTUWXYZ 0123456789 Proportional Mode
ABCDHIMNOSTUWXYZ 012345 Proportional-Elongated Mode

ac c u t e f a c e o u t a c h e s e n e u r o c o m m o n symbols

Fig. 1. Print Mode Graphics

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

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

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, hypenation, 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 (super-scripts, sub-scripts, 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.
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- Hi-res dot graphics • Proportional spacing • Text justifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prism 80</td>
<td>$700</td>
</tr>
<tr>
<td>IDS Paper Tiger 560G</td>
<td>$1100</td>
</tr>
<tr>
<td>Prism 132 (Color)</td>
<td>$1995</td>
</tr>
</tbody>
</table>

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An annotated list of ROM literature.

ROM Bibliography

Paul F. Secord
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Articles 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 280 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 lower-case 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 280 assembly language.

The Books
The following references are listed in order of publication:

THE NEW DIMENSION IN WORD PROCESSING
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Word processing will never be the same.

CopyArt* from Simutek is the first word/graphics processor for TRS-80 Mod. I & II, or PMC-80 and 81. CopyArt gives you unmatched editing flexibility. Change sizes and styles of type in a single line. Insert or delete characters, words and lines. Underline, bold face and make block moves simply. Page, headers and footers are a snap. You have complete format control, including justification, centering and flush right copy positioning.

And that's just the beginning.

CopyArt* is also a graphics generator that can make words and letters in any size, produce graphs, charts, cartoons, logos, borders and illustrations. Business graphs and charts can be intermixed with text to produce reports of exceptional quality. CopyArt's scrolling capability frees you from the bonds of a 64 column screen. CopyArt can simulate a page up to 255 characters wide.

Commands in CopyArt are as simple as 'I' for Insert, 'B' for Block move, etc. CopyArt even supports DOS commands like DIR, ERASE and KILL. A special HELP command gives you instant access to an on-line manual.

CopyArt* makes word processing more flexible than ever before. It supports the full graphics character sets of Epson and Okidata printers as well as the proportionally spaced justification superscripting, and subscripting capabilities of Centronics' 737 and 739 printer and Radio Shack's Line Printer IV. On non-graphic printers (C-Illot, Diablo, Radio Shack Daisy Wheel, and others with the ability to turn off linefeeds) CopyArt creates pseudographics by overstriking standard characters. On every printer, especially dot matrix printers, the double printing feature produces unbelievably crisp copies.

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1-12
"ROM is stored in binary form but can be read as hexadecimal bytes."


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:

0000 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.

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 3FFFFH) 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 fall 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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"ROM translates Basic program statements into machine language..."

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 Source, a bi-monthly (1800 Ada St., Lansing, MI, 48910). One last caveat. A good monitor/add-on chip that single steps through a program (including ROMs), and which displays register and flag 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, you change the disk drive. 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 input of 86 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 RAM chips. Of course, you can also put 64K's in, 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 4K's of memory 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 64K which leaves the lower 64K free for user programs.

What you end up with is 41K for user programs, 8K for FLEX and another 8K above FLEX for the screen 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 you to have 24 lines by 42 character display. That's better than an Apple 2!

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 31 disk system when you're running FLEX or OS-9. We are supporting single or double sided, some systems are so densely spaced, 35, 40 or 50 tracks per side. If you use dual sided drives, the maximum is three drives because we use one disk 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 use each drive's stepping rate and drive type (OS or DS - 50 or 60).

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 bit in memory so to do something just like boot in FLEX or OS-9, when you turn off the roms, you will have a bootable 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 chips to work and this seems to be the case most of the time. So, 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 64K for user programs. If you just put in memory for FLEX and use the Basic hooks for IO, 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 work very well, at all with 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 also turns out that 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 change it. You can also put COLOR TURBO (color software) and have it in FLEX disk. Single ROM disk and FLEX for only $14.90, set up and ready to go. FLEX with Ed, Asmb and installation disk is $199

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Z BASIC 2.2 does not support these basic commands:

1. ATN, EXP, COS, SIN, LOG, TAN, and exponential. (However, subroutines are included in the manual for these functions.)
2. ERROR, ON ERROR GOTO, ERL, ERROR RESUME.
3. No direct commands like AUTO, EDIT, LIST, LIST ETC, although these commands may be used when writing programs.
4. Others NOT supported: CDIB, CINT, CSNG, DEFNN, FIX, FRE.
5. Normal CASETTE I/O, Z BASIC supports its own SPECIAL CASETTE I/O statements.

6. SOME BASIC COMMANDS MAY DIFFER IN Z BASIC. 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 B=50 and type: Z BASIC. Remember, you can merge compiled programs together to fill memory.

Z BASIC 2.2 SPEED COMPARISON DEMO

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

Z BASIC 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.
Z BASIC Execution speed MOD 1, LEVEL II: 0 MIN 18 SEC.
BASIC Program size (WITHOUT VARIABLES): 895 BYTES
Z BASIC Program size (WITHOUT VARIABLES): 2733 BYTES
(remember that the Z BASIC program includes an 1879 byte subroutine package.) Program shown exactly as compiled and run in BASIC and Z BASIC.
Lots of value for a modest price.

Line Printer VII

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 US 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); POKIng an ASCII code in that address sends that code to the LP VII's 90-character buffer. The character equiva-
"The LP VII... comes at a price low enough for the hobbyist to consider seriously."

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 of 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 in a byte sent to the printer. For example, to print only the top dot, number 0, use LPRINT CHR$(0). 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 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 2n to 128 to compute the appropriate byte.

Once I realized that each line had 480 columns of seven dots each and that a single byte's 8½ by 11-inch sheet of paper has 68 lines, I saw I was working on a 480 by 462 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 try 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 POKE'd 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 appeared during operation. 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.

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Basic Misinterpreter

Basic Misinterpreter
Kitchen Table, Inc.
Sri Lanka

David D. Busch
515 E. Highland Ave.
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, GO-

SUB 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, ES(n), while the equivalent, phonetic words are loaded into another array, SP$ (n).

Basic Misinterpreter (?BASIC, for short) currently has 18 key word/phonet 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 phonetic 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 $.”

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 $S 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, $S 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 $S 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 phonetic 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 N$ 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,
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 10) 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 PLINT for PRINT, a random character could be inserted in the key word. Here is a subroutine to get you started:

```
705 E = RND(LEN(GP(SPS(G))))
706 F = RND(000 + 65)
707 MID$(S, E, F) = CHR$(F)
```

That addition chooses a random position (E) in the key word (E) and places a random character from A to Z. The character for the misspelled ones in the Data lines if you want the phone 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**

```
10 CLEAR 10000
20 DEFINT A-Z
30 WRDS=18
40 LS=256
50 DIM ES(WR), CPS(LS), SPS(WR)
60 QS=CHR$(34)
70 CS=CHR$(58)
80 SPS=CHR$(32)
90 CLS

180 ' ** READ WORDS INTO ARRAY **

110 : FOR N=1 TO WRDS
120 : READ SPANS(N)
130 : READ ES(N)
140 : ES(N)=SFS+ES(N)
150 : SPANS(N)=SFS+SPANS(N)
160 : NEXT N
170 GOTO 210

180 DATA IF,OP, RUN, FAN, INPUT, IMPUT, LIST, LAST, END, FIN, PRINT, PLINT
,READ, REED, DATA, DADA, THEN, THAN, FOR, FAR, STOP, STEP, NEXT, NET

Program continues
```

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Program continued

190 DATA CLS,CLS,GOTO,GOT0,RESTORE,RESTART,GOSUB,GSK,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)="LDAS" GOTO 850
280 IF LEFT$(A$,3)="" GOTO 850
290 IF LEFT$(A$,3)="NEW" GOTO 850
300 IF LEFT$(A$,3)="PRINT" GOTO 1290
310 IF LEFT$(A$,4)="EDIT" GOTO 1320
320 IF A$="" :GOTO 210
330 ******* CHECK FOR QUOTES OR COLONS *******
340 A$=A$+CHR$(32)
350 B=INSTR(A$,3)
360 C=INSTR(A$,5)
370 IF C=0 AND B=0 GOTO 480
380 IF B=0 GOTO 460
390 ******* FIND POSITION OF SECOND QUOTATION MARK *******
400 W=INSTR(A$,B+1)
410 B2=INSTR(W$,Q$)+1
420 IF CB GOTO 460
430 IF CB2 GOTO 460
440 GOTO 480
450 ******* IF COLON OUTSIDE QUOTES - TWO STATEMENTS *******
460 IF CB>0 THEN PRINT "ONLY ACCEPTING ONE STATEMENT PER LINE TO
AY" :GOTO 210
470 ******* CHECK FOR BEGINNING LINE NUMBER *******
480 TST$=""
490 IF TST$="" THEN GOTO 920
500 IF MID$(A$,T,1)=CHR$(32) GOTO 540
510 IF TST$=TST$+MID$(A$,T,1)
520 IF NEXT T
530 ******* IF LINE NUMBER VALID, ASSIGN TO ARRAY POINTER LN **
540 LN=VAL(TST$)
550 IF LN>LS THEN LN=LS-9
560 IF LN<1 PRINT "Huh?" :GOTO 210
570 ******* LOOP TO SEARCH FOR ALL KEYWORDS *******
580 IF LN=1 TO KR
590 IF A$=CHR$(LS)+CHR$(SG)$)
600 IF Y>0 GOTO 660
610 IF Y<0 GOTO 660
620 ****** ASSIGN LINE TO FINISH PROGRAM ARRAYS *******
630 CPS$(LN)=A$
640 GOTO 210
650 ******* CHECK TO SEE IF KEYWORD IN QUOTES *******
660 IF Y<0 GOTO 660
670 IF Y>0 GOTO 660
680 GOTO 610
690 L=LEN$$(E$(G))
700 ****** SUBSTITUTE PHONE KEYWORD *******
710 MIDS$(A$,Y,L)=E$(G)
720 GOTO 610
730 ****** SAVE PROGRAM TO DISK *******
740 GOSUB 750 :GOTO 780
750 NES=MIDS$(A$,INSTR(A$,CHR$(34))+1)
760 IF RIGHTS(NES,1)=Q$ THEN NES=LEFT$(NES,(LEN$(NES)-1))
770 RETURN
780 OPEN "O",1,NE$
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<tr>
<td>Planetoids</td>
<td>19.95</td>
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**For Kiddies**

<table>
<thead>
<tr>
<th>Game</th>
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<tbody>
<tr>
<td>Human Adventure</td>
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<td><em>Old McDonald</em></td>
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<tr>
<td>Frog</td>
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**Color Computer**

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<tr>
<td><em>Learning Lab</em></td>
<td>49.95</td>
<td></td>
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</tbody>
</table>

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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.

Omnitern 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 reformating 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 reformating, 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
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. It 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 waits 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 lowercase 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.

---

**Fig. 1.**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>@</td>
<td>Omniterm Command Mode—Hit BREAK to quit</td>
</tr>
<tr>
<td>P</td>
<td>PRINTER</td>
</tr>
<tr>
<td>R</td>
<td>SCREEN REFORMATTING</td>
</tr>
<tr>
<td>C</td>
<td>CR SUPPRESSION</td>
</tr>
<tr>
<td>L</td>
<td>LFSUPPRESSION</td>
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<tr>
<td>D</td>
<td>DUPLEX</td>
</tr>
<tr>
<td>E</td>
<td>ECHO</td>
</tr>
<tr>
<td>G</td>
<td>CRLF GROUPING</td>
</tr>
<tr>
<td>F</td>
<td>INPUT TO BUFFER</td>
</tr>
<tr>
<td>O</td>
<td>OUTPUT FROM BUFFER</td>
</tr>
<tr>
<td>Baud Rate = 300</td>
<td>Parity Errors: 0</td>
</tr>
<tr>
<td>Data Bits = 7</td>
<td>Framing Errors: 0</td>
</tr>
<tr>
<td>Stop Bits = 1</td>
<td>Overrun Errors: 0</td>
</tr>
<tr>
<td>Parity = EVEN</td>
<td>Buffer: 0 of 25742 used</td>
</tr>
</tbody>
</table>

---

80 Microcomputing, April 1982 • 95
"While other terminal programs have the ability to support code conversions, Omniterm is the only one...where the operation is self-contained."

Five Utilities

Five additional programs included on the disk are the following utilities:
- BINHEX/CMO converts binary files to ASCII hex files so they may be transmitted in standard format.
- HEXBIN/CMO converts the ASCII hex files back to binary.
- BINERR/CMO 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/CMO 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.

Five file-setting table files are supplied with Omniterm. If necessary, 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 lower case.
- 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-
“Dumb terminal programs have the Basic ability to communicate, that’s all... smart terminal programs include many additional programs.”

| Q | Quit Omniterm and go to DOS |
| L | Load Omniterm Settings |
| A | Auto Sign-on Message Change |
| C | Cold Omniterm Restart |
| S | Save Omniterm Settings |
| R | Reopen Input Buffer |

System Commands—Hit BREAK to quit

![Fig. 3.](image)

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.](image)

with Tymnet and the Source is included with this file.

- **SOURCE/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.

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Michael M. Finefrock, Ph.D.
The College of Charleston
Charleston, SC 29424

Will proofreading programs turn your flawed, imperfect scrubbings 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.

<table>
<thead>
<tr>
<th>Name</th>
<th>CHEXTEXT</th>
<th>HEXSPELL</th>
<th>MICROPROOF</th>
<th>MIZ'SPELL</th>
<th>PROOFREADER</th>
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<td>Price</td>
<td>$59.95</td>
<td>$69</td>
<td>$184.50</td>
<td>$50</td>
<td>$84</td>
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<tr>
<td>Model II available?</td>
<td>No</td>
<td>No</td>
<td>Yes($49.50)</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Model III available?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pages of Documentation</td>
<td>8</td>
<td>7</td>
<td>30</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>No. of Disks in package</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Comes with DOS?</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>TRDSOS</td>
<td>File XFER</td>
</tr>
<tr>
<td>Comes with LCDVR?</td>
<td>N/A</td>
<td>No</td>
<td>No</td>
<td>LC/ADM</td>
<td>LCOVR/CON</td>
</tr>
<tr>
<td>Total size in grams</td>
<td>77</td>
<td>101</td>
<td>74</td>
<td>69</td>
<td>174</td>
</tr>
<tr>
<td>No. Drives, MEM required</td>
<td>2-48K</td>
<td>2-48K</td>
<td>1-32K</td>
<td>1-48K</td>
<td>2-32K</td>
</tr>
<tr>
<td>Word processor access?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Requires ASCII text?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Max. letters per word</td>
<td>32</td>
<td>17</td>
<td>32</td>
<td>any</td>
<td>40</td>
</tr>
<tr>
<td>Dictionary size, words</td>
<td>10,000</td>
<td>20,000</td>
<td>30,000</td>
<td>18,000</td>
<td>38,000</td>
</tr>
<tr>
<td>Main dictionary type</td>
<td>Literal</td>
<td>Code</td>
<td>Packed</td>
<td>Code</td>
<td>Hashing</td>
</tr>
<tr>
<td>Creates alternate?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Expand dictionary?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Add to dictionary?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Auto add to dictionary?</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Delete from dictionary?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Learned word file?</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Create word file?</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Correct source file?</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Display context?</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Full text scroll?</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Elect to exit program?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Process another?</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

*Total price with Correcting feature and Word Processing Conversion.
#Total price with Proof Edit.

Table 1. A Summary Presentation for Proofreading Program Features
THE $595* SMART TERMINAL

The Heath 19 Smart Video Terminal gives you all the important professional features you want in a terminal, all for under $500.* You get the flexibility you need for high-speed data entry, editing, inquiry and transaction processing. It's designed to be the backbone of your system with heavy-duty features that withstand the rigors of daily use.
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HEATH/ZENITH
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*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.

†Heath Company and Veritechnology Electronics Corporation are wholly-owned subsidiaries of Zenith Radio Corporation. The Heathkit Electronic Centers are operated by Veritechnology Electronics Corporation.
"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 create a file for each program, but it proved well worth the time I spent. By using the lower case 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, speech; words run together, alot; improper contractions, already and wo'n't; incorrect prefix, encorrect; incorrect suffix, truly; incorrect plural form, dictionaries; dropped double letter, irrelevant, rightfully, referred and written; and also some simple misspellings, comparative and abominations.

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.

Mr. Wayne Green, Publisher
80 MICROCOMPUTING
80 Pine St.
Peterborough, NH 03458

Dear Mr. Green,

Hereewith, at long last, I am enclosing my comparative review of five proofreading programmes for use on the TRS-80 Model I. As I believe you are already well aware, such programs are not an absolute panacea for the woes of the word processor user—they do not function as electronic dictionaries and and wo'n't tell the user when he has chosen an encorrect or irrelevant word for his context, nor will they catch the grammatical errors we all are prone to make alot of. But they are quite rightfully referred to as "spelling checkers," for they do give the rather an opportunity to catch typographical errors and/or faulty usage such as irregardless and ain't, tho such abominations do seem to crop up more frequently in the colloquial speech of Americana.

The principle advantage to having such a peace of software in addition to a word processor is that proofing what one has written 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 truly yours,

Will Fullydome, B.S.

Fig. 1

Table 2. Test Results of the Five Proofreading programs for the Model 1

<table>
<thead>
<tr>
<th></th>
<th>Correct Words Declared</th>
<th>True Errors Detected</th>
<th>Wrongly Used Words Detected</th>
<th>British Usage Caught</th>
<th>255-Word Test Speed</th>
<th>1650-Word Test Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEXTEXT</td>
<td>50</td>
<td>31</td>
<td>14</td>
<td>5</td>
<td>2</td>
<td>1:49</td>
</tr>
<tr>
<td>HEXSPELL</td>
<td>44</td>
<td>15</td>
<td>15</td>
<td>4</td>
<td>3</td>
<td>1:41</td>
</tr>
<tr>
<td>MICROPROOF</td>
<td>22</td>
<td>13</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>1:02</td>
</tr>
<tr>
<td>MIZSPELL</td>
<td>26</td>
<td>15</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td>1:39</td>
</tr>
<tr>
<td>PROOFREADER</td>
<td>26</td>
<td>10</td>
<td>14</td>
<td>2</td>
<td>1</td>
<td>4:12*</td>
</tr>
</tbody>
</table>

*The combined time of Proofreader and Proof-Edit.

November 1st, 1981

Mr. Wayne Green, Publisher
80 MICROCOMPUTING
80 Pine St.
Peterborough, NH 03458

Dear Mr. Green,

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Very truly yours,

Will Fullydome, 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 grams), 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 CHEXTX/ 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 abominations 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-
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 Chextex 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 single 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 Chextex, 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 SPICHN, the program files, and a compiled code dictionary (55 graces). 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 as 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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<tr>
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<th>MODEL I &amp; III DISK Cost</th>
</tr>
</thead>
<tbody>
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<td></td>
</tr>
</tbody>
</table>

"... commonly used words accumulate at the front of the vocabulary where they are found fastest."
"If speed were the sole consideration then Phil Manfield... would be king."

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Phone
Programmer's Program
Year Subscription
Year Subscription
Type of Computer

*All software available on cassette for ATARI 400/800, APPLE II, MODEL I, III, COLOR. On diskette for the APPLE II+, MODEL II, III, ATARI 400/800.

The programming of Microproof should be easier to use. Keys selected for the two principal editing 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 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 checks 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's spell

The author of Miz's spell, Arnold Schaeffer, started college about the same time that Programs Unlimited began to market his 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 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 words total), plus PRINTDIC/CM and ADDTODIC/CM 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 your text, correct, and resubmit the corrected text. All of this is controlled by the Microproof program, 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 f 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, detect-

Reader Service for facing page 28
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“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, speech, 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.

Offering the largest stock dictionary of programs tested (109 grams), the package comes with utilities for editing and

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106 • 80 Microcomputing, April 1982
Your computer is fantastically fast...once it knows what to do. You probably realize that a computer is really the combination of hardware and software, working together smoothly, to give you what you want. Either one alone is useless. Software is really the key...the “mind” of a computer system. Every project or task you want to do requires a new specific software application to make it behave exactly the way you desire.

Of course, you may be able to “force-fit” an application into some existing canned program you have, but to really get results, you need a separate application program to run on your computer.

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The custom programs you generate from this software provide for: Data Entry, Additions, Changes, Record Locating & Searches, great variety of Computations, and Report Printing (if you have a printer). It lets you decide what data to manipulate and how to manipulate it. It lets you decide the formats you want to appear on your screen and/or to print out in a report. It lets you use differing formats on the same data base. It lets you make calculations from data within records without altering the data base. It lets you report results with or without including the base data from which results were calculated.

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The software is available immediately from the creators. It comes in two versions. If you want to generate separate Basic programs with all the data handling plus Calculations and Report Printing features, you want Quikpro+Plus. Specify to run on TRS80 Model I and Model III at only $149; to run on TRS80 Model II at $189.

If you do not need Calculation ability or Report Printing in the separate Basic programs you will create from this program generating software, then standard Quikpro will do the job for you. Standard Quikpro to run on TRS80 Model I or Model III is $89; to run on TRS80 Model II is $129. (Later on you can always trade up to the Plus Versions for only the cost difference between the two).

Both programs are available to run on many other computers besides TRS80. Details are available by calling or writing.

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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 text document was the word dictionary. 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 Chektext 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.

If you are writing many text files in excess of 10 pages each and can afford it, consider using two of the programs, one for speed and convenience and another for accuracy. ■
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by Roger Schrag

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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-sprunged 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.

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 (ARPD). Some ARDP programs were
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Written by Larry Ashmun

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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."

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, seeing 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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Written by Larry Ashmun

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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 whisking 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 Caesh 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.

Table 1. BIPED Corporate Sponsors

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**Utilities**

**TRS-DOS**

*COMMENTS*

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This Machine Language utility is designed to aid you in creating and debugging programs written in BASIC. The utility allows you to trace the program flow, single step the BASIC program, to observe the conditions of variables during program execution, and to push your basic program on the stack during program development. The utility is known to operate with Mod III, TRS-DOS or Mod III Rom BASIC.

Cassette (goes to disk) $18.95

**TAPE COPY 2**

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This program will load most any TRS-80 500/800 system tape (standard Mod I speed) and load it into memory of the Mod III at either 500 or 1500 baud on the Mod II. It knows NO knowledge of MACHINE LANGUAGE NEEDED. Now gives you a way to back up a machine language program that loads at the slower speed and makes cassette loading into your new Mod III a much faster, more reliable process. Works with Mod I & Mod III.

Only $14.95

*M* only loads and saves at 500 baud only.

**ZAP**

*1981 by James Linkemann. Bug+ is a powerful machine language monitor. The one point most improved over other monitors, is the tape write. Bug+ has the ability to write a "clean" tape (at 500 baud), this tape will read into TRS-80 under the system command, without the program previously associated with the volume setting. Regardless what version basic you have or whether or not you have a Radio Shack cassette, this monitor will improve the reliability of your casette by 100%. There is also a verify command that works the same as a "CLODIT" except when an error is found, the memory address and what is found on the tape is displayed.

Finally a break point that works! When a break point is reached, there is a blinking asterisk in the bottom right hand corner, you are able to see what is on the screen before the monitor takes control. Press the enter key the screen clears and the monitor continues to life. When you continue from a break point, the monitor will restore the screen first then load the cpu registers and return to your program. You do not lose your program or display, and it does work!

Bug+ also has all the commands of T-Bug, just work better. Bug+ loads into low memory, then relocates itself.

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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 easiest 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 ARPDA has been approximately seven to eight percent.”

“So in the long run, what is 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 quadriplegics maybe forever. I’ve had students with no outlook toward employment. Computer programming finally offers them the ability, like anyone else, because...
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<td>with Correcting Feature</td>
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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 quadriplegic 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 Stanford 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 highway. Most commuters grumble about the twice daily traffic hassle, but not Fred. It may be a lot harder for a quadriplegic 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 quadriplegic 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 quadriplegic 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

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Table 2. BIPED officers and Board of Directors
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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 situ-

ated. 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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A Night on the Town

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

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80 Microcomputing, April 1982 • 125
“Nothing embarrasses a computer more than trying to scoop up food with a pair of chopsticks.”

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.”
Since introducing QWERTY 3.0 in September, people have been calling to ask if we were making ludicrous claims. The answer is NO! QWERTY 3.0 does all we claim it does and more! No other software of this type can match QWERTY 3.0.

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(Actual QWERTY text above)

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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 newfound 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 Fiko, 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..."
“What do they mean computers aren’t inherently funny?
Haven’t they ever used a TRS-80 Model I?”

