80 U.S.

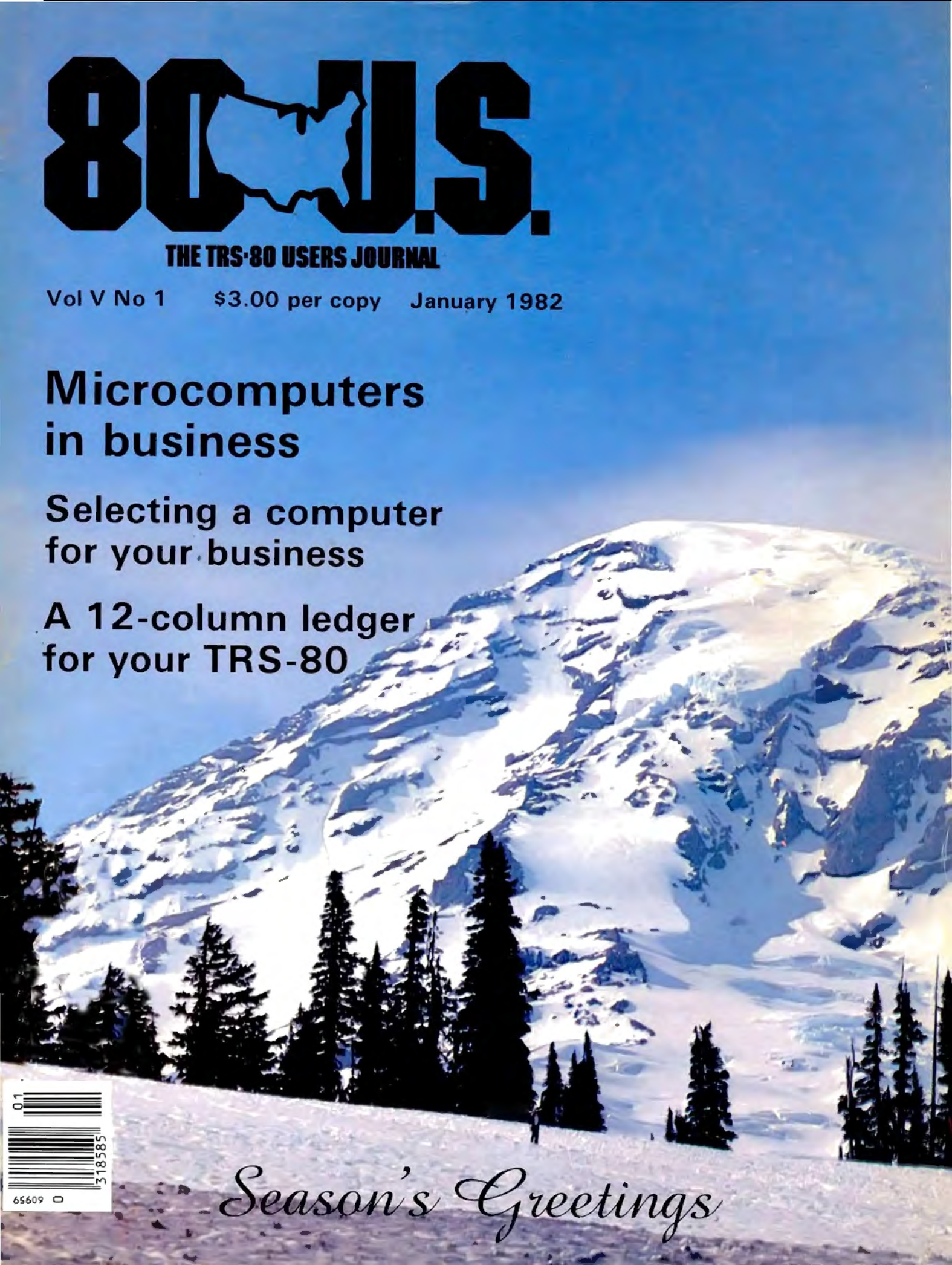
THE TRS·80 USERS JOURNAL

Vol V No 1 $3.00 per copy January 1982

Microcomputers in business

Selecting a computer for your business

A 12-column ledger for your TRS-80



Season's Greetings

NEWDOS/80 Version 2.0
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Apparat's newest disk operating system for the TRS-80®, NEWDOS/80 Version 2.0, has added many new enhancements and features to make your Model I or III computer more powerful. We've kept one thing the same. Our support.