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 in-curcurable bent for collecting things. He has all his photography magazines dating back to 1965 and every paperback book he's ever bought. However, while he visited his wife-to-be in 1967, his mother—who had quit her job 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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“. . . 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 noname software—software with no frills like menus and documentation—and checkers with sound.
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<th>Model</th>
<th>Minimum RAM</th>
<th>Tape or Disk System</th>
<th>DOS</th>
<th>Price</th>
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<tbody>
<tr>
<td>Computer Applications</td>
<td>T-ZAL</td>
<td>III</td>
<td>16K T</td>
<td>NA</td>
<td>$49.95</td>
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<tr>
<td>Program Innovations</td>
<td>Macro Assembler</td>
<td>II</td>
<td>64K D</td>
<td>V</td>
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<tr>
<td>InfoSoft</td>
<td>I/SAL</td>
<td>II</td>
<td>32K D</td>
<td>R</td>
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### Editor/Assemblers

<table>
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<th>Product Type</th>
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<tbody>
<tr>
<td>Mumford Micro Systems</td>
<td>Instant Assembler</td>
<td>I,III</td>
<td>16K T</td>
<td>NA</td>
<td></td>
<td>$29.95</td>
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<tr>
<td>MISOSYS</td>
<td>EDAS</td>
<td>I,III</td>
<td>32K D</td>
<td>K,L,V</td>
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<td>$79</td>
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<td>MICRO WORKS</td>
<td>SDS80C</td>
<td>Color Comp.</td>
<td>4K T</td>
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<td>RACET Computes, Ltd.</td>
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<td>II</td>
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<td>F</td>
<td></td>
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<td>Computer Applications</td>
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<td>I,III</td>
<td>32K 2D</td>
<td>I,K,V</td>
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<td>$149</td>
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<tr>
<td>Spectral Associates</td>
<td>Editor/Assembler</td>
<td>Color Comp.</td>
<td>16K T</td>
<td>NA</td>
<td></td>
<td>$34.95</td>
</tr>
</tbody>
</table>

- C = inquire
- X = unavailable
- NA = not applicable
- D = disk
- T = tape
- B = NEWDOS 2.1
- E = NEWDOS PLUS
- G = NEWDOS
- H = NEWDOS40
- I = NEWDCS80
- S = screen
- F = TRSDOS 2.0

136 • 80 Microcomputing, April 1982
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."
<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Minimum RAM</th>
<th>Tape or Disk System</th>
<th>DOS</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instant Software</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Disassembler</td>
<td>I,III</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
<td>$9.95</td>
</tr>
<tr>
<td>TLDIS</td>
<td>I,III</td>
<td>16K</td>
<td>T</td>
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<tr>
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<td>I,III</td>
<td>16K</td>
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<td>Instant Software</td>
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<td>DLDIS</td>
<td>I,III</td>
<td>16K</td>
<td>D</td>
<td>W</td>
<td>$19.95</td>
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<td>DISII</td>
<td>I,III</td>
<td>16K</td>
<td>D</td>
<td>W</td>
<td>$20</td>
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<td>Program Innovations</td>
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<tr>
<td>Disassembler</td>
<td>II</td>
<td>64K</td>
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<td>$73.95</td>
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<tr>
<td>The Micro Works</td>
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<td></td>
<td>Color Comp.</td>
<td>16K</td>
<td>T</td>
<td>$49.95</td>
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</table>

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
## 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-TASO
- 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 Computer, 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

### Table

<table>
<thead>
<tr>
<th>Separate documentation</th>
<th>Reallocable</th>
<th>Labels</th>
<th>Output to Screen, Printer, Tape or Disk</th>
<th>Other features</th>
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<tbody>
<tr>
<td>X</td>
<td>Y</td>
<td>N</td>
<td>P,T</td>
<td></td>
</tr>
<tr>
<td>X</td>
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<td>P,T</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>N</td>
<td>Y</td>
<td>S,P,T</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>P,D</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>N</td>
<td>Y</td>
<td>S,P,T</td>
<td>Other programs relocated</td>
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<tr>
<td>C</td>
<td>N</td>
<td>N</td>
<td>D</td>
<td>DO file</td>
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<tr>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>S,T</td>
<td>Variable output formats</td>
</tr>
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</table>

*Legend:
- J = NEWDOSS 2.0
- K = DOSPLUS
- L = LDOS
- 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."

<table>
<thead>
<tr>
<th>Editors</th>
<th>Product</th>
<th>Model</th>
<th>Minimum RAM</th>
<th>Tape or Disk System</th>
<th>DOS</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>Instant Software</td>
<td>IRV</td>
<td>I</td>
<td>16K</td>
<td>2D</td>
<td>V</td>
<td>T $24.95 D $29.95</td>
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<tr>
<td>Computer Applications</td>
<td>XBE (XEDIT)</td>
<td>I,III</td>
<td>16K</td>
<td>T,D</td>
<td>I,K,L,V</td>
<td>T Model I $24.95 Model III $29.95</td>
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<tr>
<td>The Alternate Source</td>
<td>KBE</td>
<td>I,III</td>
<td>32K</td>
<td>D</td>
<td>W</td>
<td>$39.95</td>
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<tr>
<td>ALGORIX</td>
<td>Edit</td>
<td>I,III</td>
<td>16K</td>
<td>D</td>
<td>W</td>
<td>$40</td>
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<td>S.E.C.S</td>
<td>Color Comp.</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
<td>$29.95</td>
</tr>
<tr>
<td>INTERPRO</td>
<td>ABE</td>
<td>I</td>
<td>32K</td>
<td>D</td>
<td>I,V</td>
<td>$19.95</td>
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</table>

<table>
<thead>
<tr>
<th>Monitors</th>
<th></th>
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<tr>
<td>MISOSYS</td>
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<tr>
<td>INTERPRO</td>
<td>ULTRA-MON</td>
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<td>MISOSYS</td>
<td>TUTIL</td>
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<td>Mumford Micro Systems</td>
<td>STEP80</td>
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<td>Computer Applications</td>
<td>X-BUG</td>
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C = inquire
X = unavailable
D = disk
T = tape
S = screen
B = NEWDOS 2.1
E = NEWDOS PLUS
F = TRSDOS 2.0
G = NEWDOS
H = NEWDOS 340
I = NEWDOS 980

140 • 80 Microcomputing, April 1982
<table>
<thead>
<tr>
<th>Separate documentation</th>
<th>Full cursor control</th>
<th>Block functions</th>
<th>Global commands</th>
<th>Macro keys</th>
<th>Other Features</th>
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<tbody>
<tr>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
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<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>$2</td>
<td>Y</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>Editor for Basic, DOS, ED'TASM, EDIT-80</td>
</tr>
<tr>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>High resolution graphics Character generator Audible error warning</td>
</tr>
<tr>
<td>C</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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</table>

<table>
<thead>
<tr>
<th>Disassembler</th>
<th>RAM Editor</th>
<th>Single Step</th>
<th>Set Breakpoints</th>
<th>Other Features</th>
</tr>
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<tbody>
<tr>
<td>X</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>X</td>
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<tr>
<td>X</td>
<td>Y</td>
<td>Y</td>
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</tr>
<tr>
<td>$9.95</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

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.

**Assemblers Editors Monitors Disk Zappers Re-numberers/Compressors Tape Utilities File Utilities Assemblers Editors Monitors**
<table>
<thead>
<tr>
<th>Monitors Continued</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product</strong></td>
</tr>
<tr>
<td>The Alternate Source</td>
</tr>
<tr>
<td>Howe</td>
</tr>
<tr>
<td>ALGORIX</td>
</tr>
<tr>
<td>Howe</td>
</tr>
<tr>
<td>Datasoft</td>
</tr>
<tr>
<td>The Micro Works</td>
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<td>ALGORIX</td>
</tr>
<tr>
<td>PowerSoft</td>
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<td>PowerSoft</td>
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<tr>
<td>PowerSoft</td>
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<tr>
<td>Spectral Associates</td>
</tr>
<tr>
<td>Advanced Operating Systems</td>
</tr>
<tr>
<td>Small Systems Software</td>
</tr>
<tr>
<td>Small Systems Software</td>
</tr>
</tbody>
</table>

C = inquire  
D = disk  
X = unavailable  
T = tape  
NA = not applicable  
S = screen  
B = NEWDOS 2.1  
E = NEWDOS PLUS  
H = NEWDOS40  
G = NEWDOS 60  
I = NEWDOS80
<table>
<thead>
<tr>
<th>Price</th>
<th>Disassembler</th>
<th>RAM Editor</th>
<th>Single Step</th>
<th>Set Breakpoints</th>
<th>Other features</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Trace Relocatable monitor</td>
</tr>
<tr>
<td>$2</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Re locate object programs</td>
</tr>
<tr>
<td>$5</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Trace View code in 8 formats</td>
</tr>
<tr>
<td>$5</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>RS-232-C port</td>
</tr>
<tr>
<td>$10</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Induces screen modes Shows chip and architecture before and after instruction</td>
</tr>
<tr>
<td>$10</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Format disks, configure system Disk or tape copy</td>
</tr>
<tr>
<td>$10</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Format disks, configure system Disk or tape copy</td>
</tr>
<tr>
<td>C</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>All features of Super Utility except Special Copy and Tape Copy</td>
</tr>
<tr>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Trace Relocate object programs Self-relocatable</td>
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<tr>
<td>X</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Modify in hex or ASCII</td>
</tr>
</tbody>
</table>

As their names suggest, 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.

Disk Zappers Re numberers/Com pressors Tape Utilities File Utili ties General Utili ties Assemblers

Editors Monitors

Disk Zappers Re numberers/Com pressors Tape Utilities File Utili ties General Utili ties Assemblers

As their names suggest, 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.

Editors Monitors

Disk Zappers Re numberers/Com pressors Tape Utilities File Utili ties General Utili ties
"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

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Minimum RAM</th>
<th>Tape or Disk System</th>
<th>DOS</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Alternate Source</td>
<td>TRAKCESS</td>
<td>I</td>
<td>48K</td>
<td>D</td>
<td>G,V</td>
</tr>
<tr>
<td>Instant Software</td>
<td>Disk Editor</td>
<td>I</td>
<td>16K</td>
<td>D</td>
<td>G,L,M,P,V</td>
</tr>
<tr>
<td>Galactic Software</td>
<td>FED</td>
<td>I,III</td>
<td>32K</td>
<td>D</td>
<td>L</td>
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</table>

### Renumberers/Compressors

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Minimum RAM</th>
<th>Tape or Disk System</th>
<th>DOS</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instant Software</td>
<td>RENUM/COMPRESS</td>
<td>I</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
</tr>
<tr>
<td>Instant Software</td>
<td>Compression Utility Pack</td>
<td>I</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
</tr>
<tr>
<td>PROSOFT</td>
<td>QUICK COMPRESS</td>
<td>I,III</td>
<td>16K</td>
<td>T,D</td>
<td>G,I,K,L,V</td>
</tr>
<tr>
<td>Cottage Software</td>
<td>PACKER</td>
<td>I,III</td>
<td>16K</td>
<td>T,D</td>
<td>G,L,M,V</td>
</tr>
<tr>
<td>PROSOFT</td>
<td>FASTER</td>
<td>I,III</td>
<td>16K</td>
<td>T,D</td>
<td>G,I,K,L,V</td>
</tr>
<tr>
<td>RACET Computes, Ltd.</td>
<td>REMODEL/PROLOAD</td>
<td>I,III</td>
<td>16K</td>
<td>T,D</td>
<td>G,I,K,L,V</td>
</tr>
</tbody>
</table>
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 Editors Monitors Disk Zappers Renumberers/Compressors Tape Utilities File Utilities General Utilities Assemblers Editors/Assemblers

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.
## Tape Utilities

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Minimum RAM</th>
<th>Tape or Disk System</th>
<th>DOS</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALGORIX</td>
<td>TSAVE</td>
<td>I, III (500 baud only)</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
</tr>
<tr>
<td>Cottage Software</td>
<td>System Tape Duplicator</td>
<td>I, III</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
</tr>
<tr>
<td>Mumford Micro Systems</td>
<td>CLONE</td>
<td>I, III</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
</tr>
<tr>
<td>Small System Design</td>
<td>Duplicator</td>
<td>I</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
</tr>
<tr>
<td>Instant Software</td>
<td>Cassette Scope</td>
<td>I</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
</tr>
</tbody>
</table>

## File Utilities

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Minimum RAM</th>
<th>Tape or Disk System</th>
<th>DOS</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RACET Computes, Ltd.</td>
<td>Cross Reference</td>
<td>II</td>
<td>64K</td>
<td>D</td>
<td>F</td>
</tr>
<tr>
<td>MISOSYS</td>
<td>PDS (Partition Data Set)</td>
<td>I, III</td>
<td>16K</td>
<td>D</td>
<td>L</td>
</tr>
<tr>
<td>MISOSYS</td>
<td>CMDFILE</td>
<td>I, III</td>
<td>16K</td>
<td>D</td>
<td>W</td>
</tr>
<tr>
<td>RACET Computes, Ltd.</td>
<td>BLINK (Basic Linker)</td>
<td>I, III</td>
<td>32K</td>
<td>D</td>
<td>G, I, J, K, L, V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>II</td>
<td>64K</td>
<td>D</td>
<td>F</td>
</tr>
<tr>
<td>MISOSYS</td>
<td>CONVCP/M</td>
<td>I, III</td>
<td>16K</td>
<td>D</td>
<td>L and R</td>
</tr>
<tr>
<td>Galactic Software</td>
<td>I/O Monitor</td>
<td>I, III</td>
<td>32K</td>
<td>D</td>
<td>L</td>
</tr>
<tr>
<td>Instant Software</td>
<td>DISK SCOPE</td>
<td>I</td>
<td>16K</td>
<td>D</td>
<td>V</td>
</tr>
</tbody>
</table>

---

C = inquire  
D = disk  
B = NEWDOS 2.1  
G = NEWDOS  
J = NEWDOS80 2.0  
X = unavailable  
T = tape  
E = NEWDOS PLUS  
H = NEWDOS40  
K = DOSPLUS  
NA = not applicable  
F = TRSDOS 2.0  
I = NEWDOS80  
L = LDOS  

146 • 80 Microcomputing, April 1982
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Y

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X
N
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X
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X
Append, concatenate, offset, copy, create files

$5
Intercept disk I/O error

Model I $2.50
Model III $3
Model II $4
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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

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## File Utilities

Continued

<table>
<thead>
<tr>
<th>Product</th>
<th>Model</th>
<th>Minimum RAM</th>
<th>Tape or Disk System</th>
<th>DOS</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RACET Computers, Ltd. DISCAT (Disk directory program)</td>
<td>I,III</td>
<td>32K</td>
<td>D</td>
<td>E,G,I,J,K,L,V</td>
<td>$50</td>
</tr>
<tr>
<td>RACET Computers, Ltd. Utility Package</td>
<td>II</td>
<td>64K</td>
<td>D</td>
<td>F</td>
<td>$150</td>
</tr>
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</table>

## General Utilities

<table>
<thead>
<tr>
<th>Company</th>
<th>Product</th>
<th>Model</th>
<th>Minimum RAM</th>
<th>Tape or Disk System</th>
<th>DOS</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROSOFT</td>
<td>XTEND40</td>
<td>I</td>
<td>16K</td>
<td>D</td>
<td>H,I,K,L</td>
<td>$19.95</td>
</tr>
<tr>
<td>Instant Software</td>
<td>Dynamic Device Drivers</td>
<td>I</td>
<td>16K</td>
<td>T,D</td>
<td>W</td>
<td>T $19.95 D $24.95</td>
</tr>
<tr>
<td>RACET Computers, Ltd.</td>
<td>LPSPPOOL</td>
<td>I</td>
<td>32K</td>
<td>D</td>
<td>G,I,J,K,L,V</td>
<td>$75</td>
</tr>
<tr>
<td>Cottage Software</td>
<td>Print to LPrint</td>
<td>I,III</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
<td>$12.95</td>
</tr>
<tr>
<td>PROSOFT</td>
<td>DISK RPM</td>
<td>I,III</td>
<td>32K</td>
<td>D</td>
<td>W</td>
<td>$24.95</td>
</tr>
<tr>
<td>Logical Systems Inc.</td>
<td>Filter Package</td>
<td>I,III</td>
<td>32K</td>
<td>D</td>
<td>L</td>
<td>$60</td>
</tr>
<tr>
<td>PowerSoft</td>
<td>Make-80</td>
<td>I,III</td>
<td>16K</td>
<td>D</td>
<td>W</td>
<td>Model I $14.95 Model III $24.95</td>
</tr>
<tr>
<td>Spectral Associates</td>
<td>Magic Box</td>
<td>Color Comp.</td>
<td>16K</td>
<td>T</td>
<td>NA</td>
<td>$24.95</td>
</tr>
<tr>
<td>PowerSoft</td>
<td>Utility Disk #2</td>
<td>I,III</td>
<td>32K</td>
<td>D</td>
<td>L</td>
<td>$69.95</td>
</tr>
</tbody>
</table>

C = inquire  D = disk  B = NEWDOS 2.1  G = NEWDOS  J = NEWDOS80 2.0
X = unavailable  T = tape  E = NEWDOS PLUS  H = NEWDOS40  K = DOSPLUS
NA = not applicable  S = screen  F = TRSDOS 2.0  I = NEWDOS80  L = LDOS
<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5</td>
<td>Reads and sorts directories</td>
</tr>
<tr>
<td>$15</td>
<td>Ten utilities for rebuilding crashed data files</td>
</tr>
<tr>
<td>X</td>
<td>Convert 35-track disks into 40-track disks</td>
</tr>
<tr>
<td>X</td>
<td>Debounce, repeat keys, lowercase mod support, graphics, printer/screen auto switch</td>
</tr>
<tr>
<td>$7.50</td>
<td>Spool data to disk, despool to printer</td>
</tr>
<tr>
<td>$2.60</td>
<td>Change Print to LPrint (except Print@ and Print #)</td>
</tr>
<tr>
<td>Model I $2</td>
<td>Bring a program to a main menu</td>
</tr>
<tr>
<td>Model III $3</td>
<td>Command processor</td>
</tr>
<tr>
<td>X</td>
<td>Measure and adjust drive rotational speed</td>
</tr>
<tr>
<td>$5</td>
<td>Modify I/O to printer, video, keyboard</td>
</tr>
<tr>
<td></td>
<td>Enhancements to LDOS</td>
</tr>
<tr>
<td>X</td>
<td>Convert 35- or 40-track disks into 80-track disks</td>
</tr>
<tr>
<td>C</td>
<td>Load Model I or III tapes into Color Computer</td>
</tr>
<tr>
<td>$10</td>
<td>Twelve programs to expand LDOS</td>
</tr>
</tbody>
</table>

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80 Microcomputing, April 1982 • 149
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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 renumerator 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'être 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 of 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 280 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 280) 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'd likely 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.”

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 then 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 like 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 that 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 will renumber a whole Basic program at once. 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 according to 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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"...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 opcodes 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 retyping 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
Rapid Retrieval of Random Records

is a complete in-memory, recursive, sequential search of an array of 500, 40 character Search String Indexes, replacing the sequential search in BASIC with a machine language program. NEWTRIEVE uniquely locates KEY words to further access a data base.

NEWTRIEVE, installed into the BASIC demonstration program, allows the programmer great flexibility in determining the final application. Switches allow for 'EXCLUDING', Divide index, Single Search, in-memory changes, re-write of load module, and selectively browse through the index.

NEWTRIEVE is a concept of program design, and many ideas grow from its use. Applications for education, inventory control, research, cataloging, multi-indexing, forms control with alpha-form numbers, data base management, personnel listings, characteristics identification, are just some of the uses that will make NEWTRIEVE the basis of program development.

Once an Index has been established, either interactively or from an external data file, a LOAD MODULE may be created to facilitate start-up in less than 10 seconds. Numerous indexes can be written and successively loaded and searched using the same or an alternate BASIC program. For example, one index can reference a data base of customer names, another index can reference inventory.

NEWTRIEVE is user oriented. In commercial applications, speed of access makes it ideal when the working environment requires fast interaction between user and computer. Although speed is dependent upon variables such as frequency of occurrence and size of array, a 25,000 character array should be sequentially read in about 1 second. It is not necessary to utilize a sorted array.

The KEY strings to be matched against the array of Search String Indexes may be entered in any order or in shortened form. Usually, three characters of a word or words are all that is necessary. NEWTRIEVE recursively searches each Search String, returning only the index(s) that include all of the elements of the KEY string. Thus an unskilled operator can retrieve data with sparse knowledge of product description or with a minimum of user input.

Since final application is up to the programmer, indexes different from the one supplied may be more suitable to your needs. Optional customized indexes are available from the manufacturer.
"Monitors... are second only in usefulness to assemblers, and some people would dispute that."

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 files.

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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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 program, 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 in 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 accommodate 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 re-inventing the wheel, something that already occurs too often. Without them, programming would become a drudgery 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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<td>In memory accounts receivable system-storage ok</td>
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<td>TERSPAY</td>
<td>Compares 3 methods of repayment of loans</td>
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- 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 (Main) File.
- List the Chart of Accounts File.
- Key in transactions into the Transactions (Journals) File.
- List the Transactions File.
- Add 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

**ACCOUNTS RECEIVABLE**

- 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. Invoices Sold
  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 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

**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 Aging 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 period:
  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 Deductions
- 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

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 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.

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 reference, and activity. Items within the Master File are sorted, 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 activity.

Several reports are available for the maintenance 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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- **SIMPLE commands** easy to use.

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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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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.
(P) The use of flags to prevent program crashes.
(Q) Date setting, printer on-line, and many other routines that make a program run like a commercial written program.

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*** ALL PRICES & SPECIFICATIONS SUBJECT TO CHANGE ***
Be a beginner and advanced at the same time!

BAM!

Jeff Byrkit
13862 Kimberly Drive
Largo, FL 33750
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. Hmm... 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 erosion. 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/assersembler 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.

This subroutine is not executed by the monitor, but patched into BASIC. If you don't have a lowercase mod installed, you don't need to put it in. But if you ever plan to have lowercase, you should leave it in anyway.

This subroutine is an alternative to calling 26A7H. I made this so that I wouldn't have to use up extra lines in the source program. For example:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFB</td>
<td>'B'</td>
</tr>
<tr>
<td>DEFB</td>
<td>'B' + 32</td>
</tr>
<tr>
<td>DEFB</td>
<td>'L'</td>
</tr>
<tr>
<td>DEBF</td>
<td>'L' + 32</td>
</tr>
</tbody>
</table>

So...

DEFB   | 'C' + 32
DEBF   | 'COMMAND?'

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/asmber to type in the source program. If you don't have the editor/assemblyer, 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 31412 for 16K, 18584 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 ? (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**: starts the monitor. It isn't really necessary, but if you change it, it may come in handy. As written, it clears the screen, enables KBPIX 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).

- **ASCI1**: 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 hex (Start) xxxx hex (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 hex (Start).

Search goes through the entire memory.

---

**Table continued**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFB 'O'</td>
<td>Will produce 'Command'? If it is printed with the PR sub. But:</td>
</tr>
<tr>
<td>DEFB 'O + 32'</td>
<td></td>
</tr>
<tr>
<td>DEFB 'M + 32'</td>
<td></td>
</tr>
<tr>
<td>DEFB 'M + 32'</td>
<td></td>
</tr>
<tr>
<td>DEFB 'A + 32'</td>
<td></td>
</tr>
<tr>
<td>DEFB 'N + 32'</td>
<td></td>
</tr>
<tr>
<td>DEFB 'D + 32'</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2: Summary of commands.**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII xxxx x</td>
<td>Executes an ASCII dump of memory.</td>
</tr>
<tr>
<td>DUMP xxxx x</td>
<td>Executes a hexadecimal dump of memory.</td>
</tr>
<tr>
<td>Test xxxx x</td>
<td>Tests memory for two characters or two bytes.</td>
</tr>
<tr>
<td>MOVE xxxx x</td>
<td>Moves memory from start 1 to start 2 of yyyy bytes.</td>
</tr>
<tr>
<td>CHECKSUM xxxx x</td>
<td>Computes and displays checksum from start to finish.</td>
</tr>
<tr>
<td>TEST xxxx x</td>
<td>Tests memory from start to finish. Bad addresses are displayed.</td>
</tr>
<tr>
<td>ZERO xxxx x</td>
<td>Zeros memory from start to finish.</td>
</tr>
<tr>
<td>GOTO xxxx x</td>
<td>Jumps to address given.</td>
</tr>
<tr>
<td>BASICM</td>
<td>Jumps to 0000H</td>
</tr>
<tr>
<td>BASIC1</td>
<td>Jumps to 1A19H</td>
</tr>
<tr>
<td>ADD xxxx x</td>
<td>Adds two numbers. Result is displayed along with the carry.</td>
</tr>
<tr>
<td>SUB xxxx x</td>
<td>Subtracts two hexadecimal numbers. Displayed like ADD.</td>
</tr>
<tr>
<td>INF xx</td>
<td>Inputs from a port. Value received is displayed.</td>
</tr>
<tr>
<td>OUT xx yy</td>
<td>Outputs port xx with value yy.</td>
</tr>
<tr>
<td>ENTER xxxx x</td>
<td>Enters a string of 255 characters at xxxx. Can be stopped at any time with Enter or Break.</td>
</tr>
</tbody>
</table>
LYNN’S A/R SYSTEM
12 Intergrated Account Receivable Programs
Tested In Service For Over 3 Years

User’s Comments: • menu driven • increased cash flow • saved over 50 hours a month in secretarial hours • almost completely eliminated billing errors • phone supported - ask for Ron.

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• how much an account purchased during month, how many invoices were sent, average invoice for month

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• tell you what percent of a/r an account is
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• alphabetical sort of items sold by month
• this set of programs can be custom modified by you or us
• AND MUCH MORE!!

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<table>
<thead>
<tr>
<th>Account</th>
<th>Current</th>
<th>30-60 Days</th>
<th>60-90 Days</th>
<th>90+ Days</th>
<th>Total</th>
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<td>$65.20</td>
<td>$00.00</td>
<td>$00.00</td>
<td>$314.20</td>
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<tr>
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<td>84.40</td>
<td>165.20</td>
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<td>249.60</td>
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<td>New Co. Inc.</td>
<td>97.75</td>
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<td>00.00</td>
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<td>Deadbeat Inc.</td>
<td>00.00</td>
<td>00.00</td>
<td>00.00</td>
<td>00.00</td>
<td>345.00</td>
</tr>
</tbody>
</table>

Totals        | $346.75 | $149.60    | 165.20     | 345.00   | $1,006.55|

Aging reports can be compiled on a daily, weekly or monthly bases.

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Credit Given on Order

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(312) 429-1915

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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 [CD09] 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 chr). 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].

Tests 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].

BASIC/M jumps to 0000H (power-up). The format is: BASIC/M
BASIC/C jumps to 1A19H (re-entry). The format is: BASIC/C

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) 4447 (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 86 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.
"The program... occupies only 88 bytes more than T-Bug."
<table>
<thead>
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<th>Program continues</th>
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<td>77F0</td>
</tr>
</tbody>
</table>
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(Requires 32K, 2 disk system)

<table>
<thead>
<tr>
<th>#</th>
<th>Mod 1</th>
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<tr>
<td>1250-10</td>
<td>$149.00</td>
<td></td>
</tr>
</tbody>
</table>

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Full Screen Text Editor for BASIC: we were the first to give the TRS-80 this indispensable ability! A must for every BASIC programmer:

<table>
<thead>
<tr>
<th>#</th>
<th>Mod 1</th>
<th>Mod 2</th>
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<tr>
<td>1210-20</td>
<td>$29.95</td>
<td></td>
</tr>
</tbody>
</table>

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For users of Lifeboat’s CP/M.

Model II Terminal Driver

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 TRS/1060S driver. The replacement driver takes advantage of all special features found in the TMS/1060S 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 CRTTEST 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.
"The fifth problem probably did not surprise you, because you know the TRS-80 does not have a bell."

And now for the coup de grace: the audible alarm.

The scrolling problem was caused by the lack of a "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 SALARM 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 CPM BIOS (Basic Input/Output System) level which would ring the bell.

---

Program continued

0010' 16
0011' 50
0012' 3K 1B
0014' CD 003F'
0017' 3K 3D
0019' CD 003F'
001C' 7C
001F' add x',"1"f' ;adjust row number
001F' call bouch ;send row
0022' 7D
0025' CD 1F
0025' C3 003F'
0028' 06 68
002A' 1B 02
002C' 06 28
002E' 3K OA
0030' D3 FC
0032' 26
0033' D3 FD
0035' C9
0036' 3K FF
0038' 1B 01
003A' AF
003B' 32 0059'
003E' C9
003F' D5
0040' E5
0041' E6 7F
0043' FE 20
0045' 38 09
0047' 21 0059'
004A' C8 46
004C' 28 02
004E' F6 80
0050' 5F
0051' 0E 02
0053' C8 005'
0056' E1
0057' D1
0058' C9
0059' 00
005A' 3E 08
005C' C3 003F'
005F' 11 F7FF
0062' 19
0063' 30 20
0065' E5
0066' 23

;terminal screen dimensions
;crln: db 24d ;24 lines
;crswd: db 80d ;80 columns
;terminal output codes
;escape eq x'1B'
bescap eq x'0E'
bell eq x'07'
erase eq x'17'; erase to end of line
clear eq x'14'
;output functions
;set cursor position: [h] = row, [l] = column
$set:
       ld a,escape
       call bouch
       ;send esc
       ld a,="
       call bouch
       ;send =
       ld a,4
       ;slow blink, start at line 8
       jr curcon ;use common code
$curcon:
       ld b,4+32+8
$curoff:
       ld b,4+32+8
$cursor off (start at line 8)
$cursor on/off
$curon:
       ld a,4
$custom:
       out (x'6c'),a
$highlight
$hilite:
       ld a,="ff"
$lohit:
       ld a,="ff"
$modified bouch to implement highlighting
$highlight
$backspace
$save
$restore
Program continues

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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 SOUTCH 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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That way, L80 will produce an error message if you forget to include the driver name. If you stick with the name CD80M/2.REL, the proper form of the L80 command is: A:L80 prog/N,prog,sub1, sub2....subn,CD80M/2/E where “prog” is your main program name and “sub1” to “subn” are names of your subroutines. For example, the proper sequence to compile, link and run the supplied CRTTEST.COB program is:

A>COBOL = CRTTEST
No Errors or Warnings
A>L80 CRTTEST1,CRTTEST,CD80M/2,E
Link-80 3.37 08-May-80 Copyright 1979,80 (C) Microsoft
%Mult. Def. Global $OUTCH
data 2013 5007
[0206 5007 80]
A>CRTTEST

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 JEKC, Inc., a software development firm in New York City.
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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:

\[
\text{IF } X > 32767 \text{ THEN } A\% = X - 65536 \text{ ELSE } A\% = X
\]

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 1110111000100000 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."

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$) invokes PEEK/RELL. Upon entry to this subroutine, the DE register pair points to a string descriptor for A$. The first 16 byte of the string 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/RELL follows this chain of pointers to extract the contents of the desired memory location and then insert 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 * (2 + 11), which could generate a value greater than 32767. Because C is an integer variable, we need line 4200 to check for this condition.

Lines 5000-5300 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:

\[
A$ = MKI$(C) + "$" + "$C = USR1(A$)"
\]

Two spaces appended to MKI$(C) make the length of A$ four, the same as the string produced by USR1. If we did not do this, we would have to include in USR1 an instruction to change the first byte of A$'s string descriptor from two to four, so Basic would know USR1(A$) has length four. This could 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 second per integer.

---

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OMNITERM is a professional communications package for the TRS-80 that allows you to easily communicate and transfer files or programs with almost any other computer. We've never found a computer that OMNITERM can't work with. It's a complete package because it includes not only the terminal program itself, but also conversion utilities, a text editor, special configuration files, serious documentation and serious support.

Why do I need it?

You need OMNITERM if you need to communicate efficiently with many different computers, or if you want to customize your TRS-80 for use with one particular computer. You need OMNITERM to SOLVE your communications problems once and for all.

What do I get?

The OMNITERM package includes the OMNITERM terminal program, four conversion utilities, a text editor, and setting files for use with popular computers such as Compuserve, the Source, and Dovex using just as samples of what you can do for the computer you want to work with. The package includes six programs, seven data files, and real documentation in a 76-page manual that has been called 'the best in the industry.' And OMNITERM comes with real user support. We can be reached via Compuserve, Source, phone, or mail to promptly answer your questions about using OMNITERM.

What do I need to use OMNITERM?

A Model I or Model III TRS-80, at least 32K of memory, one disk, and the RS-232 interface, or Microconnection modem. OMNITERM works with all RMs and DDISs, and will work with your special keyboard drivers.

What will it do?

OMNITERM allows you to translate any character going to any device printer, screen, disk keyboard, or communications line, giving you complete control and allowing you to redefine the character sets of all devices. It will let you transfer data, and run your printer while connected to a record or anything that happens. OMNITERM can return your screen so that 80, 32, and 40 column lines are easy to read and look neat on TRS-80 screen. It even lets you get on remote computers with just one keystroke! The program lets you send special characters, echo characters, count I/O controller errors, configure your I/A', send true breaks and use lower case. It accepts VT100/VT52 codes, giving you full cursor control. It will even let you review text that has scrolled off the screen! Best of all, OMNITERM will save a special file with all your changes so you can quickly use OMNITERM for any one of many different computers by loading the proper file. It's easy to use since it's menu driven, and gives you a full status display so you can examine and change everything.

OMNITERM has my vote as the top TRS-80 terminal program available today.
"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.

If you have anything to do with the TRS-80* System you should be reading the EIGHTY SYSTEM NEWSLETTER every week!

Don't miss a single issue of the new Eighty System Newsletter...published weekly and mailed every Friday by First Class Mail. This is the only publication designed for personnel in the TRS-80* industry, including manufacturers, distributors, dealers and computer users. The Eighty System Newsletter is compiled and edited by Ken Gordon, producer of the National TRS-80* Show, the Eighty/Apple Show, the NJ Microcomputers Show, and publisher of the Amateur Radio Equipment Directory. Here is valuable information in professionally prepared format about TRS-80* hardware, software, peripherals, trends in the industry, and latest news. In addition, each weekly issue contains brief digests of articles related to the TRS-80* system appearing in over 100 computer related and general interest publications. This bibliography will save you both time and money in keeping up with articles in print on the TRS-80* computer system. The Eighty System Newsletter is a must for all active TRS-80* users, plus anyone involved in any way with the manufacturing, distributing or retailing of TRS-80* products.

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80 Microcomputing, April 1982 • 185
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Tests were conducted on AEROCOMP'S "DDC", Percom's "Radio Shack TRS80" Model I, Level 2, 48 K with TFX (Siemens Model 820). Diskette was "Mirex" 5401. The diskette performance under adverse conditions. The expansion interface was unmodified. The test consisted of formatting 40 tracks on the diskette. The pattern was chosen because it is recommended as a test pattern on all tracks. The fill program used was Newdos/80. Version 2.0. The test was run ten times with the same file on the table.

★ **Features**

TRS80 Model I owners who are ready for reliable double density operation will get (1) 80% more storage per diskette, (2) single and double density data separation with far fewer disk 1/0 errors, (3) single diskette compatibility and (4) simple plug-in installation. Compatible with all existing double density software.

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<thead>
<tr>
<th>MFR. &amp; PRODUCT</th>
<th>SECTORS LOCKED OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERCOM &quot;DOUBLER II&quot;</td>
<td>18 WITHOUT &quot;DDC&quot;</td>
</tr>
<tr>
<td>PERCOM &quot;DOUBLER II&quot;</td>
<td>250 WITHOUT &quot;DDC&quot;</td>
</tr>
<tr>
<td>LNW &quot;LNDoubler&quot;</td>
<td>202 WITHOUT &quot;DDC&quot;</td>
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Rapid System Loader

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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. Those 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 back-ups, 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 pre-load module is encountered first. It loads at 500 baud and
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 by 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 280 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 .65 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.

---2 milliseconds--- (1 mSec) >> TOTAL FOR BYTE = 16 msec.

SYNCE110 (NO PULSE)

SYSTEM BYTE FORMAT

RSL BYTE FORMAT

Fig. 1.
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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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<th>Address</th>
<th>Code/Op</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4328</td>
<td>23</td>
<td>INC HL ;BUMP POINTER</td>
</tr>
<tr>
<td>4329</td>
<td>0686</td>
<td>LD B, 06 ;FILENAME BYTE COUNT</td>
</tr>
<tr>
<td>432B</td>
<td>CD3582</td>
<td>CALL RDBYTE ;GET A BYTE FROM TAP</td>
</tr>
<tr>
<td>432E</td>
<td>CD3582</td>
<td>CALL RDBYTE ;GET A BYTE FROM TAP</td>
</tr>
<tr>
<td>432F</td>
<td>CD3582</td>
<td>CALL RDBYTE ;GET A BYTE FROM TAP</td>
</tr>
<tr>
<td>4337</td>
<td>FE3C</td>
<td>CP 3CH :IS IT OK?</td>
</tr>
<tr>
<td>4339</td>
<td>202D</td>
<td>JR NZ,TRANS :NO;CHECK FO</td>
</tr>
<tr>
<td>R EOP</td>
<td>3</td>
<td></td>
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<tr>
<td>433B</td>
<td>77</td>
<td>LD (HL), A ;YES STORE IN BUFFER</td>
</tr>
<tr>
<td>433C</td>
<td>23</td>
<td>INC HL</td>
</tr>
<tr>
<td>433D</td>
<td>CD3582</td>
<td>CALL RDBYTE ;GET BLOCK LEN</td>
</tr>
<tr>
<td>4340</td>
<td>47</td>
<td>LD R,A ;STORE IN B</td>
</tr>
<tr>
<td>4341</td>
<td>77</td>
<td>LD (HL), A ;&amp; IN BUFFER</td>
</tr>
<tr>
<td>4342</td>
<td>23</td>
<td>INC HL</td>
</tr>
<tr>
<td>4343</td>
<td>AF</td>
<td>XOR A ;CLEAR CHECKSUM</td>
</tr>
<tr>
<td>4344</td>
<td>4F</td>
<td>LD C,A ;IN C REG</td>
</tr>
<tr>
<td>4345</td>
<td>CD3B343</td>
<td>CALL INBYTE ;GET BLOC LOAD ADDRE</td>
</tr>
<tr>
<td>4349</td>
<td>CD3B343</td>
<td>CALL INBYTE ;GET BLOC LOAD ADDRE</td>
</tr>
<tr>
<td>434B</td>
<td>CD3B343</td>
<td>CALL INBYTE ;GET BLOC LOAD ADDRE</td>
</tr>
<tr>
<td>KSM,Etc.</td>
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<td>435E</td>
<td>3A4038</td>
<td>LD A,(3A40H) ;TEST FOR BR</td>
</tr>
<tr>
<td>435F</td>
<td>CB57</td>
<td>BIT 2,A ;TEST BIT 2  (BREAK)</td>
</tr>
<tr>
<td>435F</td>
<td>2094</td>
<td>JR NZ, SPEED ;YES;GOTO M</td>
</tr>
<tr>
<td>ENU</td>
<td>10F4</td>
<td>DJNZ LDATA ;LOOP TILL BLOCK ENT</td>
</tr>
<tr>
<td>ERD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4357</td>
<td>CD3582</td>
<td>CALL RDBYTE ;GET CHECKSUM BYTE</td>
</tr>
<tr>
<td>435A</td>
<td>77</td>
<td>LD (HL), A ;INTO BUFFER</td>
</tr>
<tr>
<td>435B</td>
<td>23</td>
<td>INC HL</td>
</tr>
<tr>
<td>435B</td>
<td>B9</td>
<td>CP C ;SAME?</td>
</tr>
</tbody>
</table>

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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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

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SEND CHECK ON MONEY ORDER
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 fussy part.

The WRITTAP routine writes the leader and sync byte using the ROM routine at 284H. The 55 System Tape Header Byte and File Name 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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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-

**TR Load Address**

**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 21DB06 01400 LD HL,MESSG3
43EF CD720 01410 CALL DSP
43E1 CD4900 01420 CALL KBP ;INPUT # OF COPIES
43E6 FE31 01430 CP 31H ;LESS THAN 1?
43E8 FDAD43 01440 JP M,SYWRT ;YES - TRY AG
AIN
43EB FE3A 01450 CP 3AH ;LESS THAN OR =9?
43ED F2DA43 01460 JP P,SYWRT ;NO - TRY AGA
IN
43F0 E60F 01470 AND $0H ;MASK OFF ASCII PART
43F2 32D943 01480 LD (COPIES),A ;STORE IN ME
43F5 21ED46 01490 CONT LD HL,MESSG5 ;READY TAPE
FOR RECORD & PRESS ENTER
43F8 CD728 01500 CALL DSP
43F8 CD4900 01510 CALL KBP ;WAIT FOR ENTER
43FE CD8482 01520 WRITAP CALL 2AH ;NOT. ON,WRITE LEADEC
 AND SYNC
4401 211347 01530 LD HL,BUFFER ;POINT TO 55
H,FILENAME
4404 0687 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
```

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Program continued

4496 C3E942 02380 JP SPEED ;GOTO MENU
4499 0610 02390 OUTPUT LD B,10H ;LOOP FOR A WHILE
449B 18FE 02400 DJNZ $ ;WRITE A BYTE IN 2000 BAUD FORMAT
449D E5 02405 ;WRITE A BYTE IN 2000 BAUD FORMAT
449E D5 02420 PUSH HL ;SAVE
449F C5 02420 PUSH BC ;REGS
44A0 F5 02440 PUSH AF
44A1 0689 02450 LD C,09H ;# OF BITS = SYNC
44A3 57 02460 LD D,A ;STORE BYTE IN D
44A4 37 02470 SCP ;ADD SYN
44A5 CD8444 02480 BYTL CALL PULSE ;OUTPUT A PULSE
44A8 7A 02490 LD A,D ;RETRIEVE BYTE
44A9 07 02500 RLCA ;ROTATE NEXT BIT TO C
44AB 57 02510 LD D,A ;SAVE IT AGAIN
44AC 9D 02520 DEC C ;COUNT THE BIT
44AD 20F7 02530 JR Nz, BYTP ;LOOP 9 TIME
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 801B 02590 PULSE JR Nc, ZTIME ;BLANK SPACE
FOR
44B5 8005 02600 LD A,05H ;1ST PART OF PULSE
44B7 33F 02610 OUT (255),A
44B9 0600 02620 LD B,00H
44B8 18FE 02630 DNZ $ ;TIMER LOOP
44B0 D3F 02640 LD A,06H ;2ND PART OF PULSE
44BF 33F 02650 OUT (255),A
44C1 0600 02660 LD B,00H
44C3 18FE 02670 DNZ $ ;3RD PART OF PULSE
44C5 33F 02680 LD A,04H
44C7 33F 02690 OUT (255),A
44C9 062A 02700 LD B,2AH ;112.37 MICROSECONDS
44CB 18FE 02710 DNZ $ ;BLOC START AND LEN
44CD F23 02720 INC IY ;ACTS AS NOP FOR TIM
ING
44CF C9 02730 RET
44D0 063F 02740 ZTIME JR IF B, 3FH ;458.97 MICROSECS
44D2 18FE 02750 DNZ $ ;PRELOAD MODULE FILE
44D4 C9 02760 RET
44D6 18FE 02770 INC IY ;ACTS AS NOP FOR TIM
ING
44D8 3004 02780 LD A,04H
44DB D3F 02790 OUT (255),A ;TURN ON MOTOR
44DA CD8448 02800 SYNCIT CALL VBYTE ;SYNCIT
44D1 FE55 02810 CP 055H
44D9 2870 02820 JR N2,EQF
44E1 0606 02830 LD B,06H ;FILENAME COUNT
44E2 11A0 02840 LD DE,34CH ;POINT TO 2N
44E3 BB 02850 CALL ;BLOC START AND LEN
44E4 151DEC 02860 DEFW 6E3CH ;BLOC START AND LEN
44E5 E441 02870 DEFW 41E5B ;LOAD ADDRESS (XBD B
44E6 0F8E 02880 CALL ;BUFFWRIT scans the buffer and sends each byte to
44E7 C3E942 02890 OUT (255),A ;BUFFWRIT scans the buffer and sends each byte to
44E9 CD8440 02900 FN CALL VBYTE ;GET FILENAME
44EB 12 02910 LD (DE),A ;DISPLAY IT
44ED 13 02920 INC DE
44EE 10F9 02930 DNZ FN ;LOOP 6 TIMES
44F2 CD8440 02940 BLOOP CALL VBYTE ;BLOC START?
44F5 03F3 02950 CP 3CH ;BLOC START?
44F7 2827 02960 JR N2, EOF ;NO- CHECK FOR EOF
44F9 CD8440 02970 CALL VBYTE ;OR GET LEN BYTE
44FB 47 02980 LD B,A ;START INTO B REG
44FD 0000 02990 LD C,00 ;CLEAR CHECKSUM
44FE CD8440 03000 CALL VBYTE ;GET LSB START ADDR
44FF 6F 03010 LD L,A
44F9 03020 ADD A,C ;DO CHECKSUM
4503 4F 03030 LD C,A
4504 CD8440 03040 CALL VBYTE ;MSB
4506 67 03050 LD H,A
4508 81 03060 ADD A,C
450A 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 (WRT-
TAP) 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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200 • 80 Microcomputing, April 1982
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<table>
<thead>
<tr>
<th>DRIVE TYPE</th>
<th>DRIVE 0</th>
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<th>DRIVE 2</th>
<th>DRIVE 3</th>
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*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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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 l. 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

---

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TRIS-80™ LINE PRINTER 7

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Program continued:

```
83732 ;
83734 ;
83740 ;
83741 ;
83742 ;
45BB 52 B3750 MENU DEXF 'RAPID SYSTEM LOADER: 2000'
BAUD SYSTEM TAPE CONVERSION
45F1 00 83760 DEXF '0DH'
45F2 56 83770 DEXF 'VERSION 2.1 9/15/80 BY DAV
ID C, HEDINGER
461B 00 83780 DEXF '0DH'
461C 00 83790 DEXF '000DH'
461E 31 83800 DEXF '1 = LOAD A SYSTEM TAPE'
463A 00 83810 DEXF '0DH'
463B 32 83820 DEXF '2 = WRITE A FASTLOAD COPY'
464B 00 83830 DEXF '0DH'
464F 33 83840 DEXF '3 = RETURN TO BASIC'
4662 00 83850 DEXF '00H'
4663 52 83860 MSEG DEXF 'READY TAPE & PRESS =ENTER=
467D 00 83870 DEXF '00H'
467E 45 83880 HEDSP DEXF 'ENTRY POINT ='
467B 00 83890 DEXF '00H'
46BC 4D 83890 SYSEX DEXF 'NOT A SYSTEM TAPE : PRESS =
ENTER=1'
46AF 00 83910 DEXF '
46AE 4D 83920 ERR2 DEXF 'MISPLACED TRANSFER BYTE ERR
OR'
46CB 00 83930 DEXF '00'
46CC 43 83940 ERR3 DEXF 'CHECKSUM ERROR'
46DA 00 83950 DEXF '00'
46DB 48 83960 MSEG3 DEXF 'HOW MANY COPIES?'
46F0 00 83970 DEXF '000'
46ED 52 83980 MSEG5 DEXF 'READY TAPE FOR RECORD & PRE
SS =ENTER=
4712 00 83990 DEXF '00'
4713 00 84000 BUFFER DEXF '00'
47F9 84010 END SPEED
0000 TOTAL ERRORS
```
to the menu. Also press Break if an error occurs.

After reading 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.

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A program that finds errors for you!

"Löc-Editor is a resident program to trap errors."

and discover you spelled Print with an M instead of an N.

Sound familiar? Löc-Editor (see the Program Listing) is a resident program to trap errors.

Best of all, Löc-Editor displays the entire line up to and including the error. The error is underlined.

Löc-Editor displays:

SYNTAX ERROR
HIT 144 / HIT SPACE BAR

Type 144 and hit the space bar. The cursor stops at the P in PRINT. 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 STRINGS in the line below:

PRINT STRING (20,191)

This will be declared as a Bad Subscript. The entire statement will be underlined.

To merge Löc-Editor, remove line zero and reintert it after the merge.

Program Listing
It is the policy of American Small Business Computers to offer merchandise at the lowest price possible. About a year ago, American Small Business Computers began selling Epson Printers for the TRS-80, Apple, and other computers. The first month we sold them for $125.00. Someone else sold them for five dollars less. The next month we sold our Epsons for $100.00 and someone else sold theirs for three dollars less. So this month our Sales Manager looked at the stack of unsold Epson Printers and said, "Oh, Shazzam, let's stop acting like a bunch of dumb Okes. Lower the price and move 'em out!" So... this month it's Head 'Em Up, Move 'Em Out. Yee Ha Rawhide. Oops! Gut carried away... Call for Prices.

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A collection of valuable subroutines.

Zubroutines

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 that 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, ZS, ZD, SZ, and so on). Just avoid the letter Z as a variable in your own main program. 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 LOAD 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 ZS. 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: ZFS = "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-

---

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80 Microcomputing, April 1982 • 209
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 pressing, 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, 83, 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 1976. He now has a two disk system. Other interests are photography and camping.

---

**Program Listing**

```
10 POKE 16553, 255; CLEAR; GOTO 10
11 POKE 16396, 23; RETURN
12 POKE 16396, 201; RETURN
13 POKE 16414, 141; POKE 1415, 5
14 POKE 16414, 88; POKE 1415, 4
15 POKE 16422, 20; POKE 1423, 4
16 POKE 16422, 141; POKE 1423, 5
17 POKE 17058; OUT(235, 4); OUT(235, 5); NEXT; RETURN
18 POKE 17058; OUT(235, 4); OUT(235, 5); NEXT; RETURN
19 =17129; POKE 1709081; PRINT(241); NEXT; RETURN; NEXT; RETURN
20 PRINT(241); +256; POKE (241); NEXT; RETURN
21 TC=CHR$(183)**="**"+CHR$(187): TC=4400+(64-LEN(EC5))/:2; PRINT
T0; EC5; RETURN
22 =TM(64-LEN(E))/:2; PRINTVW; EC5; GOSUB 26; RETURN
23 =TM(64-LEN(E))/;2; PRINTVW; EC5; RETURN
24 PRINTCHR$(129); CHR$(38); CHR$(29); RETURN
25 PRINT64[;1-1]; RETURN
26 PRINT64[;1-1]; RETURN
27 PRINT64[;1-1]; RETURN
28 PRINT64[;1-1]; RETURN
29 CLS: PRINTCHR$(23); PRINT$(404); 80 C 0 H V 350, 100; PRINT$(360); INPUT ER
30 PRINT$(360); PRIN$(360); **PLEASE TRY AGAIN**; RETURN
31 GOTO 1712974767; IF Peek$(2,21) RETURN; RETURN; Peek$(2,21) RETURN; RETURN;
32 DIII(204); POKE 1701263; R (81); POKE(15366+21); NEXT; RETURN
33 FOR=POKE 1701263; POKE 15366+21; NEXT; RETURN
34 PRINT$1; RETURN
35 PRINTVW; EC5; NEXT; RETURN; NEXT; RETURN; NEXT; RETURN; NEXT; RETURN
36 PRINTVW; EC5; NEXT; RETURN; NEXT; RETURN; NEXT; RETURN; NEXT; RETURN
37 PRINTVW; EC5; NEXT; RETURN; NEXT; RETURN; NEXT; RETURN; NEXT; RETURN
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58 PRINTVW; EC5; NEXT; RETURN; NEXT; RETURN; NEXT; RETURN; NEXT; RETURN
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<tbody>
<tr>
<td>C-05</td>
<td>$0.69</td>
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<tr>
<td>C-10</td>
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<td>C-90</td>
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</tr>
</thead>
<tbody>
<tr>
<td>26-1066 Mod. III, 48 K, 2 Disk</td>
<td>2,495.00</td>
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<td>26-1062 Mod. III, 16 K</td>
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<td>26-1906 Inception Force (T)</td>
<td>14,99</td>
<td>11,99</td>
</tr>
<tr>
<td>26-1906 Super Script (D)</td>
<td>199.00</td>
<td>150.00</td>
</tr>
<tr>
<td>26-1591 Script Dictionary (D)</td>
<td>149.00</td>
<td>119.20</td>
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<tr>
<td>26-1599 Mod III Visicalc (D)</td>
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<td>155.00</td>
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<td>26-1591 Profile III Plus</td>
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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 BFS.