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Version 2.0...
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- Selective variable clearing
- Can display basic listings page by page
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- Enhanced disassembler
- Command chaining
- Superzap to scan files
- Fast sort function in basic

These new features, added to the existing capabilities of NEWDOS/80, makes it one of the most powerful additions you can make to your system. And Apparat's commitment to support assures that you've purchased a superior product, both today and tomorrow. At just $149.00 it could be the best investment you will make for your TRS-80.

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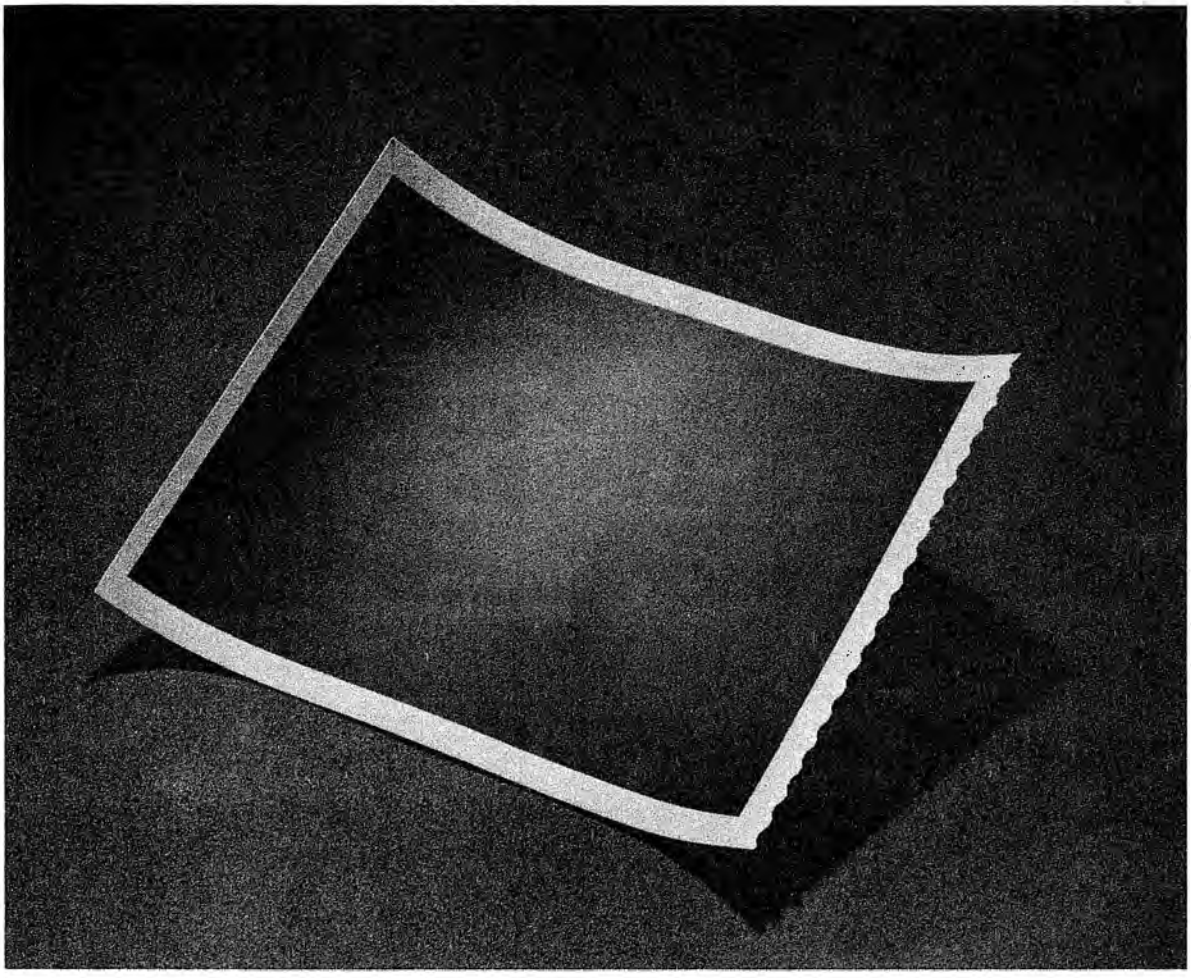