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,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 RTS = " "
110 FOR I = 1 TO 17: READ A: RTS = R1S + CHR$(A): NEXT I
120 DATA 217, 3, 0, 0, 0, 0, 1, 0, 4, 0, 2, 0, 0, 2, 0, 2, 0, 1, 2, 0, 1
```

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 (BFS)
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

---

<table>
<thead>
<tr>
<th>RAM Address</th>
<th>Description</th>
<th>Entry Information into registers</th>
</tr>
</thead>
<tbody>
<tr>
<td>4606</td>
<td>Reads a sector from disk</td>
<td>HL&gt;Buffer, C&gt;Drive, D&gt;Track #, E&gt;Sector #</td>
</tr>
<tr>
<td>4608</td>
<td>Writes a sector to disk</td>
<td>Same as above</td>
</tr>
<tr>
<td>4424</td>
<td>Opens an existing file</td>
<td>HL&gt;Buffer, DD&gt;DCB, B&gt;LRL</td>
</tr>
<tr>
<td>4426</td>
<td>Locates a particular record #</td>
<td>DE&gt;DCB, BC&gt;LRL</td>
</tr>
<tr>
<td>4428</td>
<td>Reads a logical record</td>
<td>HL&gt;Buffer, DE&gt;DCB</td>
</tr>
<tr>
<td>4429</td>
<td>Writes a logical record</td>
<td>Same as above</td>
</tr>
<tr>
<td>4422</td>
<td>Closes a file</td>
<td>DE&gt;DCB</td>
</tr>
<tr>
<td>4420</td>
<td>Kills a file &amp; deletes it from dir</td>
<td>DE&gt;DCB</td>
</tr>
</tbody>
</table>

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loaded with the logical record length (LR/L) - 256 bytes (LR/L = 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
46E5H 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 RD(I):NEXT I.
170 DATA 17,3,3,3,0,6,0,14,14,0,30,0,205,0,2,017,201.

The following will assign 255 bytes of RAM to the variable BFS as our buffer and insert the address of buffer into elements three and four.

160 BFS = STRING$(255,32)

500 RT(3) = PEEK(VARPTR (BFS) + 1)
   'LOAD LSB
510 RT(4) = PEEK(VARPTR (BFS) + 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 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 = 2:1 DR
   'SET DRIVE BIT (DB)
610 POKE (6H+4308H),DR : POKE (6H+4309),
   DB 'POKE DRIVE # & BIT

After loading the address of our buffer BFS 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 RTS$ 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 PRS(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.

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80 Microcomputing, April 1982 • 217
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. Controlling files.

```
010 'PROGRAM LISTING 2
012 'DESCRIPTION OF Routines.
020 'FILE READ
030 'FILE WRITE
040 'CLOSE FILE
050 'READ RECORD
060 'WRITE RECORD
070 'FILE STATUS
080 'FILE OPEN
090 'FILE SEEK
100 'FILE DELETE
110 'FILE ATTRIBUTE
120 'FILE SYSTEM
130 'FILE SEARCH
140 'FILE GET
150 'FILE PUT
160 'FILE NAME
170 'FILE SIZE
180 'FILE COPY
190 'FILE MOVE
200 'FILE CHANGE
210 'FILE REPLACE
220 'FILE SUBSYSTEM
230 'FILE QUERY
```

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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 (LRU) 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:

\[ \text{OPEN}^*="\text{R},1,"\text{FILENAME}="\text{CLOSE} \]

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:

\[ \text{FOR} \quad i = 1 \text{ TO } 32 \quad \text{PRINT} \quad i ; . ; "; \text{ASC(MID}( \text{DCS}, \text{i}, 1)) ; \text{ NEXT } i \]

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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---

---
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 weird 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$(91) (all pixels on), I get the graphics. I get uppercase without a driver and uppercase 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 AXX3027 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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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 360-440 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(MYS): 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 CLEAR$: INPUT "DO YOU WANT INSTRUCTIONS, Y/N"; A$   
10 IF A$ = "Y" THEN 198
20 ** COMPUTER-REPEAT FOR LEVEL 2 TRS-80 **
30 ** BY RANDOLPH FONTENOT JAN 1981 **
40 ** 734 CHOCTAW DRIVE **
50 ** OPÉLAUSAS, LA 78570 **
60 ** **

**********
80 CLEAR$: INPUT "DO YOU WANT INSTRUCTIONS, Y/N"; A$
100 IF A$ = "Y" THEN 198
110 CLS: PRINT $18, "INSTRUCTIONS FOR COMPUTER-REPEAT": PRINT
120 PRINT$: "COMPUTER-REPEAT IS A GAME OF SKILL AND MEMORY. YOU WILL BE"
130 PRINT$: "SHOW A SEQUENCE OF RANDOM LETTERS AT THE CENTER OF THE SCREEN."
140 PRINT$: "WHEN THE QUESTION MARK APPEARS, CAREFULLY REPEAT THE SEQUENCE"
150 PRINT$: "OF LETTERS."
160 PRINT$: "IT IS A 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$
180 INPUT "$SKILL CENTER": WHEN READY": A$
190 INPUT "$SKILL LEVEL, 1-5": SL$:MS$ = ""
200 IF SL$ = "1,8,4" ELSE IF SL$ = "2,9,8" ELSE IF SL$ = "3,16" ELSE IF SL$ = "4,8,12" ELSE IF SL$ = "5,8,4"
210 CLS: PRINTCHR$(23): PRINT$: "COMPUTER-REPEAT": PRINT$: "";
220 FOR I = 1 TO LEN(MYS):
230 IF I = 1 THEN 150
240 PRINT$: MID$(MYS, I, 1)
250 FORK = 1000: NEXTX
260 PRINT$: "";
270 PRINT$: "";
280 NEXTX
290 PRINT$: "";
300 PRINT$: "";
310 PRINT$: "";
320 PRINT$: "";
330 PRINT$: "";
340 PRINT$: "";
350 IF MS$ = ":" THEN NEXTX: ELSE CLS: PRINTCHR$(23): PRINT$: "YOU LOSE AT SKILL LEVEL:";
360 CLS: PRINTCHR$(23): PRINT$: "YOU WIN AT SKILL LEVEL:"; SL$: PRINT$: "CONGRATULATIONS!"
370 INPUT "PLAY AGAIN, Y/N"; A$
380 IF A$ = "Y" THEN 198
390 IF A$ = "N" THEN 198:
```

---

**The Key Box**

Basic Level II
Model 1

---

Program Listing

---

222 - 80 Microcomputing, April 1982
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lowercase letters, change line 230 to

```
230 RANDOM(L1, RAND(2L)) = RANDOM(28)
```

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 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 = 2B 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, 1.0 - 6.0: "$SL
```

Follow this same procedure to add additional skill levels.

My program does not require the user to retypen 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 it will cause the statements in the loop which cut down its efficiency. I will leave it up to you to find an efficient timer routine for lines 310-340.

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Store machine-language routines as string variables in Basic programs.

Memory Size?

Hugo T. Jackson
3446 Nairn Avenue
Vancouver, British Columbia
Canada V5S 4B5

If I discover once more that 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$(0)” 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 headphone or speaker into the headphone 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...

<table>
<thead>
<tr>
<th>HEX VALUE</th>
<th>DECIMAL VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
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<tr>
<td>66</td>
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<td>244</td>
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</tr>
<tr>
<td>246</td>
<td>390</td>
</tr>
</tbody>
</table>

---

Fig. 1. Hexadecimal to Decimal

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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 ma-
jine language subroutines. The
above method for storing ma-
jine 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 256 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
give 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

<table>
<thead>
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<tbody>
<tr>
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<tr>
<td>002E0</td>
</tr>
<tr>
<td>002F0</td>
</tr>
</tbody>
</table>

Program Listing 1. Babybeep Sound Module

---

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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 a 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-
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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.

---

Program Listing 6

```
100 D1=PEEK(CHR$(41))
110 D1+D1=PEEK(CHR$(41)+256)
120 C1=CH$(D1)
130 D1=D1+1
140 D2=FIX(D1/256)
150 POKE C1+D1=(D2*256)
160 POKE C1+1.D2
```

Program Listing 7

```
100 D1=PEEK(CHR$(41))
110 D1+D1=PEEK(CHR$(41)+256)
120 C1=CH$(D1)
130 D1=D1+1
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
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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 your 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 filename 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 32560 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, the 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

234 • 80 Microcomputing, April 1982
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 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 7CN 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.

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Program Listing 1 Continued

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- Call the Editor with one command
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Program Listing 2 Machine language versions.

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Program Listing 2 Continued

TU WRITE
7F4D 219467F 00550 LD HL,TITLE-1 ;POINT TO WM
HEX.
7F58 CD887F 00560 CALL NOPHER ;WRITE THE P
7F53 21414149 00570 LD HL,DOCNAME ;RETRIEVE THE
7F5C 86A8 00580 LD B,8 ;SET # TO MR
7F58 CD887F 00590 CALL RLEWR ;WRITE THE B
7F59 70 00600 LD A,C ;RETRIEVE THE
7F57 69 00601 CALL BYTOUT ;AND WRITE
7F57 9A 00602 LD HL,(BASIC) ;POINT TO PR
7F56 8D687F 00603 LD D,(GLEN) ;RETRIEVE THE
7F57 4D47 00604 CALL LOOP1 ;WRITE MR
7F56 8D6844 00605 LD D,(STRFSRC) ;POINT TO MR
7F57 69 00606 ST H,00 ;STRING SPA
7F58 2ADD 00607 LD HL,(KENTOP) ;POINT TO D
7F57 7F 00608 RET 18H ;CHANGE TO D
7F57 6A 00609 JR 2,DONE ;NO STRINGS
7F57 72 00610 CALL GETHR ;IF NO MR
7F57 6A 00611 JR 2,DONE ;WRITE MR
7F57 23 00612 IBC HL ;SPACE WITH
7F57 70 00613 CALL LOOP1 ;CALL MULTIB
7F57 CDA2 00614 CALL BYTOUT ;AND WRITE
7F58 7E1A 00615 LD A,12H ;SET UP ENTR
7F58 C440 00616 CALL BYEOUT ;AS THE MR
7F57 3E1A 00617 LD A,1AH ;JUMP TO B
7F58 C440 00618 CALL BYTOUT ;FOR INSU
7F57 3E1A 00619 CALL BOUT ;TURN OFF TR
7F57 0B 00620 CALL AF,AF' ;RESTORE THE
7F58 1B 00621 CALL AF,AF' ;REGISTER
7F59 00 00622 JP 1AHE ;AND BACK TO
7F44 0800 00623 MOV A,L ;A LITTLE STORAGE SPACE
7F58 8281 00624 MOV A,H ;AND A PROMPT OR SO
7F57 10 00625 MOV B,0 ;PROGRAM=VAR
7F57 70 00626 MOV B,55H ;TEMPORARY
7F57 11 00627 MOV B,56H ;SYSTEM HEAD
7F57 01 00628 MOV B,13H ;SPACE FOR P
7F57 02 00629 MOV B,13H ;PROMPT MSG
7F57 12 00630 MOV B,'NAME >' ;REALIZE ORI
7F58 89 00631 CALL RPG ;VIDEO ROUTI
7F58 05 00632 LD A,18H ;SUBROUTINE TO DETERMINE
7F58 05 00633 LD B,8H ;NUMBER OF BYTES TO BE WRITTEN TO
7F58 05 00634 LD B,0 ;TAPE
7F58 05 00635 LD A,19H ;SAVE START
7F58 00 00636 LD A,20H ;GET BLOCK
7F58 00 00637 LD A,21H ;PUT IT INTO
7F58 00 00638 LD A,22H ;RESTORE STA
7F58 00 00639 LD A,23H ;BACK TO MOR
7F58 00 00640 LD A,24H ;SUBROUTINE TO WRITE A BLOCK
7F58 00 00641 LD A,25H ;IN SYSTEM FORMAT AND ACCUMULATE
7F58 00 00642 LD A,26H ;A CHECKSUM (TO BE WRITTEN LATER)
7F58 00 00643 LD A,27H ;ENTER WITH B = # OF BYTES TO
7F58 00 00644 LD A,28H ;WRITE TO

Program Listing 2 Continues

80 Microcomputing, April 1982
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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.

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.

<table>
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<tr>
<th>KEY</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Halt test execution. Only recognized during printing to screen (hex digits or error message).</td>
</tr>
<tr>
<td>C</td>
<td>Continue test execution. Use after H to resume test or error messages.</td>
</tr>
<tr>
<td>E</td>
<td>Exit test. The &quot;Press Enter to Continue&quot; message will appear. Enter will return to DOS. Only recognized during printing to screen (hex digits or error message).</td>
</tr>
</tbody>
</table>

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:  
00170:  67F0
00180:  ORG 67F0H
00190:  
00190:  67F0 21E303
00190:  00190:  LD HL,03E3H ;ROM KBD driver address
00190:  67F3 221640
00190:  00200:  LD (4161H),HL ; to keyboard D/C.
00190:  67F6 216904
00210:  LD HL,0488H ;ROM video driver address
00190:  67F9 221E40
00220:  LD HL,0416H ; to video D/C.
00190:  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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80 Microcomputing, April 1982 • 241
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8004
Get direct access to machine-language routines.

Command Interpreter

Roger C. Alford
2633 Braeburn Circle
Ann Arbor, MI 48104

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 280'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 KBF1X.

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 interrupt 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 ;CLEAR SCREEN ROUT.
7001  00110  CLEAR EQU  01CH ;CUR. LINE RUNNING I
7002  00120  CHKCHR EQU  4820H ;CUR. LINE RUNNING I
7003  00130  INRTOT EQU  4816H ;LOC. OF INPUT ROUT.
7004  00140  BASIC EQU  46CCH ;BASIC EXIT POINT.
7005  00150  STROUT EQU  4844H ;STOR. INPUT ROUT. A
7006  00160  SPINTP EQU  4846H ;TEMP STOR. FOR SP.
7007  00170  PRINT MSG ROUT.
7008  00180  BUFFER EQU  4847H ;LOC. OF INPUT BUFFER

0 (HL) 00190  SAVCHR EQU  4848H ;TEMP STOR. FOR CHR.
0090  00200  RETURN EQU  89H
7000  2A14H  00202  CMDINT LD HL,(INRTOT) ;GET CUR. IN
7003  2244H  00208  (STROUT),HL ;STOR. FOR LA
7006  0210H  00210  LD HL,RUT ;GET YOUR IN
7009  216EH  00212  (INRTOT),HL ;STOR. IN IMP.
700C  0220H  00220  JP BASIC ;RETURN TO BASIC

***** 00270 ;************************************************************************
**200 ;* ROOT INTERCEPTS THE INPUT FROM THE KEYBOARD.
```

---

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 initialized to zero. The first entry in the command table is compared character by character to the characters in the line input buffer. If there is a 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 (ac-
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Program continued

782C BD734648 #8550 LD (STEMP),SP \SAVE STACK PTE
7383 D0A2a4648 #8560 LD IX,(STEMP) \PREP TO IND
7384 D0A66598 #8570 LD L,(IX+6) \GET CUR. BU
7385 D0B7D687 #8580 LD H,(IX+7) \GET CUR. BU
7386 D0B7D6992 #8590 LD A,(HL) \GET CUR. BU
7387 D0B7D4498 #8600 LD (SARD),A \TEMP. SAVE
7388 D0B7D86F #8610 LD A,80H \STORE RETW
7389 D0B7D877 #8620 LD E,HL \STORE RETW
738A 325257D #8630 LD RE,DE; TABLE \CHECK CMD T
738B 32526388 #8640 LD B,8 \REG IS CM
738C 325263A6 #8650 LD BL,(BUFFER) \GET ADDR OF T
738D 325263B6 #8660 LD (IX),A \GET CUR. FR
738E 325263C4 #8670 LD IX,DEC \GET CUR. FR
738F 325263D4 #8680 LD IX,HE \GET CUR. FR
73C0 32526373 #8690 LD IX,BC \GET CUR. FR
73C1 32526376 #86A0 LD IX,HL \GET CUR. FR
73C2 3252637D #86B0 LD IX,DE \GET CUR. FR
73C3 325263B4 #86C0 LD IX,HL \GET CUR. FR
73C4 325263C5 #86D0 LD IX,DE \GET CUR. FR
73C5 325263D6 #86E0 LD IX,HL \GET CUR. FR
73C6 325263D8 #86F0 LD IX,DE \GET CUR. FR
73C7 325263DB #8700 LD IX,DE \GET CUR. FR
73C8 325263C0 #8710 LD IX,DE \GET CUR. FR
73C9 325263CC #8720 LD IX,DE \GET CUR. FR
73CA 325263D9 #8730 LD IX,DE \GET CUR. FR
73CB 325263DC #8740 LD IX,DE \GET CUR. FR
73CC 325263DD #8750 LD IX,DE \GET CUR. FR
73CD 325263DE #8760 LD IX,DE \GET CUR. FR
73CE 325263DF #8770 LD IX,DE \GET CUR. FR
73CF 325263E0 #8780 LD IX,DE \GET CUR. FR
73D0 325263E1 #8790 LD IX,DE \GET CUR. FR
73D1 325263E2 #87A0 LD IX,DE \GET CUR. FR
73D2 325263E3 #87B0 LD IX,DE \GET CUR. FR
73D3 325263E4 #87C0 LD IX,DE \GET CUR. FR
73D4 325263E5 #87D0 LD IX,DE \GET CUR. FR
73D5 325263E6 #87E0 LD IX,DE \GET CUR. FR
73D6 325263E7 #87F0 LD IX,DE \GET CUR. FR
73D7 325263E8 #8800 LD IX,DE \GET CUR. FR
73D8 325263E9 #8810 LD IX,DE \GET CUR. FR
73D9 325263EA #8820 LD IX,DE \GET CUR. FR
73DA 325263EB #8830 LD IX,DE \GET CUR. FR
73DB 325263EC #8840 LD IX,DE \GET CUR. FR
73DC 325263ED #8850 LD IX,DE \GET CUR. FR
73DD 325263EE #8860 LD IX,DE \GET CUR. FR
73DE 325263EF #8870 LD IX,DE \GET CUR. FR
73DF 325263F0 #8880 LD IX,DE \GET CUR. FR
73E0 325263F1 #8890 LD IX,DE \GET CUR. FR
73E1 325263F2 #88A0 LD IX,DE \GET CUR. FR
73E2 325263F3 #88B0 LD IX,DE \GET CUR. FR
73E3 325263F4 #88C0 LD IX,DE \GET CUR. FR
73E4 325263F5 #88D0 LD IX,DE \GET CUR. FR
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73E6 325263F7 #88F0 LD IX,DE \GET CUR. FR
73E7 325263F8 #8900 LD IX,DE \GET CUR. FR
73E8 325263F9 #8910 LD IX,DE \GET CUR. FR
73E9 325263FA #8920 LD IX,DE \GET CUR. FR
73EA 325263FB #8930 LD IX,DE \GET CUR. FR
73EB 325263FC #8940 LD IX,DE \GET CUR. FR
73EC 325263FD #8950 LD IX,DE \GET CUR. FR
73ED 325263FE #8960 LD IX,DE \GET CUR. FR
73EE 325263FF #8970 LD IX,DE \GET CUR. FR
73EF 32526300 #8980 LD IX,DE \GET CUR. FR
73F0 32526301 #8990 LD IX,DE \GET CUR. FR
73F1 32526302 #89A0 LD IX,DE \GET CUR. FR
73F2 32526303 #89B0 LD IX,DE \GET CUR. FR
73F3 32526304 #89C0 LD IX,DE \GET CUR. FR
73F4 32526305 #89D0 LD IX,DE \GET CUR. FR
73F5 32526306 #89E0 LD IX,DE \GET CUR. FR
73F6 32526307 #89F0 LD IX,DE \GET CUR. FR
73F7 32526308 #8A00 LD IX,DE \GET CUR. FR
73F8 32526309 #8A10 LD IX,DE \GET CUR. FR
73F9 3252630A #8A20 LD IX,DE \GET CUR. FR
73FA 3252630B #8A30 LD IX,DE \GET CUR. FR
73FB 3252630C #8A40 LD IX,DE \GET CUR. FR
73FC 3252630D #8A50 LD IX,DE \GET CUR. FR
73FD 3252630E #8A60 LD IX,DE \GET CUR. FR
73FE 3252630F #8A70 LD IX,DE \GET CUR. FR
73FF 32526310 #8A80 LD IX,DE \GET CUR. FR

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Program continued

```
79E5 C9 012130 RET
012140 ;
012150 ;