This is a picture of all the printers in the world that outsell the MX-80.

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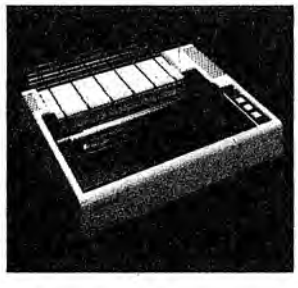
That seems like a straightforward enough policy. But when we first introduced the MX-80, the competition laughed. Now they're cutting prices, introducing "new" models, and running splashy color ads, all in an effort to catch up. And they're not laughing.

But you don't have to take our word for it. You've got a choice: you can buy the printer that's been embraced by several hundred thousand computer fanatics all over the world. Or you can buy something else. And take your chances.



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Editorial

Back in the good old days when I was still a farm boy, we had a pipsqueek of a tractor. It wheezed, puffed, grunted and snorted. It also died quickly when it encountered a tough piece of sod while pulling a plow. Then, one spring, I got to use a new diesel-powered monster with a 50-gallon gas tank. It was grossly overpowered, even when pulling a five-bottom plow, a packer and a seeder. It purred like a kitty, and there was nothing that would even begin to make it hesitate. It cut through the soil as though it was warm butter.

It was a thing of beauty and a joy forever, and there was plenty of time to make value judgements about overkill and underkill. It was nice to have several hundred horsepower at your disposal and use only small percentage of it. It made life easy because little things didn't hang you up and cause frustration. Taking wear and tear on both the machine and the operator into consideration, it was probably cheaper in the long run.

Computers do not pull plows, but there is an analogy here. How much computing horsepower do you need, and how much frustration do you encounter in trying to make a microcomputer act like a minicomputer? In the case of our big tractor, it made one effortless pass through a half-mile field. The operation was complete: One swath of dirt, about 80 inches wide, was plowed, packed and seeded. There was no need to come back to it until harvest time. The small pipsqueek, on the other hand, had to make three passes, and it cut a smaller swath to begin with.

Let's look at a real-life situation here at 80-U.S. We have a four drive Model II which handled a 10,000 plus subscriber file. It worked very well - until we hit that 10,000 limit. Now, all of a sudden, it was decision time again. It already took almost 6 hours to print labels for the magazine. The printer, a Centronics 703, seemed to be the pacing factor since it ran without hesitation. Obviously, a faster printer was indicated. One Saturday afternoon, we hauled in a real line printer. It actually printed an entire line in one fell swoop. It printed its line, and then waited! The computer was now the pacing factor. More specifically, it was disk access time which caused the delay. The net result was that throughput was not increased. We had had a very well matched system all along, and didn't know it.

Naturally, we scrapped the idea of buying a faster printer. It wouldn't help the situation at all. The capacity problem could easily have been solved by interfacing a hard disk system to the Model II. It was available and sitting right there next to it. It was a 20-megabyte Corvus system, here for evaluation. It worked like a dream, and has a fantastic disk access time. With the hard disk, we could increase our capacity to at least 32,000 records. Running labels for the magazine would then take about 15 hours! It would take another 15 hours to run a checking list prior to the actual running of the labels.

We have no second shift, and to put one on would cost bucks. Aside from that, our experience shows that we rarely can run continuously for even six hours without getting an I/O error or power glitch somewhere during that time. It appeared we were trying to plow a half mile field with a quarter mile tractor. There are limits to microcomputers, and we seem to have hit it in this case. For all other applications though, the computer is overpowered, and loafs through without pain or strain.