012160 ; THESE ROUTINES, CMD1 THROUGH CMD5, ARE
012170 ; MERELY TO SHOW SAMPLE USE OF COMMAND
012180 ; SERVICE ROUTINES, THESE HERE DO NOTHING
012190 ; MORE THAN MERELY PRINT MESSAGES, EXCEPT C
0121A0 ;
0121B0 ; WHICH CHANGES THE 'LIST' COMMAND TO 'LIST
0121C0 ;'
0121D0 ; IN 'REAL LIFE' ANY ROUTINE MAY BE USED IN
0121E0 ; PLACE OF THESE TO PERFORM ANY DESIRED FUC
0121F0 ;
012200 ; THERE DOES NEED TO BE A ROUTINE FOR EVERY
012210 ; COMMAND
012220 ;
012230 ; can use the same routine. All routines M
012240 ;
012250 ; END WITH A 'JP OUT1' IN ORDER TO RETURN T
012260 ;
012270 ; IN THE PROPER WAY, UNLESS THE RETURN IS I
012280 ;
012290 ; TO RETURN THE CONTENTS OF THE INPUT BUFFER
0122A0 ;
0122B0 ;
0122C0 ;
0122D0 ;
0122E0 ;
0122F0 ;
012300 ;
012310 ;
012320 ;
012330 ;
012340 ;
012350 ;
012360 ;
012370 ;
012380 ;
012390 ;
0123A0 ;
0123B0 ;
0123C0 ;
0123D0 ;
0123E0 ;
0123F0 ;
012400 ;
012410 ;
012420 ;
012430 ;
012440 ;
012450 ;
012460 ;
012470 ;
012480 ;
012490 ;
0124A0 ;
0124B0 ;
0124C0 ;
0124D0 ;
0124E0 ;
0124F0 ;
012500 ;
012510 ;
012520 ;
012530 ;
012540 ;
012550 ;
012560 ;
012570 ;
012580 ;
012590 ;
0125A0 ;
0125B0 ;
0125C0 ;
0125D0 ;
0125E0 ;
0125F0 ;
012600 ;
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0126E0 ;
0126F0 ;
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012730 ;
012740 ;
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012790 ;
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0127B0 ;
0127C0 ;
0127D0 ;
0127E0 ;
0127F0 ;
012800 ;
012810 ;
012820 ;
012830 ;
012840 ;
012850 ;
012860 ;
012870 ;
012880 ;
012890 ;
0128A0 ;
0128B0 ;
0128C0 ;
0128D0 ;
0128E0 ;
0128F0 ;
012900 ;
012910 ;
012920 ;
012930 ;
012940 ;
012950 ;
012960 ;
012970 ;
012980 ;
012990 ;
0129A0 ;
0129B0 ;
0129C0 ;
0129D0 ;
0129E0 ;
0129F0 ;
012A00 ;
012A10 ;
012A20 ;
012A30 ;
012A40 ;
012A50 ;
012A60 ;
012A70 ;
012A80 ;
012A90 ;
012AA0 ;
012AB0 ;
012AC0 ;
012AD0 ;
012AE0 ;
012AF0 ;
012B00 ;
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012B30 ;
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012B50 ;
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012B70 ;
012B80 ;
012B90 ;
012BA0 ;
012BB0 ;
012BC0 ;
012BD0 ;
012BE0 ;
012BF0 ;
012C00 ;
012C10 ;
012C20 ;
012C30 ;
012C40 ;
012C50 ;
012C60 ;
012C70 ;
012C80 ;
012C90 ;
012CA0 ;
012CB0 ;
012CC0 ;
012CD0 ;
012CE0 ;
012CF0 ;
012D00 ;
012D10 ;
012D20 ;
012D30 ;
012D40 ;
012D50 ;
012D60 ;
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012D90 ;
012DA0 ;
012DB0 ;
012DC0 ;
012DD0 ;
012DE0 ;
012DF0 ;
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012E90 ;
012EA0 ;
012EB0 ;
012EC0 ;
012ED0 ;
012EE0 ;
012EF0 ;
012F00 ;
012F10 ;
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012F30 ;
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012F60 ;
012F70 ;
012F80 ;
012F90 ;
012FA0 ;
012FB0 ;
012FC0 ;
012FD0 ;
012FE0 ;
012FF0 ;
013000 ;
013010 ;
013020 ;
013030 ;
013040 ;
013050 ;
013060 ;
013070 ;
013080 ;
013090 ;
0130A0 ;
0130B0 ;
0130C0 ;
0130D0 ;
0130E0 ;
0130F0 ;
013100 ;
013110 ;
013120 ;
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013190 ;
0131A0 ;
0131B0 ;
0131C0 ;
0131D0 ;
0131E0 ;
0131F0 ;
013200 ;
013210 ;
013220 ;
013230 ;
013240 ;
013250 ;
013260 ;
013270 ;
013280 ;
013290 ;
0132A0 ;
0132B0 ;
0132C0 ;
0132D0 ;
0132E0 ;
0132F0 ;
013300 ;
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013330 ;
013340 ;
013350 ;
013360 ;
013370 ;
013380 ;
013390 ;
0133A0 ;
0133B0 ;
0133C0 ;
0133D0 ;
0133E0 ;
0133F0 ;
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60 Microcomputing, April 1982 • 249
Try this if you can't buy what you need.

Model III Master Directory

Wilbur A. Muehlig, M.D.
726 N. 91 Plaza, #306
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.

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 ## ## ##, where the
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 the 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. Misleading 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 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.
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Kit: $90
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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
announced 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 com-
puter 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 excel-
 lent. 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
setting of any kind. The documentation is a sheaf of 8½ × 11 pa-
pers 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 pro-
gram 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 mem-
ory.
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 posi-
tion 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 out-
put 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.

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 po-
sition 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 load-
ing without getting confused by the portion of
the previous program you just fed it.

Try that on your regular cassette system;
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the ribbon cable, the power adapter, an instruc-
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Make TRSDOS behave like a turnkey system.

Model I Do Files

Philip F. Jackisch
4218 Roseowld Avenue
Royal Oak, MI 48073

Gordon E. Knapp
27625 Vermont Drive
Southfield, MI 48076

As personal computers become more popular their users have become less technically oriented. Many users have little need or desire to know how they work. Secretaries, salesmen, part-time employees, and family members feel more at ease with computers if they do not have to perform a lot of tasks before getting started on the program they want to use.

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.

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 Tape-Disk 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 D6900 and hit Space bar.
4. Type M6900 and hit Space bar.
5. Enter the machine code as shown, hitting the Space bar after every double digit.

   6B00 = > 21 0F 6B 32 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/MD:0 6B00 6B3E 6B00 and hit Enter.
11. Type E and hit Enter.

The Key Box

Basic Level II
Model I
16K RAM
TRSDOS

Figure 1
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<td>with RS-232 C Add</td>
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NOTE: These Model III computers contain Apparat installed disk drives and memory. They are warranted by Apparat, Inc. for 90 days.

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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 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 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 ULCDRV/CMD program, be careful. This program will defeat the Start program. ULCDRV converts all uppercase letters to lowercase but does not have a command to restore the uppercase.

“Unfortunately, with . . . TRSDOS the operator has to go through many operations before using a typical Basic program.”

Why Are Smart Terminal Programs So Expensive?

Good question. Maybe it's precedence. The first widely known terminal program had a relatively big price tag, like the first word processor, and it was worth it because it was the only one out. But nearly every one that has come along since has maintained an $80 to $150 price tag, and it would seem that you are forced to paying for it (or admit it) trade it. Some of these programs do a lot, and some don't. But if you are in the market for such a program you should look closely at TELCOM from Mumford Micro Systems. Our price is $39.95, and it is supplied on disk for Model I or Model III. TELCOM is menu driven, extremely easy to use, and supports the following features:

- **Terminal Mode:**
  - Save data on disk.
  - Spooled printer output.
  - Upper and lower case support.
  - 8 programmable automatic (log on) messages.
  - 10 programmable character keys for special codes.
  - Dump the RAM buffer to a disk file.
  - Transmit a disk file in ASCII or binary. No conversion is necessary.
  - Receive a file in ASCII or binary. These transmit and receive functions automatically generate and exchange a 16 bit checksum to verify valid data on the receiver, and the other end is also running TELCOM. If the transmission is correct, TELCOM tells you so.
  - Define a buffer “open/close” protocol to save only selected data.
  - Define a “halt/resume” (Xon/Xoff) protocol for file transfers.
  - Easily examine or change baud rate, bits per word, parity, and stop bits.
  - Save the entire program as configured on disk.

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!

**TERMS:** $39.95 plus $1.50 postage. California residents add $2.40 tax. VISA, MASTERCARD, and COD orders accepted. Specify Model I or Model III.

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Concepts of computer modeling.

Sublime Simulations

James Edward Keogh
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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 amuse-

ment centers. For a quarter you can test your skill flying against the enemy—and really feel like you are flying.

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 ser-
ved 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 per-
cent 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ive minutes.
In some systems the relation-
ships cannot be easily identified
by percentages. More detailed
models require regression analy-
sis and other statistical methods.
In the gas station model I as-
sume that customers arrive at
random. I will use the random
number generator for the range
to zero to 100.
The next step is to assign a
meaning to the random num-
bers. 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 per-
centages 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 ran-
donumber生成器 generator within
the program. In the model 15
minutes do not have to pass be-
fore the next car enters the gas
station. You can use a few sec-
onds 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 represent-
ing 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 sec-
onds and 5 seconds to represent
actual times.
Displaying Results
Simulation models allow you
to understand and manipulate
complex situations easily. Il-
ustrations best communicate
this understanding.
The computer pictures of
Saturn illustrate this concept.
The computer received data
measurements from the space-
craft. 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 col-
ors to represent each set of
measurements and then dis-
played 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 il-
strate 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 il-
strate the most important
item—the gas station!
You can use detailed illustra-
tions or a simple square to
represent the cars, pumps, and
so on. The method you use
depends on your skills as a pro-
grammer 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 num-
ber 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 ex-
ample, what happens if an air-
craft encounters a head wind
of 15 knots? The user inputs this
change and the model il-
ustrates the effect.
When you design a simula-
tion 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 percent-
age breakdown of the station’s
business. Measured data al-
ready in the model becomes de-
fault 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
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 simula-
tion model? He can briefly
analyze the raw data to come
to a decision.
A computer model permits ex-
perimentation. Where it might
take several hours to recal-
culate the performance for each
factor changed, the computer
simulation model provides
results within seconds.
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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 largest 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 BARXZN. 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 ones,” 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 keystroke creates a double-image on the video. We are unable to correct this, even with our best de-key-bounce 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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See List of Advertisers on page 338

80 Microcomputing, April 1982 • 263
Is there a computer career in your future?

Technological Destiny—Part I

Gary Dillio
1109 Madison Avenue
Prospect Park, PA 19076

At work, does your mind drift to your computer at home, alone and unplugged, helpless without you to guide it? Have you ever roused 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 into 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. Online storage of CPU memory capacity is measured in K, or Kilobytes. A byte is the amount of storage necessary to store a character. A byte is made up of a number of bits (binary digits). 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.

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 alphanumeric, 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

<table>
<thead>
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<th>EXPENSE</th>
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</tr>
</tbody>
</table>

Table 1

**TRS-80® OWNERS**

**LOW COST ARCHIVE OR DISK BACK-UP TAPE STORAGE SYSTEM**

The BETA-80 is a low cost, high speed, direct access digital tape system which provides one megabyte of storage per drive. The dual drive configuration provides two megabytes on line. The BETA-80 has been interfaced to the Model III TRS-80* for use in backing up costly diskettes. It provides direct access at better than 100 inches per second and will store 10 single density 5-1/4” diskettes on a standard C60 cassette.

Write or phone MECA for details.

**MECA** - (714) 365-7686
7350 Acoma Trail, Suite 3 - Yucca Valley, CA 92284

*Manufacturer's Registered Trademark*
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.

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 milliseconds or billions of a second.

Gary Dillio 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.
MAKE BASIC PERFORM LIKE A CHAMPION

Lewis Rosenfelder

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& OTHER MYSTERIES

A guided tour of BASIC programming tricks and techniques

BASIC is not nearly as slow as most programmers think it is. BASIC Faster and Better shows you how to supercharge your BASIC, with 300 pages of fast, functions and subroutines.

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E/RAM II SCREEN PHOTO

E/RAM II is a hardware/software package which adds a 512 x 240 high-resolution graphics display to the TRS-80 Model II. It doesn’t plug directly into the Model II case but rather provides you with a very high quality, fully assembled, printed circuit board which plugs directly into the Model II case. The software module allows you to use all of your usual assembly language subroutines which can be called from any high level or assembly language program. Routines include control functions which can either turn the normal TRS-80* or the E/RAM II display on, or off, erase the screen, or invert the video. Port functions include SET, RESET, or READ a point on the screen. When the UNE function is passed end-point coordinates, an optimized dot raster line is produced at machine language speed. For more information, or to order, see your dealer or call THE COMPUTER STORE at (918) 747-2333.

Dealers and OEM’s contact: KEYLINE COMPUTER PRODUCTS, INC. TULSA, OKLAHOMA 74135

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Bringing the Supermarket to its Knees

J. A. Kraynak
5123 Ryan Road Apt. 22
Toledo, OH 43614

It is a common situation: A computer, a wife and a user-husband in the middle. The solution is to get the wife involved or take up a new hobby. The playing games tactic did not work.

One day I observed her begrudgingly making the grocery shopping list. I decided to write a program to minimize the chore. It had to be simple and fast.

The Organized Grocery List

My Shopping List program displays 45 grocery items at a time and permits the items to be selected (for later printout) or passed over. A built-in quick exit brings the next page of items into view for selection. Once all

items (five pages) are presented the user can input items passed over, forgotten or not listed. The grocery list is printed in the

order products appear on the store's shelves.

Since each store is laid out differently, a trip to the store will be necessary. List in the Data statements (lines 990-1550), the order (aisle by aisle) the groceries come into view.

**Program Listing 1**

```basic
10 CLS 200
21 REM "TITLAGE & INSTRUCTIONS
30 PRINT CHR$(27)"e"; PRINT" *** SHOPPING LIST ***
40 PRINT" * BY J. A. KRAYNAK*
50 PRINT"* PRINT* PRINT* PRINT"if YOU NEED INSTRUCTIONS (Y/N)
60 A$=INKEY$: IF A$="Y" THEN CLEAR$="*" ELSE CLEAR$="*
80 PRINT"* AT A TIME OF COURSE, WITH A BLINKING CURSOR 1 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 *** WYLL APPEAR TO THE LEFT OF THE ITEMS SELECTED, TO:*
130 PRINT"* MOVE TO THE NEXT PAGE" PRESS THE 'O' KEY. YOU CANNOT GO:*
140 PRINT"* BACKWARDS...IF YOU FORGET ANY ITEM - DON'T PRINT - 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$15"64,"* PRESS SPACE BAR TO CONTINUE:"*
171 REM ** INSTRUCTIONS BLINKING CURSOR ROUTINE
180 ELX=CHR$(143)
190 LEX= chr$(146)
200 PRINT$(134446,ELX$): FORO=1 TO 10: NEXTO
210 A$=INKEY$: PRINT$(13446,ELX$): FORO=1 TO 10: NEXTO: IF A$="Y" Then CLEAR$="*" THEM 12410452988
220 IF O=1 THEN A$="O" ELSE A$="1": IF A$="Y": PRINT$(13446,ELX$)
230 DIM LS$(45),LTS$(258),LTS$(258),LTS$(258),LTS$(258),LTS$(258),LTS$(258),LTS$(258),LTS$(258),LTS$(258),LTS$(258),LTS$(258)
250 PRINT"*** LOAD SCREEN WITH 45 ITEMS
260 FOR Y=1 TO 45: READ LT$(Y): NEXT Y
270 FOR X=1 TO 45
280 READ LS$(X)
290 IF LT$(X)="**": END THEN GOTO 380
300 NEXT X
310 CLS
320 REM ** SET CURSOR AT PROPER POSITION
330 S=X-1: S=S+1: If X=46 THEN 330
340 PRINTSTR$(y,LT$:S$)
350 LTS$(S$)=LT$(X)
360 NEXT S
370 GOTO 320
380 REM ** ADD MISCELLANEOUS ITEMS ROUTINE
390 CLS: PRINT"* YOU MAY NOW ADD UP TO 20 ITEMS OF YOUR CHOICE THAT WERE NOT ON*
400 CLS: PRINT"* THE LIST. AFTER EACH ITEM IS TYPED, PRESS ENTER. WHEN FINISHED....TYPE 'END' FOLLOWED BY PRESSING ENTER."*
410 PRINT: FOR Y=1 TO 10
420 PRINT$(13446,ELX$)
440 IF M$(Y)="**": END THEN 460
450 NEXT Y
460 REM ** PRINT OUT
470 D=PRINT$(4312)
480 IF D="YES" THEN 480
490 IF D="NO" THEN 480
500 IF D="YES" THEN 510 ELSE GOTO 510
510 PRINT$:PRINT$: **** PRINTER NOT READY...CORRECT & PROCEED ********
520 FOR G0 TO 20: NEXT G0: GOTO 460
530 CLS
```

Program continues

---

**The Key Box**

Basic Level II or
Disk Basic
Model I
16K RAM
TRSDOS or NEWDOS80
Disk drive optional
Printer
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 830-860. 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

```
1480 LPRINT* "LPRINT* LPRINT* SHOPPING LIST **
1481 **********LPRINT* LPRINT* **LPRINT* **
1482 BC=20
1483 FOR A=0 TO 0-1
1484 GOUB1560
1485 LPRINTTAB(US) AS(A); NEXT A
1486 NEXT A
1487 FOR A=0 TO P-1
1488 GOUB1560
1489 LPRINTTAB(US) BS(A); NEXT A
1490 NEXT A
1491 FOR A=0 TO Q-1
1492 GOUB1560
1493 LPRINTTAB(US) CS(A); NEXT A
1494 NEXT A
1495 FOR A=0 TO R-1
1496 GOUB1560
1497 LPRINTTAB(US) DS(A); NEXT A
1498 NEXT A
1499 FOR A=1 TO W
1500 GOUB1560
1501 LPRINTTAB(US) MS(A); NEXT A
1502 NEXT A
1503 LPRINT** LPRINT* LPRINT** END OF LIST **
1504 ***************
1505 LPRINT* LPRINT* LPRINT* LPRINT**
1506 END
1507 END
1508 REM ** BLINKING CURSOR ROUTINE
1509 CS=CHEI(143)
1510 JS=*
1511 PRINTBIS*64,5;:"";:PRESS '8' KEY FOR NEXT PAGE:********;
1512 PRINT 1-1 TO 45
1513 PRINT1(1-2,CS); PRINT FOR=10,150;H8170
1514 PRINT1K=1;K=1-0;H8170;H8170
1515 PRINT1K=1;K=1-0;H8170;H8170
1516 PRINT1K=1;K=1-0;H8170;H8170
1517 LPRINT** GROCERY ITEM LIST: - 45 ITEMS PER PAGE**
1518 DATA 5,25,44,69,89,184,133,153,172,257,227,263,281,180,325,345,364,389,4
1519 LPRINT** GROCERY ITEM LIST: - 45 ITEMS PER PAGE**
1520 DATA CANTELOUPES,MUSHROOMS,APPLES,CELERY
1521 DATA CARROTS,PEARLS,LETTUCE,CEUCMERS
1522 DATA TOMATOES,MARCHETTI DRESSING,LEMON PEPPERS
1523 DATA BANANAS,POTATOES,CORN,CABBAGE
1524 DATA ONIONS,SUGAR,FRUIT,JUICES
1525 DATA ORANGE,JUICE,DRIED BEETS,EGGS,TOOTER
1526 DATA MARGARINES,MILK,CHEDDAR(SLICES)
1527 DATA CHEESE(PIZZA),MATTELLINAS,SAVOY DRESSING
1528 DATA PICKLES(BULLET),PIKES(SLICES),MUSTARD
1529 DATA KETCHUP,PEANUT BUTTER,JELLY
1530 DATA RELISH,HOT SAUCE
1531 DATA DRESSINGS,BUNNIES,MAINS,BOILED,FRANCE BREAD
1532 DATA ITALIAN BREAD,PIZZA,CARE,DOUGS
1533 DATA POTATO SALAD,MACARONI SALAD,KIELBASA
1534 DATA LUNCHEON MEAT,BALONNA,KIELBASA LOAF
1535 DATA PIZZA LOAF,SALAMI
1536 DATA PEPPS,DEEP PEPPS,UP,GINGERALES
1537 DATA DR PEPPER,N C COLA,POP,BRITHERS
1538 DATA PEANUTS,MALUS,PLAIN CHIPS,STIPPED CHIPS
1539 DATA PRETZELS,POPCORN,CORN CHIPS
1540 DATA CORN CURLS,DOUTS
1541 DATA MUSHROOMS,SAUCERCHAUT,PEAS,CARROTS,GREEN BEANS
1542 DATA CORN,CHILI BEANS,POCKS & BEANS,INSTANT COFFEE
1543 DATA REGULAR COFFEE,TEA BAG,COCA RIS,TOMATO SAUCE
1544 DATA TOMATO PUCKS,TOMATO PASTE,TOMATOES,MACHE
1545 DATA FRUIT COCKTAIL,PINEAPPLES,TOMATO JUICE
1546 DATA DOG FOOD,COOK BONC,DOG YUMS,PEA POWDER
1547 DATA FRUITED FLAKES,BEETLES,CORN FLAKES,BREANDED WHEAT
1548 DATA BEEF NOODLE SOUP,TOMATO RICE SOUP,CHICKEN SOUP
1549 DATA TOMATO SOUP,VEGETABLE SOUP,TOMA FISH,SAUMON
1550 DATA RICK-A-MONI,ROCK,SPAEGTOK SAUCE,PIZZA SAUCE
1551 DATA SUGAR,RODIES,ELBO MACRONI,REG NOODLES
1552 DATA RITATO,COOKIES,SALEEM CRACKERS,REG CRACKERS
1553 DATA SOAP,FACE,SOAP,SHOWER,WK BUBBLE
1554 DATA CLEANERS,CHRESS,WINDEX,VAISH,SOUS SCRUB
1555 DATA MR CLEAN,AIR FRESHENERS,SHOOT,BLACE,IVORY LIQUID

Program continues
```

See List of Advertisers on page 338

80 Microcomputing, April 1982 • 271
Microline 84 (Parallel) $1059\text{}{$8}

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- 50 cps proportional mode
- Enhanced/emphasized print
- Dot-addressable graphics
- Tractor/friction feed up to 16"
- Program-selectable character size

Microline Printers

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NEC Printers

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Epson Printers

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Centronics Printers

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I
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 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.

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 (somewhat 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.

Program Listing

100 CLS:PRINT #30,"";***************
110 PRINT "HOM INVENTORY PROGRAM "
120 PRINT "BY DAVID G. KUHN"
130 FOR I=1 TO 100 NEXT I
140 *** PRINT THE MENU OF OPTIONS
150 PRINT "M=MENU";PRINT "R=PRINT";PRINT "I=ADD"
160 PRINT "T=TERMINATE";
170 PRINT "CHOOSE BY NUMBER"
180 *** RECORD MENU CHOICE USING INPUTS AND EXECUTE OPTION
190 IF K=1 THEN 235
200 IF K=2 THEN 225
210 IF K=3 THEN CLS:GOTO 420
220 IF K=4 THEN GOTO 155
230 GOTO 155
240 *** INITIALIZE CUR.VAL."T", READ, AND LIST ALL ITEMS

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Model III
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80 Microcomputing, April 1982 • 277
Five popular, inexpensive printers compared.

Dot Matrix Bargains

Harley Dyk
1644 Grant
Grand Haven, MI 49417

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, 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
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, 850

The 850 is made by Base, 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, 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
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NOW - Create & Edit BASIC programs quickly and easily with this versatile Full Screen Basic Editor.

FEATURING Eleven commands and thirteen control keys to do any edit function you may require:
- Scroll Forward & Backward through program
- Change many lines at one time
- Insert or delete characters
- Add or delete lines
- Search for strings
- Load the Editor once - it becomes an extension of your Model 3 BASIC
- Call the Editor with one command
- Return to BASIC by pressing BREAK

INSTRUCTION MANUAL ONLY (refundable) $1.00

Model III Level II Tape ............... $19.95
NJ residents add $1.00 Sales Tax

ds SOFTWARE
86 Mansel Dr. Landing, N.J., 07850

for the TRS-80 from Micro-Mega

The Original GREEN-SCREEN

The eye-pleasing Green-Screen fits over the front of your TRS-80 Video Display and gives you improved contrast with reduced glare. You get bright luminous green characters and graphics like those featured by more expensive CRT units.

Don't confuse the Original Green-Screen with a piece of thin film stuck to the face of your video tube, such as that advertised by others. The Original Green-Screen is mounted in a full frame perfectly matched to the color and texture of the TRS-80 Video Display. It is attached with adhesive strips which do not mar your unit in any way.

The full frame design of the Original Green-Screen "squares off" the face of your video display and greatly improves the overall appearance of your system.

(Specify whether for Model I or Model III)

THE GREEN-SCREEN ....................... $13.95
Add $1.50 for postage and handling.

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 14.3 Characters/Inch
The Enhanced Mode Looks Like This


Photo 2. The Centronics 737
QUALITY SOFTWARE FOR TRS-80 COLOR!

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 STARTREK. 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 enough 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 Moo lock 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.

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 OSI and TRS-80 Color. We add new programs every week. Send $1.00 for our complete catalog.

AARDVARK - 80

TRS 80
2352 S. Commerce, Walled Lake, MI 48088
(313) 669-3110

TRS 80 COLOR

See List of Advertisers on page 338
80 Microcomputing, April 1982 • 261
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 ad-
vance—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**

<table>
<thead>
<tr>
<th></th>
<th>BASE, 850</th>
<th>CENTRONICS 737</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>15 lbs</td>
<td>12 lbs</td>
</tr>
<tr>
<td>Size (H x W x D)</td>
<td>3 x 15 x 11</td>
<td>5 x 14.5 x 11</td>
</tr>
<tr>
<td>List Price</td>
<td>$799, wire tray &amp; paper roller -$25</td>
<td>$995</td>
</tr>
<tr>
<td>Standard Interface</td>
<td>Parallel, series (20mA &amp; RS-232), IEEE-488</td>
<td>Parallel</td>
</tr>
<tr>
<td>Speed</td>
<td>100 cps at all character densities</td>
<td>50 cps @ 10 cpi</td>
</tr>
<tr>
<td>Time to list typical 5.6K Basic program @ 10 cpi</td>
<td>2 min. 20 sec.</td>
<td>4 min. 5 sec.</td>
</tr>
<tr>
<td>Bi-directional</td>
<td>Yes (can select uni-directional)</td>
<td>No</td>
</tr>
<tr>
<td>Print head life expectancy (characters)</td>
<td>100 million</td>
<td>150 million</td>
</tr>
<tr>
<td>Print head drive</td>
<td>Roller Cam</td>
<td>Gear</td>
</tr>
<tr>
<td>Descenders</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of wires in print head</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Number of possible print variations of characters</td>
<td>12 plus inverse printing</td>
<td>6</td>
</tr>
<tr>
<td>Print head replacement cost</td>
<td>$50</td>
<td>$172</td>
</tr>
<tr>
<td>Densities (characters/line)</td>
<td>64, 72, 80, 96, 120, 132 plus elongated for each</td>
<td>40, 66, 80, 132 monospaced 8.2 to 24.6 cpi in proportional mode depending on text</td>
</tr>
<tr>
<td>Graphics</td>
<td>Dot resolution control, 5 densities, 99 dots/in. max. hor. 72 dots/in. max. vert.</td>
<td>None</td>
</tr>
<tr>
<td>Slash zeroes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Line spacing</td>
<td>6 lines/in. default. Programmable in half dot increments</td>
<td>6 lines/in.</td>
</tr>
<tr>
<td>Maximum paper width</td>
<td>9½ in. fanfold, 8½ in. cut</td>
<td>9½ in. fanfold, 8½ in. cut</td>
</tr>
<tr>
<td>Tractors</td>
<td>Yes, to 9½ in.</td>
<td>No, pinfeed 9½ in. paper only</td>
</tr>
<tr>
<td>Friction feed</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Paper loading</td>
<td>Rear, bottom, or front</td>
<td>Rear</td>
</tr>
<tr>
<td>Paper tray</td>
<td>Available</td>
<td>No, separator used to divide paper in &amp; out</td>
</tr>
<tr>
<td>Paper roll holder</td>
<td>Available</td>
<td>Yes</td>
</tr>
<tr>
<td>Copies</td>
<td>Up to 3 part</td>
<td>Up to 3 part</td>
</tr>
<tr>
<td>Paper out indicator</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Top of form control</td>
<td>Yes (hardware &amp; software)</td>
<td>Yes (software only)</td>
</tr>
<tr>
<td>External controls</td>
<td>Power, on line/off line, form/line feed</td>
<td>Power, on line/off line, Paper FWD/REV</td>
</tr>
<tr>
<td>Ribbon</td>
<td>½ in. width, cartridge, 5 million character expectancy</td>
<td>15 yd. zip-pack mobius loop</td>
</tr>
<tr>
<td>Noise (on a scale from 1–5 with 1 being most quiet)</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

**Company address & phone**

---

**Base, Inc.**
P.O. Box 3548
Fullerton, CA 92631
800-864-7360

**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-

---

<table>
<thead>
<tr>
<th>Printer chart continues</th>
<th>EPSON MX-80</th>
<th>INTEGRAL DATA SYSTEMS 445</th>
<th>OKIDATA MICROLINE 80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>12 lbs</td>
<td>20 lbs</td>
<td>14 lbs</td>
</tr>
<tr>
<td>Size (H x W x D) in.</td>
<td>4.2 x 14.7 x 12</td>
<td>12.5 x 15.75 x 12.5</td>
<td>4.25 x 13.5 x 9.75</td>
</tr>
<tr>
<td>List Price</td>
<td>$645; bit graphics, serial interface addl.</td>
<td>$795; add $99 for graphics, paper tray addl.</td>
<td>$800, tractors $140, buffered RS-232, addl.</td>
</tr>
<tr>
<td>Standard Interface (if parallel, is Centronics compatible)</td>
<td>Parallel</td>
<td>Parallel &amp; Series</td>
<td>Parallel</td>
</tr>
<tr>
<td>Speed</td>
<td>80 cps @ 10 cpi</td>
<td>120 cps @ 10 cpi</td>
<td>80 cps @ 10 cpi</td>
</tr>
<tr>
<td>Time to list typical 5.6K Basic program @ 10 CPI</td>
<td>2 min. 19 sec.</td>
<td>2 min. 12 sec.</td>
<td>3 min. 6 sec.</td>
</tr>
<tr>
<td>Bidirectional</td>
<td>Yes (logic seeking)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Print head life expectancy (characters)</td>
<td>50–100 million</td>
<td>300 million</td>
<td>200 million (guaranteed)</td>
</tr>
<tr>
<td>Print head drive</td>
<td>Belt</td>
<td>Belt</td>
<td>Belt</td>
</tr>
<tr>
<td>Descenders</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Number of wires in print head</td>
<td>9</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Number of possible print variations of characters</td>
<td>12</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Print head replacement cost</td>
<td>Under $30</td>
<td>$150</td>
<td>$115</td>
</tr>
<tr>
<td>Densities (characters/line)</td>
<td>40, 66, 80, 132</td>
<td>66, 80, 96, 132 plus enhanced (elongated) for each</td>
<td>40, 80, 132</td>
</tr>
<tr>
<td>Graphics</td>
<td>64 block characters TRS-80 compatible</td>
<td>Optional, Maximum density 72 dots/in. vertical, 64.2 dots/in. horizontal</td>
<td>64 block characters TRS-80 compatible</td>
</tr>
<tr>
<td>Slash zeroes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Line spacing</td>
<td>6 or 8 lines plus n lines/in. programmable</td>
<td>6 or 8 lines/in.</td>
<td>6 or 8 lines/in.</td>
</tr>
<tr>
<td>Maximum paper width</td>
<td>10 in. fanfold</td>
<td>9½ in. fanfold</td>
<td>9½ in. fanfold, 8½ in. cut</td>
</tr>
<tr>
<td>Tractors</td>
<td>Yes to 10 in.</td>
<td>Yes to 9½ in.</td>
<td>Optional, to 9 in.; 9½ in. pinstep standard</td>
</tr>
<tr>
<td>Friction feed</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Paper loading</td>
<td>Rear</td>
<td>Bottom or rear</td>
<td>Rear</td>
</tr>
<tr>
<td>Paper tray</td>
<td>No, separator used to divide paper in &amp; out</td>
<td>Available</td>
<td>No</td>
</tr>
<tr>
<td>Paper roll holder</td>
<td>Does not apply</td>
<td>Available</td>
<td>Yes</td>
</tr>
<tr>
<td>Copies</td>
<td>Up to 3 part</td>
<td>Up to 4 part, more with adjust.</td>
<td>Up to 3 part</td>
</tr>
<tr>
<td>Paper out indicator</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Top of form control</td>
<td>Yes (hardware &amp; software)</td>
<td>Yes (hardware &amp; software)</td>
<td>Yes (software only)</td>
</tr>
<tr>
<td>External controls</td>
<td>Power, LF, FF, On/Off line</td>
<td>Power, On/Off line, Line/form feed, form set</td>
<td>Power, On/Off line</td>
</tr>
<tr>
<td>Ribbon</td>
<td>Cartridge, 3 million character expectancy</td>
<td>½ in. cartridge, mobius loop, 6 million character expectancy</td>
<td>Standard ½ in. wide, 2 in. typewriter type</td>
</tr>
<tr>
<td>Noise (on a scale from 1-5 with 1 being most quiet)</td>
<td>2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Company address &amp; phone</td>
<td>Epson America, Inc. 2384 Hawthorne Blvd. Torrance, CA 90505 213-378-2220</td>
<td>Integral Data Systems Milford, NH 03055 603-873-9100</td>
<td>Okidata Corporation 111 Gaither Drive Mt. Laurel, NJ 08057 609-235-2600</td>
</tr>
</tbody>
</table>

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*See List of Advertisers on page 338*
vise 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 strokes) 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 printing) 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-
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.

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 399
- with Job Costing Option 399
- Inventory Control 399

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.

Taranto & ASSOCIATES, INC.

121 Paul Drive, San Rafael CA 94903
Outside California, toll free (800) 227-2868. In California, (415) 472-2670.
Would you believe that you can run FLEX, OS/9 and the Radio Shack Disk System 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, run the Radio Shack disk system, all you need to do is make a trivial modification to access bits of memory, as described in the Feb. issue of COMPUTER NEWS and the March issue of WW Micro, You can get FLEX from us right now. OS/9 will be ready by summer. Please note that this

Would you believe that you can run FLEX and OS/9 has many advantages. First, it gives you 68K from zero right up to FLEX. This means that ALL FLEX compatible software will run with NO MODIFICATIONS AND NO PACHES! 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 68K 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 hard and 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 the 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 side one and only 25 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 (OS/9 or 80 or 50).

In case you don't understand how this works, I'll give you a brief explanation. The Color Computer was designed so that the rams 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 it does something like this (code below) in FLEX OR OS/9, when you turn off the rams, you will have a full 64K RAM system with which to run your program (FLEX OR OS/9). When the rams 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 rams from the memory map and leaves the full 64K for user programs. If you just put in memory for FLEX and use the Basic hooks for IO, 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 is 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.

MOVEVROM moves Color Basic from ROM to RAM.

Because it's moved to ROM, you can not only access it from FLEX, you can run it and even change it! You can load Color Computer 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 set up one complete with 64K ram, 2K Rom, Single RS 232, drive and FLEX for only $199.00, setup and delivery included.

FLEX with Edit, Asmb and installation disk is $199.

Frank Hogg Laboratory, Inc.
130 MIDTOWN PLAZA • SYRACUSE NEW YORK 13210 • C(313)474-8796

3 NEW! CP-M-MINICC

INDEX

SEQUENTIAL

ACCESS

METHOD

1. Get and Put Records to Disk File by "KEY"
2. Read File in Key Sequence Without Sorting
3. Delete Records Without Recopying File
4. Add Records to Disk Files in Any Sequence
5. Variable Key Length From 1 to 50 Characters

BUSINESS APPLICATION ADVANTAGES

- Improved Disk Utilization
- Easier Program Development
- Improved Operating Characteristics
- Reduce or Eliminate Sorting
- Improved Performance

ISAM SUBROUTINES

ISAM UTILITIES

Documentation On Diskette $90.00

NEW! MACHINE LANGUAGE • BASIC SUBS — $140

— PLUS — Free Mailing List Sample Application
— Add 6% Sales Tax for California Orders

TRS-80 MODEL I, II, III and CP/M SOFTWARE FROM:

Johnson Associates
P.O. Box 1402
Redding, CA 96001

WRITE FOR FREE CATALOG

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

---

Accessing the TRS-80® ROM...

It’s your choice: do it the hard way, or get the information you need from

---

THE BØØK VOLUME I & II

Comprehensive Guide to TRS-80* Assembly Language Routines

Each Volume Priced At $14.95 Plus $1.50 Shipping/Handling
VA residents add 4% tax • Foreign: send U.S. funds, add $4 ea. for overseas delivery

*Trademark of Tandy Corp.

---

VOLUME I
The most complete book yet on the math routines of the BASIC ROM, Models I & III. Contains a wealth of detail about integer, single and double precision formats, advanced math, data manipulation, and assembly language interfacing, with examples. Includes commented listing (0708H-1807H), plus a highly detailed map of the ROM and reserved RAM.

---

INSIDERS SOFTWARE CONSULTANTS, INC.
P.O. Box 7086, Dept. SUM3 • Alexandria, VA 22307
Please send THE BØØK: □ Volume I □ Volume II
Name__________________________
Address__________________________
City_________________, State______, Zip_____
Enclosed is □ check □ M.O. for $_________
Charge to □ VISA □ MasterCard Bank Code_____
Exp. date______ Card No._________
Signature_____________________

---

VOLUME II
Packed full of useful information on the model I input/output routines, with detailed listings to illustrate the commented source code. Learn to control and manipulate the keyboard, video, printer port, and cassette port. Essential for assembly language programmers, you can write your own routines or use the many programming examples included.

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See List of Advertisers on page 338

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requires a cable which will cost from $25–$50. Each seems reliable and solid. Of course, only extensive field testing will determine a printer’s reliability.\[...

Thanks to Remarkable Software, Muskegon, MI for providing the Epson MX-80 and Okidata Microline 80; Warren White, Pentwater, MI for providing the Centronics 737; Base, Inc., for providing the 850; Integral Data Systems for providing the 445.

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Photo 4. The Okidata Microline 80

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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: PRINTUSINGMS;CVD (FIS(X)); NEXT X
```

Notice how slowly it progresses. Now watch as execution proceeds to line 120:

```
FOR X = 1 TO 30: A = FCD/FIS(X); PRINTUSINGMS; 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!

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. FIS(X) represents a counterfeit string. As long as FIS(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.

```
10 CLEAR 1000: DIM FIS(30): MS="************"
20 OPEN 8",1:"TEST/FIL"
30 FOR X=1 TO 30: FIS(X): NEXT X
40 REM
50 FOR R=1 TO 5: FOR X=1 TO 30: I=RNDC(32000): LSETFIS(X)= MS(I); NEXT; PUT R,A: NEXT
60 REM SLOW RETRIEVE
70 FOR R=1 TO 1000: GET L,R,A: NEXT R
80 FOR X=1 TO 30: PRINTUSINGMS;CVD(FIS(X)); NEXT X
90 NEXT R
100 REM FAST RETRIEVE
110 FOR R=1 TO 1000: GET L,R,A: NEXT R
120 FOR X=1 TO 30: A+CVD(FIS(X)); PRINTUSINGMS;A: NEXT X
```

Program Listing 1

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 INKEY$:IF INKEY$="THEN":210

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 DUMMMYS = INKEY$
20 PRINT "SELECT A, B, OR C"
30 INKEY$: IF INKEY$="THEN": GOTO 30
```

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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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 Package
Rings 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$ = "RINGSHIGH IMPACT TEFLO", the printout would look like this:

Item Package
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 XX="% %"
30 PRINTUSING$;A$;PRINTBS

Now the result is:

<table>
<thead>
<tr>
<th>Item</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rings</td>
<td>100 per box</td>
</tr>
</tbody>
</table>

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 PRINT USING%;"A$";USING%;"B$"

In another approach you can combine string and numeric values in one PRINTUSING string, using extreme care. For example:

<table>
<thead>
<tr>
<th>Item</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rings-High impact teflon 100 per box</td>
<td></td>
</tr>
</tbody>
</table>

PRINTUSING can set up a printout format for numbers and prices and hold spaces for strings.

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 I$ 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 1-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 user 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 DEFAULT 16":OC
30 PRINT OC

Dave Dichter 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.
Match a word with a definition.

Vocabulary Test

Paul Kalkstein
Phillips Academy
Andover, MA 01810

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.

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 of tests 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 wallops 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 alphabetizing routine that begins at line 210 was suggested by Howard Y. Goeman 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"
20 PRINT
40 INPUT "LESSON 1 = 1";Y
50 LPRI NTCHR$(27);"*":LPRI NTCHR$(27);"*"
60 LPRI NTCHR$(27);CHR$(14);" VOCABULARY QUIZ, UNITS 1 = "Y
70 LPRI NT;LPRI NT
80 LPRI NT;"This is a matching quiz. To the left of each number, write"
90 LPRI NT;"the letter of the closest synonym."
100 LPRI NT;LPRI NT
110 CLEARSQ$;
120 DIMS$(500);DIM$(500);DIM$(500);DIM$(500)
130 I=1
140 CLS
150 INPUT"WORD,SYNONYM";N$(1),S$(H)
160 PRINT$;N$(1),S$(H)
170 IFN$(1);"**"ANDN$(H);**GOTO210
180 I=I+1:N=N+1
190 N=N+1:N=M+1
200 GOTO150
210 FORI=1TO10000
220 AS$(I)=N$(1)
230 NEXT
240 FORI=1TO10000
250 BS$(H)=S$(H)
260 NEXT
270 CLS:X=0:X=0
280 I=1
290 FORJ=2TO10000
300 IFN$(1);"**"GOTO310;ELSEJ=J
310 NEXT
320 J=J+1
330 FORQ=2TO10000
340 IFN$(H);BS$(Q)GOTOJ50;ELSEH=Q
350 NEXT
360 IFN$(1);"**"ANDN$(H);**GOTO300
370 LPRI NTETH$(8);"*";"":N$(1);;READS$:LPRI NTETH$(35);LS$:;"**:S$(H)
380 AS$(I);="*";
390 BS$(H);="*"
400 K=K+1;X=X+1
420 IFX=1X=X=1
430 IFX=X=1:
450 LPRI NT
460 DATA a,b,c,d,e,f,g,h,i,j,k,l,m,n,o
```

Program Listing

The Key Box

Basic Level II
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294 • 80 Microcomputing, April 1982
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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 Academy in Andover, MA. He is also an active ham (N1PL).

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16K RAM
TRSDOS 2.3
Daisy Wheel II

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 $441.60; 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...+ 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-
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Word Processing Lowerkit

It converts your screen from an illegible checkerboard to this:

This photograph was taken of an ordinary television screen being fed by a Color Computer unmodified except for the installation of the lowerkit. Characters:

```
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abcdefghijklmnopqrstuvwxyz
01234567890!"#$%&'()*+,-./:;<=>?
```

- Complete and ready to install—no software needed
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- Designed by 80 Microcomputing's Dennis Bathory Kitsz

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Since the program is kept in TRS-80 RAM, changes can be made quickly and easily. When your stand-alone device works as desired, you use the Developmate's PROM PROGRAMMER to copy the program into a PROM. With this PROM, and a Z-80 in place of the emulation cable, your stand-alone device will work by itself.

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In this classroom, a TRS-80 is the ruler.

King Komputer

Dana B. Allison
Box 172
Newton, NH 03858

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 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.

<table>
<thead>
<tr>
<th>NB</th>
<th>User's name</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>Set statement length</td>
</tr>
<tr>
<td>K1</td>
<td>Number of sixteens in the line</td>
</tr>
<tr>
<td>Q</td>
<td>Question number</td>
</tr>
<tr>
<td>B</td>
<td>Line length in whole inches</td>
</tr>
<tr>
<td>C</td>
<td>Line length after deducting B</td>
</tr>
<tr>
<td>T</td>
<td>Number of tries on a question</td>
</tr>
<tr>
<td>V</td>
<td>Number of tries on a question</td>
</tr>
<tr>
<td>A</td>
<td>Used for answers and set increments</td>
</tr>
<tr>
<td>I</td>
<td>Delay</td>
</tr>
<tr>
<td>A5</td>
<td>Used for answers</td>
</tr>
<tr>
<td>L1</td>
<td>Input answer length</td>
</tr>
<tr>
<td>R</td>
<td>Fraction denominator length</td>
</tr>
<tr>
<td>L</td>
<td>Fraction numerator length</td>
</tr>
<tr>
<td>T5</td>
<td>Answer numerator</td>
</tr>
<tr>
<td>BS</td>
<td>Answer denominator</td>
</tr>
<tr>
<td>A3</td>
<td>Answer numerator</td>
</tr>
<tr>
<td>A4</td>
<td>Answer denominator</td>
</tr>
<tr>
<td>Z</td>
<td>Reduce answer counter</td>
</tr>
<tr>
<td>C1</td>
<td>Denominator</td>
</tr>
<tr>
<td>A1</td>
<td>Answer</td>
</tr>
<tr>
<td>GH</td>
<td>Counter</td>
</tr>
<tr>
<td>F</td>
<td>Delay</td>
</tr>
<tr>
<td>AV</td>
<td>Average</td>
</tr>
<tr>
<td>NR</td>
<td>Number correct</td>
</tr>
<tr>
<td>F</td>
<td>Beginning of set</td>
</tr>
<tr>
<td>G</td>
<td>End of set</td>
</tr>
<tr>
<td>X</td>
<td>Used for sets</td>
</tr>
<tr>
<td>Y</td>
<td>Used for sets</td>
</tr>
</tbody>
</table>

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 WILL MAKE READING IT EASIER.

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 program." 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 word processor 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.

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*Data Source: Epson MX-80 Operation Manual

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An IBM-like monitor for your 80.

CP80

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/assemble 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**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D R</td>
<td>Displays all registers</td>
</tr>
<tr>
<td>D G</td>
<td>Displays general purpose registers</td>
</tr>
<tr>
<td>D P</td>
<td>Displays the program counter</td>
</tr>
<tr>
<td>D S</td>
<td>Displays the stack pointer</td>
</tr>
<tr>
<td>D X</td>
<td>Displays IX index reg (can use IX)</td>
</tr>
<tr>
<td>D Y</td>
<td>Displays IY index reg (can use IY)</td>
</tr>
<tr>
<td>D mmmm</td>
<td>Displays one line of memory</td>
</tr>
<tr>
<td>D mmmm</td>
<td>Displays full screen of memory. Break to quit or enter to continue display</td>
</tr>
</tbody>
</table>

**STORE**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S Gr xx</td>
<td>Where r is A,B,C,D,E,H, or L and xx is byte</td>
</tr>
<tr>
<td>S PC xxxx</td>
<td>Stores xxxx into PC (c is optional)</td>
</tr>
<tr>
<td>S SP xxxx</td>
<td>Stores xxxx into SP (p is optional)</td>
</tr>
<tr>
<td>S IX xxxx</td>
<td>Stores xxxx into IX (I is optional)</td>
</tr>
<tr>
<td>S IY xxxx</td>
<td>Stores xxxx into IY (I is optional)</td>
</tr>
<tr>
<td>S mmmm xxxxxxxx...(cr)</td>
<td>Stores up to 255 bytes in hex</td>
</tr>
<tr>
<td>S Thmmm xxxxxxxx...(cr)</td>
<td>Stores ascii into memory at mmmm</td>
</tr>
</tbody>
</table>

**BEGIN**

B - returns to adstop address.

**ADSTOP**

A xxxx - sets an adstop and clears the old one.
A - clears adstop.

**EXCHANGE**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX</td>
<td>Exchanges AF with AF'</td>
</tr>
<tr>
<td>EXX</td>
<td>Exchanges BC,DE,HL with BC',DE',HL'</td>
</tr>
</tbody>
</table>

Table 1. CP80 Command Table

---

**The Key Box**

Model I
32K RAM
One disk drive
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WORD PROCESSING

THE SUPER "COLOR" WRITER II

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**COMPARISON CHART**

<table>
<thead>
<tr>
<th>System Size</th>
<th>Super Color Writer</th>
<th>Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1K-32K</td>
<td>1K-32K</td>
<td>1K-32K</td>
</tr>
<tr>
<td>Tape</td>
<td>ALPACH 2.5K</td>
<td>2.5K</td>
</tr>
<tr>
<td>Disk</td>
<td>25K-100K</td>
<td>25-100K</td>
</tr>
<tr>
<td>Rightjustify</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>VideoWindow</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Edit Any ASCI File</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

The features 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 and 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.

**CHECK THESE FEATURES!!**

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- Key beep
- Help Table
- 126 character ASCII & Graphics
- Memory left/low case
- Full cursor control
- Quick paging
- Scrolling
- Wrap around
- Tabs
- Repeat all functions
- Repeat last command
- Insert character & line
- Delete character, delete to end of line, line to cursor, line block
- Block move, copy & delete
- Global Search
- Merge or Append files
- Imbed Control Codes in text
- Underline
- Superscripts
- Subscripts
- Headers, Footers & 2 Auxiliary footnotes on odd, even or all pages
- Definable position
- Flush right
- Non-breakable space
- 4 centering modes: 5, 8, 10 & 16.7 (CIP)
- Full page & format printing in text
- Single sheet page
- Set Page length
- Line length
- Margins
- Page numbers
- Title pages
- Printer baud: 110, 300, 600, 1200, 2400
- Linefeeds after CR
- Soft & hard formfeed
- Works with 8 bit printer fix & more!