This is my second start on an editorial for this issue. The first one was too sanctimonious and stiff. It had to do with about the same thing mentioned here, but I find they turn out better when they are simply "winged". There is just one observation from that first attempt that is worth passing along here. In trying to collect information for this issue, I found that in almost every case where a microcomputer was being used successfully in a business, there was at least one person in that business who was personally involved with computing. That person writes software and selects and modifies software for the needs of the business. I have not yet talked to or seen a place of business that has the fabled "turnkey" system in operation. I'm not sure what that says, but if I were writing software for a living, it would certainly be worth some serious thought. Perhaps the microcomputer world will spawn a new breed of person: the Micro EDP Manager.

What about our problem? We solved it rather neatly. Our entire subscription files have been converted to IBM format and transferred to a subscription service in Illinois. They have put it on an IBM 370/something or other. Soon, they will be running labels, reports and sending renewal notices. They currently service over 150 magazines. It's their only business and they are set up to handle it. It was cheaper than adding a second shift here, and now we can go ahead and promote at will. We no longer have to ask the question about where to put all those new subscribers.

It makes me sort of sad though, to find that the wonderful micro has practical limits. I always thought micros could do just about anything.

Mike

80-U.S. Journal

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AUTHORS: We constantly seek material from contributors. Send your material (double spaced, upper/lower case please) and allow approximately 4 to 6 weeks for review. Programs must be supplied in machine readable form on diskette or tape. Text files may be on diskette. Media will be returned if return postage is provided. Cartoons and photographs are welcome. Generous compensation will be made for non-trivial works which are accepted for publication. 80-U.S. Journal pays upon acceptance rather than on publication.

The Cover

Our cover for this issue shows the summit of Mount Rainier. It is intended to be our season's greeting card to you, our faithful readers. Jeff Graham was the photographer.

SUBSCRIPTION PRICE in the United States is $16 for one year, $31 for two years and $45 for three years.

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80-U.S.

THE TRS-80 USERS JOURNAL

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Volume V Number 1 **January 1982**

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Letters

As one who writes a number of retail installment contracts each week, and who used to calculate each with a calculator, I was happy to see the contract program in the Sep/Oct 81 issue.

After running the program, though, I became concerned that the interest formulas don't seem valid for this state (I'm in Washington).

Here are the changes I made in order to obtain correct rates for my location:

```
1080 RI = IR/ 1200
1090 PF =(1 -(1 + RI)^(-
  MP))/RI : PMT =(INT(BF/
  PF * 100 + .5))/100
1120 FC =(MP + PMT) - BF
1130 TP = PMT + MP : K1 =
   TP + DP!
```

In line 900, change "ADD-ON" to "ANNUAL". This way, you need not re-calculate the annual rate - it's assumed to be correct. You may also want to delete lines 1790-1890, which caluclate the Texas rate, and delete 750-790, to eliminate the Texas instructions. If so, change line 740 to:

```
740 GOSUB 910 : RETURN
```

By using this method, you assume all equal payments, and not bother with an odd last payment. CAUTION: If you charge the maximum legal rate, you may wish to add "-0.01" to the end of 1190. Otherwise, rounding errors could cause your interest to be a few cents over the legal rate. In lines 1190 and 1710 change "MP-1" to "MP".

My own contracts are figured with a minimum 2% down payment, so I added:

```
1005 PRINT@ 516, " (MINIM
  UM DOWN PAY'T"; : PRINT
  USING " $###.##"; (GT/5
  ); : PRINT ")";
```

Finally, if you intend to use this program "for real", I strongly suggest you take a sample run to your banker or accountant and double check that it's correct.

Ron Manor
Olympia, WA

(Good idea. Ed)

Just recently I got a batch of your back numbers and just had to write to tell you what a great magazine you put out.

...there are so many good things in the last six issues it is difficult to pick one out but I think I'd opt for the Graphics Editor, by William Mason...