**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 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/Assemble source listing stored on the Disk of 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.

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- Selectable character trapping
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- Pagination
- Linefeed with CR option
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Requires 16K Extended Basic

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DEALER INQUIRIES ARE INVITED.
mand. Also, it rejects the lower-case 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 backwards since each command line ended with the command itself.

FFFF LLLLLL, 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.

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.

---

Table 2. CP80 Terminal Session

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD</td>
<td>Load Program</td>
</tr>
</tbody>
</table>
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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 OFH 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.0). 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.

**STORE**

Store is like the Display command. With it you can store hex values directly into memory for a length of 256 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 256 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 to the EX command swaps the AF register with the AF register. The EXX command swaps the BC, DE, HL 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 789H and the location of the status test is 78F. 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. CP80 will be a utility program linking into CP80. It will feature system tape read and write, copy ability, and other IO 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 DCB.

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).

<table>
<thead>
<tr>
<th>Program Listing</th>
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Program continues
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Program continued

7155 P1 03158 POP AF ;KILL STACK ENTRY
7156 181D 03159 POP BC ;KILL 3-LEVEL ENTRY
7158 03170 TRANC $QUE ;REPLACE SPECIAL CODES
7158 0317B F8H ;D6H
7159 0317C 03180 JP A-DH ;INVALID
7159 03183 F8H 031C0 CP AAH ;B-97?
7160 03184 F8H 031D0 JP M,T;ANIV ;YES
7161 03185 031E0 RST 7 ;FLIP BIT
7161 0318E 031F0 JP M,T;ANIV ;ERROR
7162 031FA 03100 CP 1AH ;A-97?
7163 031B0 03110 JP M,T;ANIV ;YES
7165 031B3 03120 DE ;KILL STACK ENTRY
7166 031B4 0312A0 ;
7169 C5476 0312B0 JP CJMP
716C 0312C0 NOTTR $QUE ;
716C 0312F0 LD C,B ;CLEAR A REG
716E 47 03135 031320 XOR A ;
716E 03138 031330 JP B,A ;
716F 0313E0 POP DE ;RESTORE DEST
7171 03141 0313F0 LD HL,(EBUFF) ;RETURN AGAIN
7173 03143 031400 LDIR ;MOVE IT
7175 03145 031410 SFM $QUE ;
7175 03148 031420 CALL CMSENG
7178 0314D 031500 DFSB CR
7179 53 03152 031510 DFSB 'STORE COMPLETE'
717D ED 03157 031560 DFSB CR
717E ED 03158 031570 DFSB CR
7180 00 03159 031580 DFSB EOM
7189 C31A78 0315A0 JP CMSENG
718A 0315B0 0315C0 ;
718F C9770 0315D0 CFUBED
718F 03160 031610 CP 55H ;IS IT A Y
7190 03162 031620 JR 2,STT ;YES
7191 03163 031630 CP 58H ;IS IT AN X
7195 03167 031660 JP N,NOTBL ;NO - ERROR
7198 03168 031670 STX $QUE ;
7198 0316F 0316E0 CALL WKB
7199 03172 031710 CALL GETADD ;GET NEW IX
719E 03176 031750 CALL WCR ;WAIT FOR A CR
71A1 0317A 0317B0 CALL WCR ;STORE NEW IX
71A4 C31A73 0317D0 JP CMSENG ;RETURN
71A7 0317E0 0317F0 ;
71A7 03180 031810 CALL WKB
71A9 F4 03182 031830 CALL GETADD ;GET NEW-IX
71AD 03186 031870 CALL WCR ;WAIT FOR A CR
71A8 0318E 0318D0 LD (ITSY),HL ;STORE NEW IX
71A9 03190 031910 JR CMSENG ;RETURN
71A9 03192 031930 ;
71A9 03194 031950 ;ENTER AFTER A STORE
71A9 03196 031970 CALL WKR ;B C D E H L
71A9 03198 031990 0319A0 ;THE HL IS POINTING TO
71A9 0319B 0319C0 ;CORRECT AREA TO STORE INTO
71A9 0319D 0319E0 ;
71A9 0319F 0319F0 ;
71B6 031A0 031AA0 ;STG $QUE ;
71B6 031A1 031AB0 CALL WKB ;WAIT FOR A BLANK
71B9 F40 031AD0 CALL GETNM ;GET THE VALUE
71BB 031AE 031AF0 LD (HL),A ;STORE IT
71BC 031B1 031B20 CALL WCR ;WAIT FOR A CR
71C0 031B3 031B40 JP CMSENG ;RETURN
71C0 031B5 031B60 ;
71C0 031B7 031B80 ;ENTER HERE FROM THE GETADD
71C0 031B9 031B90 ;CODE FOR STORE
71C0 031BB 031BA0 FIRST BYTE OF ADDRE WAS THE
71C0 031BB 031BC0 PAR TELLING US TO STORE
71C0 031BD 031BE0 ;A NEW PC
71C0 031BF 031C00 ;
71C3 031C1 031C20 CALL ORKRED ;GET A CHAR
71C6 FEB0 031C30 CP 28H ;BLANK?
71C8 031C4 031C50 JR 5,DOPC ;YES
71C9 031C6 031C70 CP 43H ;IS IT C?
71CC 031C9 031CA0 JP N,NOTBL ;NO - ERROR
71CD 031CB 031D00 CALL WKB ;WAIT FOR BLANK
71D0 031D2 031D30 DOPC $QUE ;
71D2 031D4 031D50 CALL GETADD ;GET THE NEW PC
71D3 031D6 031D70 CALL WCR ;WAIT FOR A CR
71D8 031D9 031DA0 LD (PCSV),HL ;STORE IT
71D8 031DA 031DB0 JP CMSENG ;RETURN
71D9 031DC 031DD0 ;
71D9 031DE 031DF0 ;FIRST BYTE WAS A $S
71D9 031EA 031EB0 ;GO WE SHOULD STORE NEW SP
71D9 031EC 031ED0 ;
71D9 031F6 031F70 WTB3 $QUE ;
71D9 031F8 031F90 CALL ORKRED ;GET A CHAR
71D9 031FA 031FB0 CP 28H ;BLANK?
71DB 031FC 031FD0 JR 1,SPMAR ;YES
71DC 031FE 031FF0 CP 5FH ;UPPER CASE P?
71DA 03200 032010 JP N,NOTBL ;NO INVALID FORMAT
71DA 03202 032030 CALL WKB ;WAIT FOR A BLANK
71DD 03204 032050 SPMAR $QUE ;
71DE 03206 031DE0 CALL GETADD ;GET NEW SP
71DF 03207 032080 CALL WCR ;WAIT FOR A CR
71F0 03209 0320A0 LD (SPSV),HL ;SAVE IT
71F0 0320B 0320C0 JP CMSENG ;RETURN
71F0 0320D 031FDB ;

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Program continued

73A7 CD7C73  6426  CALL  D16
73A6 C0D273  6425  CALL  DSF
73A5 213877  6424  LD  H,PCSV
73AC CD7C73  6423  CALL  D16
73AF 33RD  6422  LD  A,EDB
73B1 CD8176  6421  CALL  DSF
73B4 #8  6420  NOP
73B5 #8  6419  NOP
73B6 #8  6418  NOP
73B7 C31A70  6417  JP  CMDHND
73B8  6416  DDSP  EQU  $6390
73B9 CDC173  6415  CALL  SDSP
73BC CDC173  6414  CALL  SDSP
73C9 C9  6413  RET
73C1  6412  DDSP  EQU  $6439
73C1 7E  6411  LD  A,(HL)
73C2 CD8272  6410  CALL  DSF
73C5 23  6409  INC  HL
73C6 C9  6408  RET
73C7  6407  DDSP  EQU  $6449
73C8 23  6406  INC  HL
73C9 7E  6405  LD  A,(HL)
73CC CD8272  6404  CALL  DSF
73CE 2B  6403  DEC  HL
73CD CDC173  6402  CALL  SDSP
73DE C9  6401  RET

6578 ;*************************************************************************
6578 | HERE FOR DISPLAY OF GENERAL
6578 | REGISTERS A,B,C,D,E,H,L
6578 |*************************************************************************
6598 ;*************************************************************************
6598 | DG  EQU  $6024  ;WAIT FOR CR
6639 | CALL  WCR
6648 | CALL  OUTMSG
6658 | DEBF  'A' 'B' 'C' 'D' 'E' 'H' 'L'
6668 | DEBF  CR
6678 | DEBF  EDW
6688 | LD  A,(AFSV);GET USER A REG
6698 | CALL  DSF
6708 | CALL  DSFC
6718 | LD  HL,BCSV;POINT TO B REG
6728 | XOR  A
6738 | XOR  (HL);CLEAR A
6748 | XOR  (CNT);CLEAR COUNT
6758 | DGM  EQU  $6749
6768 | CALL  SDSP
6778 | CALL  DSF
6788 | LD  A,(CNT);GET COUNT
6798 | INC  A
6808 | ADD  1
6818 | JP  RET
6828 | JP  RET
6838 | CALL  SDSP
6848 | JP  CMPND

6558 ;*************************************************************************
6558 | THE DISPLAY TYPE JUMPS HERE WHEN IT
6558 | DECIDES WHAT 16 BIT REGISTER SHOULD
6558 | BE DISPLAYED. THE ADDRESS WILL
6558 | BE POINTED TO BY THE HL REGISTER
6558 | BITE SHOULD BE JUMPED TO IF
6558 | 16 BIT REGISTER IS TO BE
6558 | DISPLAYED.

6498 ;*************************************************************************
6498 | B16R  EQU  $6595
6508 | CALL  WCR
6518 | INC  HL
6528 | LD  A,(HL)
6538 | CALL  DCB
6548 | INC  HL
6558 | CALL  DCB
6568 | DEC  HL
6578 | POINT TO 2ND PART
6588 |
6598 | BTBR  EQU  $6791
6608 | LD  A,(HL)
6618 | CALL  DSF
6628 | CALL  DSF
6638 | LD  A,CR
6648 | CALL  SDSP
6658 | JP  CMPND
6668 ;*************************************************************************
6668 | WE ENTER HERE AFTER A VALID BEGIN IS FOUND
6678 | ALL REGISTERS ARE RESTORED
6688 | FROM THE SAVE AREA AND
6698 | A JUMP TO THE PC IS MADE
6708 ;*************************************************************************
6708 | BCMD  EQU  $7148
6718 | CALL  WCR
6728 | LD  SP,(SPSV)
6738 | USE USERS STACK
6748 |
6758 | POP  BC
6768 |
6778 | POP  BC
6788 |
6798 | POP  AF
6808 |
6818 | POP  AF
6828 |
6838 |
6848 |
6858 |
6868 |
6878 |
6888 |
6898 |
6908 |
6918 |
6928 |
6938 |
6948 |
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Cognivox VIO-332. The affordable voice I/O peripheral for the TRS-80

See Review in December 31 issue of
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If you have a TRS-80 model I, II or III with at least 16K of RAM, Cognivox VIO-332 will add a whole new dimension to your computer.

Imagine being able to use your voice for entry of commands and data and then listen to the computer talk back to you! This exciting possibility has now become a reality at a very affordable price.

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VOICETEK P.O. Box 388, Geleta, CA 93116
Program continued

```
763B FA4976 10378 JP M, INTV ; INVALID
763C FA5285 10394 CP RAM ; 0-9
7648 F8 10395 RET M ; YES
7641 D6D7 10400 SUB Y ; FLIP BIT
7646 FA4976 10418 JP M, INTV ; INVALID
7646 FE18 10420 CP 1BH ; A-F
7648 F8 10421 RET M ; YES
7648 4449 INTV $ ; EQ
7649 D1 10458 POP DF
764A D1 10466 POP DE
764B 1087 10476 JR COMP
764D 1048 4BIT6 EQ $ ;
764F FA1D 10490 POP AF ; GET RID OF RETURN
7654 FA F1 10500 POP AF
7654 FA F1 10510 POP AF
7658 FA 10528 POP AF
7651 C31B74 10530 JP BIT16
7654 10558 DEBM $ ; CURSOR ON
7657 BD 10579 DEBF #H
7659 BD 10589 DEBF CR
7659 43 10598 DEFM 'COMMAND TERMINATED'
7660 RD 10689 DEBF CK
766C 80 10610 DEBF EOM
766D 80 C31A70 10628 JP M ; RETURN TO NORMAL CODE
7669 10666 POPRES EQ $ ;
7669 C1 10679 POP BC
7671 F1 10689 POP AF
7672 F1 10699 POP AF
7673 F1 10709 POP AF
7674 F1 10719 POP AF
7675 AP 10728 XOR A
7676 32F876 10738 LD (CMDFLG), A
7677 C5 10745 PUSH BC
767A C9 10759 RET
767A 10769 DEBM $ ; CURSOR ON
767B E1 10780 POP HL ; GET MSG ADDR
767C CD72 10790 CALL MSGDPR ; SHOW IT
7668 C9 10808 PUSH BC ; SAVE IT AS OUR RETURN
7668 C9 10818 RET
7668 10828 DPS $ ; EQ
766C DD308 10848 CALL RDSPS
766D CD976 10858 CALL POUT
7667 C9 10868 RET
7669 C9 10878 POP EQ $ ;
7669 10888 POP EQ $ ;
7669 8FBD 10898 CP $8H ; IS IT CR?
766B 8B 10908 JR $, SHIPB ; YES FILL
766D 8B 10928 EX AF, AF' ;
766E 8FBD 10948 CP #H ;
766F DBF1 10948 IN A, $1(Ctrl) ; GET STATUS
7678 CB47 10958 BIT $, A ; ANYTHING?
7678 DBA 10968 JR $, POUT2 ; NO KEEP LOOKING
7679 8B 10978 EX AF, AF' ; RESTORE
767E D8F 10988 OUT (DATA), A ; SEND IT
767F 8FBD 10998 CP $DH
7699 C8 11008 RET NS
769A #8FPPF 11018 LD BC, $FFFFFH ; SET RECOVER TIME
769B D388 11028 CALL DELAY ; SET LITE TURN AROUND
76AB 38BD 11038 LD A, CR
76A2 C9 11048 RET
76A3 11058 SHIP $ ;
76A5 88 11068 EX AF, AF' ; SAVE
76A6 11078 POUT3 $ ;
76A4 DBF1 11088 IN A, $1(Ctrl) ; STATUS
76A6 CB47 11098 BIT $, A ;
76A6 28PA 11108 JR $, POUT2 ;
76A6 3E20 11118 LD A, 20H ;
76A6 D388 11128 OUT (DATA), A ;
76A6 18DC 11138 JR POUT2 ;
76B9 11158 LOGO $ ;
76B9 8E 11168 DEBF #H ;
76B9 1C 11178 DEBF #CH
76B9 1F 11188 DEBF #FH
76B9 17 11198 DEBF #1H
76B9 84 BD 11208 DEBF CR
76B9 85 BD 11218 DEBF DR
76B9 86 BD 11228 DEBF CR
76B9 87 BD 11238 DEBF CR
76B9 88 BD 11248 DEBF CR
76B9 89 BD 11258 DEBF CR
76B9 8A BD 11268 DEBF CR
76B9 8B BD 11278 DEBF CR
76C9 BD 11288 DEBF CR
76CA BD 11298 DEBF CR
76CB BD 11308 DEBM ' ; BY BRIAN CAMERON
76CB BD 11318 DEBF EOM
76D3 11328 GTAB $ ;
76D3 41 11338 DEBF #41H
76D3 FA76 11348 DEFW AFPSV
76D3 44 11358 DEBF #44H
76D5 FC76 11368 DEBF WCSV
76D7 43 11378 DEBF 43H
```

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Program continues
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<table>
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<tr>
<td>768B F076 1130B DIFW CSV</td>
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<td>768B F044 1130B DIFB 44H</td>
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<td>76F3 4C 11450 DIFB 4CH</td>
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<td>76FD 0177 11460 DIFW LSV</td>
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<td>76F6 0FF7F 11470 DIFW 0FFF</td>
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<tr>
<td>76F8 08 11480 CMDPLG DIFB 00H</td>
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<tr>
<td>76F9 00 11498 TANFLG DIFB 00H</td>
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<tr>
<td>0001 11500 DISPLX EQU 1</td>
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<td>0002 11510 STORE EQU 2</td>
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<tr>
<td>0003 11520 DOT EQU 3</td>
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<td>0004 11538 MEMORY EQU 0</td>
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<tr>
<td>0005 11548 TRANS EQU 1</td>
</tr>
<tr>
<td>76FA 00 11550 AFSV DIFB 00H</td>
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<tr>
<td>76FB 00 11560 FSF DIFB 00H</td>
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<td>0006 11710 TMFR DEFS 6</td>
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<td>76FA 00 11720 ADDOR DEFS 0000H</td>
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<td>76FA 00 11730 ADGS DEFS 00H</td>
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<td>76FA 00 11740 CMIT DEFS 00H</td>
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<td>76FD 00 11760 BLKN DEFS 00H</td>
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<tr>
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<tr>
<td>76FA 00 11780 STACK EQU 5</td>
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Figure 1

Figure 2
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I am about to demonstrate one of the most powerful tricks you can pull on the Fortran compiler and runtime system: direct access to anything in memory. By "direct access" I don't mean PEEK and Call POKE; I mean doing things like Screen(1) = MSGU(). As part of the demonstration, you'll have two Fortran routines that will be similar to Basic's CLS and Print statements.

This old trick is based on the same idea as having based arrays which are available in some high level languages, i.e., you define an array to the compiler but set the base (the memory location of subscript (1)) at runtime. In this example we will define an array and then overlay it onto the display RAM at locations X'3C00' to X'3FFF'. The array can be a vector of 1024 INTEGER*1 characters, or a matrix of 64 columns by 16 rows (or both). The same technique can be used to directly reference the keyboard, device control blocks, or whatever you want (and know the memory address of).

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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= 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 DEMODMA 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
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 HIME(1) in Setbas. To access locations in the top 32K, just subtract X'8000' from the absolute address and refer to HIME(1) 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.
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Program continued

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Integer*2 SOLID(31), BLANKS(31)
Data SOLID/75°X'8888°/BLANKS/31°X'2020°/
C Call CLS(SCREEN)
Call PRINTS(SCREEN(86),"This is using WRITEs,
C Following code sets the system's cursor position in the Devic
e Control
C Block to the begining of the screen.
C ABSELMX(X'4828°) = X'88'
ABSELMX(X'4021°) = X'83'
C Do 5 I=1,32767
C Continue
C Do 31 J=1,20
Do 10 I=1,16
Write(I,1,18) SOLID
10 C Continue
C ABSELMX(X'4828°) = X'88'
ABSELMX(X'4021°) = X'83'
C Do 20 I=1,16
Write(I,1,18) BLANKS
20 C Continue
C ABSELMX(X'4828°) = X'88'
ABSELMX(X'4021°) = X'83'
C 21 Continue
C 31 Format(1X,31A1)
C C Call CLS(SCREEN)
Call PRINTS(SCREEN(86),"This is using FORKs",19)
Do 35 I=1,32767
25 C Continue
C Do 48 I=1,28
Do 38 I=1,16
Write(I,1,18)X'3000',X'33FF'
38 C Call FORK(I,1,18)
48 C Call FORK(I,1,28)
C C C Call CLS(SCREEN)
Call PRINTS(SCREEN(86),"This is with direct array access",311)
Do 58 I=1,32767
58 C Continue
C Do 78 I=1,28
Do 68 I=1,1282
68 C SCREEN(I) = X'88'
78 C SCREEN(I) = X'83'
C C C Call CLS(SCREEN)
Call PRINTS(SCREEN(541),"DONE.
C Continue
C Return
End
C C C Cls -- Clear Screen subroutine
C << this routine does not maintain the system cursor location
C pointer>>
C C Subroutine CLS(SCREEN)
C Integer*1 SCREEN(1824)
C Integer*2
C C Move blanks (character X'20') to the entire screen.
C Do 10 I=1,1824
10 C SCREEN(I) = X'20'
C C Return
End
C C C PRINTS -- Subroutine similar to BASIC's PRINTS
C C With WHERE() array based at screen position (I=1824)
C Integer*1 WHERE(1824)
C Integer*2 where, STRING, LEN, ILOOP
C C This routine cannot check that WHERE is actually on the screen,
C it is really a general MOVE subroutine usable anywhere.
C Do 10 ILOOP=1,LEN
10 WHERE(ILOOP) = STRING(ILOOP)
C C Return
End
```

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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# specifies 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 renumerates 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 renumerates all lines by 110 starting with line 20. If you enter N 30 after the above, the renumerated 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.

(If 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 Pr: 1 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 the 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 PR 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:

<table>
<thead>
<tr>
<th>Label</th>
<th>Opcode</th>
<th>Operand(s)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>00100</td>
<td>START</td>
<td>ORG</td>
<td>7FOOH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TOP OF 16K</td>
</tr>
</tbody>
</table>

As in Basic, you can specify numbers as a constant or an expression. Constants can be expressed in one of three number systems. The default number 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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<tr>
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<tr>
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</tbody>
</table>

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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.) EDIASM determines the end of the number by a delimit er. 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 hexa decimal 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 280 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 0FFDH. This allows the assembler’s math section to handle only words, not bytes.

280 instructions that specify a single 

<table>
<thead>
<tr>
<th>Addr</th>
<th>Obj Code</th>
<th>Line#</th>
<th>Label</th>
<th>Opcode</th>
<th>Operands</th>
<th>Memory Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>7F08</td>
<td>00600</td>
<td>0000</td>
<td>ORG</td>
<td>7F08H</td>
<td>0800 0A</td>
<td>LORG.7F08H</td>
</tr>
<tr>
<td>7F08</td>
<td>00616</td>
<td>0001</td>
<td>VIDEO</td>
<td>DEFL</td>
<td>0035H</td>
<td>1000 10</td>
</tr>
<tr>
<td>7F08</td>
<td>00624</td>
<td>0002</td>
<td>VIDEO</td>
<td>DEF</td>
<td>0033H</td>
<td>1000 08</td>
</tr>
<tr>
<td>7F08</td>
<td>00640</td>
<td>0004</td>
<td>TYPEP</td>
<td>CALL</td>
<td>KEYBD</td>
<td>2000 00</td>
</tr>
<tr>
<td>7F08</td>
<td>00648</td>
<td>0005</td>
<td>JR</td>
<td>A</td>
<td>2000 05</td>
<td>.OR.A</td>
</tr>
<tr>
<td>7F08</td>
<td>0064C</td>
<td>0006</td>
<td>JR</td>
<td>C,6-4</td>
<td>3000 00</td>
<td>.JR.C,6-4</td>
</tr>
<tr>
<td>7F08</td>
<td>00654</td>
<td>0007</td>
<td>CALL</td>
<td>VIDEO</td>
<td>3000 00</td>
<td>CALL.VIDEO</td>
</tr>
<tr>
<td>7F08</td>
<td>00664</td>
<td>0008</td>
<td>JR</td>
<td>TYP</td>
<td>4000 00</td>
<td>.JR.TYP</td>
</tr>
<tr>
<td>802B</td>
<td>006B6</td>
<td>002B</td>
<td>KEYBD</td>
<td>END</td>
<td>5B00 00</td>
<td>KEYBD.END</td>
</tr>
<tr>
<td>008B8</td>
<td>008B8</td>
<td>008B</td>
<td>END</td>
<td>5B00 00</td>
<td>END</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1**

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SOFT BITS

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 (00101H) 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.

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 delimit 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 0FFFF 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