Ms. Sheena Scott
Edinburgh, Scotland

(Joe Fettig of J. F. Consulting was also fascinated by Bill Mason's article. As a result, he contacted Bill and had him expand on the original idea and produce the Graphics Editor and Programmer announced in this issue's new product section. Ed.)

I've read in articles that using the improper ink with a dot-matrix printer can cause damage to the printhead. I've seen an article for adding a re-inking attachment to a printer but it did not mention the ink to use if your printer was the dot-matrix type. I've tried to find the answer locally but have had absolutely no luck. My question is what brand and type ink can I use to keep my ribbon printing dark?

Arthur Plante, Jr
Acushnet, MA

(There are different kinds of ink, many of which are designed for mechanical devices (printers, numberers and cash registers, to name a few). These contain some kind of lubricant to prevent the ink from drying out and to act as a lubricant for the mechanism.

If you are looking at a commercial re-inker, then use the ink they recommend. If yours is home-built, then use an ink designed for a cash register or numbering machine. If you can't find one of these, then possibly a self-inking stamp ink would work. Stay away from the common fountain pen inks and stamp pad inks, as they contain little or no lubricants. Ed)

In the Jul/Aug 81 issue you have printed a list of printer results... The results of my test bear out what you have discovered in your test. However, there are discrepancies in the methodology you have chosen.

It is fine to set out parameters in order to compare, but there are some things I would like to point out. If you determine cps in any printer, the thing to do is to use the entire line of print at a set cpi.

It became apparent that using less characters in a given line will give a slower cps, as in most printers the printhead must travel the full carriage (and return on non-bidirectional printers).

I have found by using the above parameter, the results show manufacturer's rated cps is more than was tested... Another program I wrote gave similar results. But as can be seen, the more characters in a line, the better the cps.

I believe that this is what the manufacturer is giving in his ratings.

Hazen R. Stump
Burnaby, BC Canada

(In talking to a number of manufacturers, the cps rating is consistently specified as "instantaneous" print speed. This means that no consideration is given for carriage return, starting or stopping, all of which affect throughput which is more meaningful in measuring printer speed than an "instantaneous" rating. As a result, many manufacturers are now rating their printers at lines per minute (usually at 80 characters per line) which does take into account time involved in carriage movement. Ed.)

I have a request. Do you know of any programs that deal with diet?

Last week... tests showed I am diabetic. Thus they put me on a 1200 calorie per day diet. Hell, that's starvation.

Anyway, I have to keep track of everything I eat and a lot of other stuff and the thought came to me of why not use the TRS-80 and the next thought was that there might be some software already written for diets.

I know how to do some of the things to write a program but some things like a three day average, always using the last three days, have me stumped.

So I have a two-fold request. First do you know of any diet programs and second, if not do you know anyone I could pay to help me write a program so I can constantly monitor my condition?

James C. McCord
Box 1672
Fairbanks, AK 99707

(I looked at one of those diets once and shuddered... take one from group A and two from group B, but not on Sunday or if you have eaten a slice of bread... Ugh! You have my sympathy, and I can't think of a better use for a TRS-80 in your case.

If anyone has information leading to the capture of such a diet program, please contact Mr. McCord directly. Ed)

I take issue with the editor that answered the complaint by Mr. Bentivegna of Cincinnati in the Sep/Oct 81 issue.

If the parties that place ads in your magazine do not know what the cost is going to be at the public release date they have no business taking an ad in your magazine and you should discourage this at all cost to your ad customers. If the computer business is so unstable that a firm price for at least a reasonable period of time after the magazine is delivered to the customer by you cannot be maintained then these firms should reconsider the price before issuing an offer to sell the product by mail through a magazine.

While I do not advise that you police each ad, the buying public would have more confidence in both you as a magazine and the firms that you provide ad space for if you would assert a less conciliatory attitude toward the firm that changes prices as they see fit.

W. B. McKinley
South Lyon, MI

(It was the implication that we didn't care which prompted my reply. That hurts, especially since we go out of our way to present correct information. I stand by my original reply to Mr. Bentivegna. -Mike).

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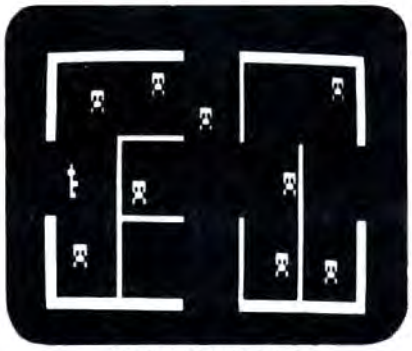

Actual unretouched photos

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NEW! SCARFMAN

SCARFMAN

THE LATEST ARCADE CRAZE now runs on your TRS-80.

It's eat or be eaten. You control Scarfman around the maze, gobbing up everything in your path. You attempt to eat it all before the monsters devour you. Difficulty increases as game progresses. Excellent high speed machine language action game. From The Cornsoft Group. With sound.

CAUTION: Played with the Alpha Joystick, Scarfman may become addictive.

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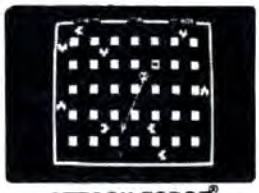

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Items at random

It's mid-winter madness time again. The madness this year has to do with our coming to you monthly instead of every other month. You may have noted we have dropped back a few pages (for the first time since we have started). Getting geared up to go monthly has been a blast, to say the least. You are now receiving about 70% more editorial material in a two-month period than before. The idea of a "February issue" seems funny around here, but we are already working on it - and it will cover word processing and spelling checkers, among other things.

We have been taking extra effort to make our programs run on several of the TRS-80 models. It should be noted that almost any program which does not include random disk files will also work on the Exatron Stringy Floppy. Speaking of the Stringy Floppy, @NEWS is missing again - technical difficulties in the Southland. The editor for that column admits to a red face, and promises to be back in February.

Starting next issue, subscriptions and all matters related to subscriptions, will be handled by an agency in Illinois. We have really outgrown doing it ourselves (and I used to do it on one Model I floppy diskette!). It is very important to renew your subscription using the same name. It is always best to include your label from a current issue. It's amazing how balled-up something can get when someone subscribes from the office and then renews from home, especially when they work in New York and live in Connecticut. Most of the time including your old label is not so much a courtesy as an absolute necessity.

What with going monthly and all, Eva Jones has moved to Editorial Secretary. Catherine Doud has joined the staff as typographer and layout person and Don Scarberry is our new assistant editor. You will probably see some of Cathy's influence in this issue, Don's should be apparent in the next and following. We are growing, and hope these new persons will enjoy their stay with us as much as the others have.

Corrections

The following products were reviewed in the last issue (Nov/Dec 81). We inadvertantly left out vendor and pricing information. Our sincerest apologies to those companies and our readers.

Introduction to TRS-80 Level II BASIC by Michael P Zabinski, Ph.D., is published by Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 07632. The price is $10.95

Fifty BASIC Exercises by J. P. Lamoitier is published by Sybex Publishing, 2344 Sixth Street, Berkeley, California, 94710 and costs $12.95.

ENHBAS, evaluated by Lawrence Charters, is from the Cornsoft Group, 6008 North Keystone Ave., Indianapolis, Indiana, 46220 (317) 257-3227 and is priced at $59.95.

Softbyte Computing's *Stock Chart Grapher* description in the advertisement appearing on page 149 should have read: Track your own stock's price performance. Shows trading prices, volumn, moving advances and price momentum for up to **60** dates. $24.95.

In *NOTES*, we talked about sending listings to the Model II from the Color computer. We inadvertantly told you to connect pin 1 of the Color computer to pins 6, 8 and 20 of the Model II. The lines are still tied together at the Model II end but *are not* connected to pin 1 of the Color computer. Also tie pins 2 and 4 together at the Model II end.