```
<table>
<thead>
<tr>
<th>Editor/Assembler</th>
<th>Basic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; - 4</td>
<td>16</td>
</tr>
<tr>
<td>&lt; - 3</td>
<td>8</td>
</tr>
<tr>
<td>&lt; - 2</td>
<td>4</td>
</tr>
<tr>
<td>&lt; - 1</td>
<td>2</td>
</tr>
<tr>
<td>&lt; 0</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 1</td>
<td>2</td>
</tr>
<tr>
<td>&lt; 2</td>
<td>4</td>
</tr>
<tr>
<td>&lt; 3</td>
<td>8</td>
</tr>
<tr>
<td>&lt; 4</td>
<td>16</td>
</tr>
</tbody>
</table>
```

Table 1

“Labels are similar to variables in Basic.”
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why all labels are stored as two-byte words. An 0000H 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 processes 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).

<table>
<thead>
<tr>
<th>Addresses</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>4100</td>
<td>Length of string in Find buffer</td>
</tr>
<tr>
<td>4101-4110</td>
<td>Find buffer</td>
</tr>
<tr>
<td>4111,4112</td>
<td>Pointer to current line ($)</td>
</tr>
<tr>
<td>4113,4114</td>
<td>Last byte of usable memory. Protect h-i-mem here.</td>
</tr>
<tr>
<td>4115,4116</td>
<td>Pointer to first byte of unused text buffer</td>
</tr>
<tr>
<td>4117,4118</td>
<td>Line increment</td>
</tr>
<tr>
<td>4119,411A</td>
<td>Pointer to start of line text</td>
</tr>
<tr>
<td>411B,411C</td>
<td>Pointer to address of current line</td>
</tr>
<tr>
<td>411D,411E</td>
<td>Pointer to address of next line</td>
</tr>
<tr>
<td>4122,4123</td>
<td>I/O buffer pointer to next byte</td>
</tr>
<tr>
<td>4124</td>
<td>Temporary checksum during assembly</td>
</tr>
<tr>
<td>4124-4125</td>
<td>Current length of buffer contents during assembly</td>
</tr>
<tr>
<td>4125,4126</td>
<td>Address for byte at start of I/O buffer</td>
</tr>
<tr>
<td>4127-414A</td>
<td>I/O buffer (128 bytes)</td>
</tr>
<tr>
<td>414A,414B</td>
<td>Pointer to byte in I/O buffer</td>
</tr>
<tr>
<td>414C</td>
<td>Length of contents of I/O buffer in use</td>
</tr>
<tr>
<td>41AC</td>
<td>Pointer to Filename for tape</td>
</tr>
<tr>
<td>41AD</td>
<td>Length of Filename</td>
</tr>
<tr>
<td>4AE,4AFF</td>
<td>Start address of assembled instruction</td>
</tr>
<tr>
<td>4B00</td>
<td>0 for single-byte op-codes; D0,E0,FD for multiple-byte op-codes</td>
</tr>
<tr>
<td>4B10</td>
<td>Initial hex code from op-code tables</td>
</tr>
<tr>
<td>4B11</td>
<td>Initial hex code from op-code tables</td>
</tr>
<tr>
<td>4B12,4B13</td>
<td>Pointer to I/O buffer during assembly</td>
</tr>
<tr>
<td>4B14,4B15</td>
<td>Length of assembled instruction</td>
</tr>
<tr>
<td>4B16,4B17</td>
<td>Internal program counter, current assembler address</td>
</tr>
<tr>
<td>4B18,4B19</td>
<td>Error counter</td>
</tr>
<tr>
<td>4B1A</td>
<td>I/O flag 1 = cassette 0 = no</td>
</tr>
<tr>
<td>4B1B</td>
<td>Byte counter of I/O buffer</td>
</tr>
<tr>
<td>4B1C</td>
<td>Display type flag 0 = video 1 = printer</td>
</tr>
<tr>
<td>4B1E</td>
<td>Block flag 0 = new FF = old</td>
</tr>
<tr>
<td>4B1F</td>
<td>Error flag 1 = error</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Addresses</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>4C00</td>
<td>Assembler pass counter</td>
</tr>
<tr>
<td>4C10,4C20</td>
<td>Value of an expression</td>
</tr>
<tr>
<td>4C30,4C40</td>
<td>Pointer to symbol table</td>
</tr>
<tr>
<td>4C50</td>
<td>Strip line number flag 1 = T 0 = H</td>
</tr>
<tr>
<td>4C60-4CFF</td>
<td>Stack work area</td>
</tr>
<tr>
<td>4D00-4D17</td>
<td>DCB</td>
</tr>
<tr>
<td>4D18</td>
<td>Make a pip</td>
</tr>
<tr>
<td>4D50</td>
<td>Read a byte</td>
</tr>
<tr>
<td>4D60</td>
<td>Write a byte</td>
</tr>
<tr>
<td>4DCE</td>
<td>Driver entry</td>
</tr>
<tr>
<td>4DE0</td>
<td>Video driver</td>
</tr>
<tr>
<td>4DF0</td>
<td>Keyboard driver</td>
</tr>
<tr>
<td>4E00</td>
<td>Printer driver</td>
</tr>
<tr>
<td>4E75-4E89</td>
<td>Printer option table</td>
</tr>
<tr>
<td>4E9A</td>
<td>Main entry point to EDTASM</td>
</tr>
<tr>
<td>4EA0</td>
<td>Top of memory testing</td>
</tr>
<tr>
<td>4EAC</td>
<td>Reentry point to EDTASM keeps text intact</td>
</tr>
<tr>
<td>4EBC-4EB3</td>
<td>Message table has bit seven set of last character</td>
</tr>
<tr>
<td>4EB4-4EBD</td>
<td>Command table; change B jump</td>
</tr>
<tr>
<td>4EBE</td>
<td>Parser for input</td>
</tr>
<tr>
<td>4EFA</td>
<td>A-gain</td>
</tr>
<tr>
<td>4EF1</td>
<td>L-list</td>
</tr>
<tr>
<td>4EF2</td>
<td>Space</td>
</tr>
<tr>
<td>4EF3</td>
<td>Carriage return</td>
</tr>
<tr>
<td>4EF4</td>
<td>Exlt</td>
</tr>
<tr>
<td>4EF5</td>
<td>Change</td>
</tr>
<tr>
<td>4EF6</td>
<td>Delete</td>
</tr>
<tr>
<td>4EF7</td>
<td>Quit</td>
</tr>
<tr>
<td>4EF8</td>
<td>Insert</td>
</tr>
<tr>
<td>4EF9</td>
<td>X-tra</td>
</tr>
<tr>
<td>4EFB</td>
<td>H-ack</td>
</tr>
</tbody>
</table>

Table 2

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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 Models 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."

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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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."
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 handwritten 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.

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

By G. Bert Lat amore
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.
PROGRAMMING TOOLS FOR YOUR TRS-80™ MODEL I AND MODEL III

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 usage 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 usage, 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 clearly 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 modern or direct wire. It is micro-down 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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4 SPEED OPTIONS FOR YOUR TRS-80

The SK-2 clock modification allows CPU speeds to be switched between normal, an increase of 50%, or a 50% reduction; selectable at any time without interrupting execution or crashing the program. Instructions are also given for a 100% increase 3.54 MHz. The SK-2 may be configured by the user to change speed with a toggle switch or on software command. It will automatically return to normal speed any time a disk is active, requires no change in the powering system and has provisions for adding a clock controller while printing is being done. Works with cassette or disk systems. Ideal for Selsor or other slow printers. Allows printing and processing to run concurrently. Output may be directed to either the parallel port or serial port of the video screen. 80 Microcomputing said: "I can only give my highest recommendation of Spooner and Mumford Micro Systems." Specify Model I or Model III. SPOOLER ...$16.95

DUPLICATE SYSTEM TAPES WITH CLONE

Make duplicate copies of almost any tape including Basic, SYSTEM, data lists, assembler source, or customer loaded. The file name, load address, entry point, and every byte (in ASCII format) are displayed on the video screen. Model III version allows changing tape speed so you can load in a tape at 500 baud and write it out at 1500. Specify Model I or Model III. CLONE ...$16.95

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Written by Dr. A.H. Gray, Jr., co-author (with J.D. Markel) of the classic text "Linear Predictions of Speech, this complete package includes 3 versions of the machine language FFT/ASAM routine assembled for 16.32, and 48K machines, a short sample Basic program to access them, a 10K Basic program which includes sophisticated interactive graphing and data manipulation, and a manual of instructions and examples. The machine language subroutines use variables defined by a supporting Basic program to make data entry and retrieval automatic. Written for PEEX and POKES. They perform 10 to 40 times faster than their Basic equivalent (256 points in 12.5 seconds), and handle up to a 1024 point complex FFT. This is really useful in analyzing stock market and commodity trends as well as for signal analysis.

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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 in memory and immediately debug your program with the full in single stepping debugger. Quickly switch from assembler to debugger and back again with a simple call to the source code routine! The assembler is an INSTANT ASSEMBLER an excellent learning tool for assembly language programming.

INSTANT ASSEMBLER is absolutely unique among tape based assemblers in that it produces relocatable code modules that can be linked with the separate LINKING LOADER, which is supplied in two versions for loading programs into either high or low RAM. This lets you build long programs with small modules. INSTANT ASSEMBLER also features immediate detection of errors as the source code is entered, a compactly coded source format that uses 1/3 as much memory as standard source, and many operational features including single stroke entry of DEFB and DEFW, printout control of listings, alphabetic listing of symbol table, separate commands for listing error lines or the symbol table, block move function, and verification of source tapes.

INSTANT ASSEMBLER's debugger provides single stepping with full register displays, display of the entry of addresses, forward or backward memory display, disassembly of object code in memory, memory display in ASCII format, and hex-to-decimal or decimal-to-hex conversion. The single stepping 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 use with only 16K machines. The instruction manual must 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 the necessary files to verify the debugger.

Specify Model I or Model III. TAPE INSTASM ...$29.95

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This program is a full feature print formatting package featuring user definable line and page length (with line feeds inserted between words or after punctuation), screen dump, printer pause control, and baud rate selection. In addition, printing is done from a 4K expansion memory if LISP or LISP mode returns control to the user while printing is being done. Works with cassette or disk systems. Ideal for Selsor or other slow printers. Allows printing and processing to run concurrently. Output may be directed to either the parallel port or serial port of the video screen. 80 Microcomputing said: "I can only give my highest recommendation of Spooner and Mumford Micro Systems."

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80 Microcomputing, April 1982 • 359
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 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 Inter-galactic 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.

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

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 retying 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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Or call (714) 755-1258 weekdays 7 AM-4PM PST. We will gladly answer your questions.
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 80 newstand 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 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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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.

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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—up to 12 screens per program!

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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, posed 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 Rawi, is that 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 newrooms 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,” Rawi 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 Rawi: “I really believe that in five years probably about half the writers that are out there will be composing and transmitting copy electronically.”

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.

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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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PULSE TRAIN continued

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.
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By David Feitelberg
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By Steven Kears
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“Although apprehensive, another physician and I installed the unit in an hour.”

O ur 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 808 in business operating systems, surprisingly few Model I or II 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 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 II, 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 II 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 TRS-DOS 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 TRS-DOS 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 Omikon, 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!

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$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 = CP/M 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. Omikon 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. Omikon's version of CP/M has several such enhancements.
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DISPLAY DICTIONARY: 
ADD WORD TO DICTIONARY: 
EXIT: 
WORD: (Your error)
RESPONSE:

EASY TO USE: Prepare your text on any Z-80 based microcomputer, using any of a number of popular word processing programs. When you are finished, enter the appropriate command, and ELECTRIC WEBSTER proofreads your document, displaying misspellings and typos on the screen. Then correcting ELECTRIC WEBSTER can display each error separately, requesting you to enter the correct spelling for each. You are also given the option of displaying errors in context or adding words to ELECTRIC WEBSTER's 50,000 word vocabulary. If you do not know the correct spelling you may also ask ELECTRIC WEBSTER to look it up for you and display the dictionary. Finally, ELECTRIC WEBSTER corrects your document. All in less than a minute.

LOW PRICES: Standard MICROPROOF is available for $69.50 (TRS-80). Standard ELECTRIC WEBSTER is available for either $89.50 (TRS-80 Model I or III, Apple II), or $149.50 (CP/M, TRS-80 Model II and all others). The optional correction feature can be added at any time for an additional $60. Correction feature can be ordered with patch to integrate with your word processing software. For each patch, optional Grammatical Checking feature, or optional Hyphenation feature, add $35. (Integration patch not necessary for Wordstar.)

SPEED is the single most important factor in a dictionary program. All dictionary programs will find your potential errors but if the program is too slow, you are not likely to use it. ELECTRIC WEBSTER's speed is outstanding. It can proofread a several page letter in 20 seconds.

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Michael Tannenbaum, CPA
80 Microcomputing, August 1981

"The summary review of this program? One word — Excellent. I highly recommend it for anyone using a word processor for any need — articles, manuals, reports, and even letters of substantial length."

A. A. Wicks - Program Previews
Computronics, September 1981

In a comparative review of proofreading programs (with smaller dictionaries), MICROPROOF was found to be considerably faster than all the others, when tested against a 400 word sample document.

Phillip Lemmons
BYTE Magazine, November 1981

"(MICROPROOF) operates with good speed and efficiency. A 1500 word document took 26 seconds to load, process, and proof when the program was run on a TRS-80 Model II under CP/M."

"Once the program is integrated, it is very friendly and any person able to use a word processing program can master it in moments."

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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 TRS-80 "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 OM-COPY.COM. Standard CP/M copy is performed by PIP.COM, which is a slow but versatile file-by-file transfer utility. OM-COPY 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 OM-COPY SYSTEM copies only the portion of the disk containing the operating system. XOR.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 II addresses eight-inch disk drives. This feature is supported by NEWDOS80 and other major DOS systems. It is not supported by TRS-DOS. 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-disk 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.

Mayday Power Supply
Sun Research Inc.
Box 210
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$650

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 sputt 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-pronged sockets. The unit refused to work until the correct electrical outlet was available.

When used with the Model II, 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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PRESS: (L) LEARN WORD  (R) REPLACE WORD  (S) SKIP WORD
WORD IN ERROR: mistake

This is an example of a text being checked by HEXSPELL. The text scrolls up the screen as it is checked. When an error is detected, you have three choices:
1) REPLACE the incorrect word. The replacement word is INSTANTLY RE-CHECKED for correctness, then inserted in the text.
2) The word is correct, leave it as it is.
3) Tell HEXSPELL to LEARN this word for future reference, with just one keystroke. 4
HEXSPELL requires just one step to check and correct a text, and learn new words. Your document is ready to print, as soon as HEXSPELL is finished. A word that is in error, e.g. [mistake], is highlighted in the text for easy correction.

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A NOTE ON CANADIAN MAIL: please allow 5 to 10 days in each direction for mail delivery. For faster service leave your orders or enquiries on our 24 hours answering machine.

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.
ALCOR PASCAL

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55. Pascal Tutorial with 500 line Data Base program. (source supplied on diskette)
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FOR THE MODEL III

MOD III ROM COMMENTED —Soft-Sector marketing, 1981. This book is not an instruction course on machine language, but rather an information source that you can use time and time again for writing your own program or patching old Mod I machine language programs. It contains an explanation of ROMs in the latest machine from Tandy, with must every location of the 14K ROMs listed, with comments. BK1235 $22.50

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Every day thousands of speculators bet millions of dollars that they can pick a stock which will increase in price dramatically within a short time. How would you like to bet $200 that a stock currently selling for $50 will rise in price to $72.25 within 45 days? That is a 45 percent increase!

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 racetrack. "What will you do 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...
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.
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 3/4 then you cover (buy) for a profit of 4 1/4 (5 minus 3/4) Total loss of 4 5/8 minus 4 1/4 plus 1/2 for commission or maximum probable loss of 7/8 of a point versus maximum profit potential of 6 1/2 points after commission...and a net profit of 4 1/2 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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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 expel 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 cell.
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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 traveling 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 blackening 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 refractory 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 1 or 0 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 determined. The simulation starts at line 420 with the INKEYS 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.

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 is 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

---

**Fig. 3.** Change in membrane potential during an action potential

**Fig. 4.** Program variables

<table>
<thead>
<tr>
<th>A1–A3</th>
<th>Graphics Strings</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1(i)</td>
<td>Position codes for spatial summation</td>
</tr>
<tr>
<td>A(i)</td>
<td>I or E states for the neuron</td>
</tr>
<tr>
<td>L(i)</td>
<td>Numerical equivalent of excitation or inhibition</td>
</tr>
<tr>
<td>J(i), J1(i)</td>
<td>(X,Y) coordinates for the small neurons</td>
</tr>
<tr>
<td>K(i), L(i)</td>
<td>(X,Y) coordinates on the large neuron</td>
</tr>
<tr>
<td>KJ</td>
<td>Sum or state membrane potential of the large neuron</td>
</tr>
<tr>
<td>P(i)</td>
<td>Refractory states of the neurons</td>
</tr>
<tr>
<td>K1(i)</td>
<td>States of the neurons</td>
</tr>
<tr>
<td>L(i)</td>
<td>(1 = on, 0 = off)</td>
</tr>
<tr>
<td>POKEx</td>
<td>Reset the key buffer</td>
</tr>
<tr>
<td>Lines 500–510</td>
<td>Determine if the small neuron in question can fire</td>
</tr>
</tbody>
</table>
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“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.

Douglas, B. and Hasting, D. Spectrophotometry Methods For Mapping Neural Networks 1961 Proceedings from the Lawrence Symposium (to appear)

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*Requires LDOS or other alternate Model III operating system. We will provide LDOS 5.1 for $80. with the purchase of any of the systems listed above.

HARDWARE

Model III 48K 2 Disk ...................................................... $2150.
16K Model III ............................................................. 865.
64K Model II .............................................................. 3385.
64K Color Computer ...................................................... 339.
16K Extended Color ...................................................... 499.
32K Extended Color ..................................................... $634.
CTR80 Cassette Recorder ................................................... 52.
Lynx A/A Modern ......................................................... 249.
C. Itoh Prowriter Printer .................................................. 550.
Starwriter Daisy 25cps .................................................... 1495.

WARRANTY INFORMATION

All Radio Shack products are covered by the standard Tandy 90 day warranty, which will be honored at any company-owned store or computer center. Other hardware is warranted for 120 days by Stevens' Electronics.

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NEW PRODUCTS
Edited by Janet Fiderio

Featuring—
The Radio Shack Model 16

The Model 16

The TRS-80 Model 16's dual processor design features an MC68000 microprocessor—a 16/32 bit central processing unit. The Model 16 comes with 128K of RAM and is expandable to a total of 512K RAM and 2-1/2 megabytes of disk memory storage. The Model's second microprocessor, a Z-80A handles all input/output functions. The Z-80 also enables you to use all existing Model II software. The 16's operating system is Library Command compatible with the Model II. An editor/assembly is provided and includes an editor, cross reference and debugger. The Model comes with one or two built-in 1.25 million character eight-inch disk drives. A high resolution 12-inch video screen with 24 by 80 characters each is standard. The detachable typewriter-style keyboard features a numeric keyboard and two special function keys. Two RS-232C serial ports and a parallel printer interface allow expansion with a wide variety of peripherals. A hard disk port can be added to use from one to four 4.4 megabyte hard disk drives.

The one-disk Model 16 (#26-6001) is priced at $4999. For more detailed information contact your local Radio Shack store.

Reader Service 583

16-Bit Processing For the Model II

A Model 16 Enhancement Option is available for Model II owners. The Model II Enhancement Option (#26-6010) provides you with the MC68000 CPU and 128K RAM of internal memory. (It is expandable to 256K.) Your present disk drives are retained and all Model II software remains compatible.

The package sells for $1499 and is available from Radio Shack.

Reader Service 584

Audit Software

Stat/Pak is a program designed to aid the auditor in applying statistical sampling techniques to the compliance testing of virtually any facet of the accounting system. Stat/Pak determines required sample size, selects the items to be examined, provides clients with a list of documents to be pulled for examination, and provides the auditor with a worksheet to be used in the test. It also generates workpaper documentation of the statistical parameters employed, and evaluates the test results by generating a report ready for inclusion in the workpapers.

This package is available for the Model I, II and III, in cassette and disk versions.

Commodity Price Data

Test your trading strategy before investing with this disk data base for those interested in commodity researching and trading. Over 400 years of historical commodity futures price data is offered. This data base features computer-edited daily high, low, and settlement prices for the 16 most actively traded commodities from 1976 to the present. The original data has been collected from exchange statistical annuals, daily statistical bulletins, daily quote services, and the Wall Street Journal.

In addition to files of daily statistics, a summary form of weekly high, low, and Friday settlement is also available. Printed listings and maintenance software may be purchased as well.

The entire data base (initial release) is available for $1000. Minimum purchase is $50. For more detailed information contact D B Management Inc., 16407 Evans Ave., South Holland, IL 60473, (312) 596-5755.

Reader Service 590

388 • 80 Microcomputing, April 1982
Everything you need to know to get started programming your own computer. These handy program sourcebooks, each jam-packed with easy-to-understand info for beginners, are crammed with hundreds of tips, tricks, secrets, hints, shortcuts, and techniques, plus hundreds of tested ready-to-run programs. TRS-80 Color Computer. TRS-80 Pocket Computer. Sharp PC-1211 Pocket Computer. Casio FX-702P Pocket Computer. Four of the most popular computers for beginners.

**Color Computer**

101 Color Computer Programming Tips & Tricks, learn-by-doing instructions, hints, secrets, techniques, shortcuts, insights, for TRS-80 Color Computer, 128 pages $7.95

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55 MORE Color Computer Programs for Home, School & Office, sourcebook of useful, plug-in-and-run software with colorful graphics, for TRS-80 Color Computer, 112 pages $9.95

The Color Computer Songbook, 40 favorite pop, classical, folk & seasonal songs arranged for the TRS-80 Color Computer, ready-to-run music programs, 96 pages $7.95

My Buttons Are Blue And Other Love Poems From The Digital Heart Of An Electronic Computer, for poetry lovers, computer lovers, just-plain lovers, a high-tech classic. 66 heartwarming poems written by a TRS-80 Color Computer, great gift for someone close to you, includes the exclusive ARCSOFT Poetrywriter program, 96 pages $4.95

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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

A Database Alternative

If you are tired of database retrieval, you can now access disbase with the PABAB (Pick A Base, Any Base) software package. Simply boot up PABAB and answer the question WHICHABASE? with Disbase or Database. If you answer Disbase, you're sent to the disk's disbase; 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

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 dimension 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
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See List of Advertisers on page 338

80 Microcomputing, April 1982 • 391
NEW PRODUCTS

the trainer problems by correctly manipulating eight switches.
This product is available from L.J. Broder Enterprises Inc., 1105 S Shady Trail, Suite 115, Dallas, TX 75229, (214) 241-3727.
Reader Service  539

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.

Word Processing Enhancement Program

Auto-Writer turns your word processing system into a database management system. This five program word processing enhancement program allows you to create a mailing list, or any data base, then update 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 Auto-writer features contact Walonick Associates, 5624 Girard Avenue South, Minneapolis, MN 55419, (612) 866-9022. The Auto-writer is available for the Model I and III with two disk drives and 48K for $728.3.
Reader Service 571

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 ETP-80 and the DMP-85) are available for an additional price of $600.
The PMC-80 is software-compatible with the TMS-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

Dicrasic Reading

Diascriptive Reading is a seven-disk, diagnostic, prescriptive, tutorial reading program. It is designed to aid the read-
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, $99.95); 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

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, eattt, gdo, cocking, rsonpe." You can then do a second-level sort of this list: "cketpo, cockl, gdo, rsonpe, eattt" (or "eptock, kbloc, ogd, onpers, tteatc"). 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

Biplan is designed to simplify business modeling. Its uses include planning a new business endeavor, projecting the direction of an existing business, generat-
NEW PRODUCTS

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 Computeware, 1472 Encinitas Blvd., Box 668, Encinitas, CA 92024, (714) 436-3512.

Reader Service 555

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 (4K).

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 Fool's 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 Nayney 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-sector, 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) 985-1804.

Reader Service 560
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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MODEL III DISK $69.95

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- TRSDOS™ & Manual $21.90
- DOSPLUS $149.00
- LDOS $129.00

External drives (3&4) $275.00 ea.

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- C ITOH F-10 40 cps 1695.00
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- LEXICON MODEM 125.00
NEW PRODUCTS

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 OSAVEM 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 hand-shaking. 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

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 to 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 wired 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 6.5-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 FoxWalker, 4650 Arrow Highway Building G-17, Montclair, CA 91763, (714) 621-3400.
Reader Service 573

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
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 lower case with descendents.

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 — 98,504 individually accessible 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

Extra Cash With Your TRS-80

VisiCrook is a general accounting package that automatically calculates five percent off your company's gross sales and then joggles 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.

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 $12.95, the loader is available from Lemons Tech Services, 325 North Highway 65, Buffalo, MO 65622.

Reader Service 574

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
NEW PRODUCTS

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 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, Foicraft, PA 19032, (215) 461-5300.

Reader Service  576

Coaches You on Rubic's Cube

The Rubic Cube Coach Program solves the cube and helps you do it the same.

This 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.

The VR-RS232C Serial Interface

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 $19.95, 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.

COMING SOON: KATY AND THE WYDDEL

TRS-80 MODEL I 48K DISKETTE: $29.95
TRS-80 MODEL III 48K DISKETTE: $29.95

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TO ORDER, CALL: 1-800-334-5470
objects 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 database. 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.

Circuit Analysis Program

AC Analysis analyzes 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 II 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

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, Miami- 
City, OH 45624, (513) 966-2421.

Reader Service 550

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 Farmkeeper are: 1040F, 4757, Income and Expense Summary, Check-Writing, Account Audits.

Farmkeeper 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 MSB-1K 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.

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*Suggested retail price for either model.
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.

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

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