In this issue

Merv is not the only one to do themes with panache. Our business line-up this issue includes Fred Blechman's 12 Column Ledger, a program for most TRS-80 models with 16K and up. It will also work with the Stringy Floppy. No, we are not hung up on Model II's and hard disks, but some of that is in here too.

Something we have never done before appears on page 22. Last summer, while flying to Aberdeen, South Dakota on Republic Airlines, I happened to read their magazine and found an article by Joel Makower. He really seemed to have done his homework, and wasn't pushing any computer in particular. We asked for reprint rights and got them. The items he discusses for a business environment are worth consideration.

Now there are compilers for just about every model of TRS-80, even 16K Level II. See page 33 for a review of three of them.

Color computer owners can get up to 1500 bytes more memory, free! R. Wayne Day from Blue Mound, Texas tells all about it, starting on page 38.

If you're tired of the "reverse shift" syndrome on your Model I, William R Bell of El Granada, California, tells how to get back to the normal "shift for upper case" with a little hardware modification. It happens on page 43.

The Exatron Corporation has introduced a disk controller for the Color computer. We take a pretty good look at it starting on page 46. The indications are that the Color computer, even though it is a fantastic game machine, can also be a serious applications machine.

Captain 80 was off to merry ol' England recently, and tells about his visit and other assorted things on page 54.

Richard Straw, who has appeared in our pages a couple of times previously, tells about linked list subroutines on page 58. They work on Level II 16K and up and also on the Color computer. This is a technique I always wondered about, now we can all find out.

In "Happiness is a printer", Larry Krengel tells about his experience with the Epson MX-80 printer. It's on page 64.

Hog Jowl Mansion is a zany adventure by Jon Waples. It starts on page 66, and should spice up your holiday spare time.

A year ago, Spencer Hall introduced his nine Z-subs. Now, he has expanded them considerably and calls it ZLanguage. They are really quite clever, and start on page 79.

Glenn Collura tells how to find execution points on page 88, Dan Connors tells how to make a turnkey system out of your Model I and Lou Pa gives us a "Spacer" program on page 94.

Terry Dettmann takes a look at the Corvus hard drive system on page 107, and for beginners, Bob Bahn looks inside the FOR...NEXT loop on page 110.

There are several other goodies, System/Command and a few reviews for your wintertime reading.

See there, going monthly wasn't that bad, was it? We will do it again in February, and in the meantime, enjoy your holidays and tell them all that you saw it in 80-U.S.

Mike

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Circle # 6

New products

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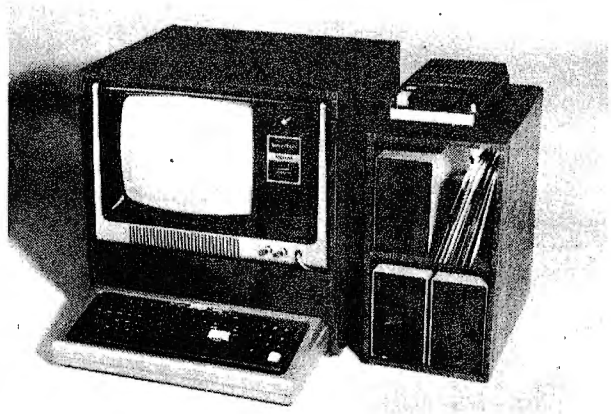
The Designatron Organizer places your TRS-80 Model I components into one convenient desk-top package to hide messy wires and cables. The Organizer consists of two wood grain cabinets. One holds the monitor, expansion interface power supplies, line filters, cables, power strip and fan. The front panel removes easily for resetting the computer. The other cabinet holds up to four disk drives, a tape recorder and fan. The cabinets are available separately. Together they sell for $87.50 plus $8.75 shipping. Designatron, 2794 Hume Road, Malibu, CA 90265 (213) 456-9023

Circle 150



New British Program

EDIT is a new full-screen BASIC editor for TRS-80 Model I/III. The program has a full-floating cursor with autorepeat and over 30 commands for professional editing of BASIC text at the character, word, line or block level. A Scripsit-like control structure aids speedy familiarization and ease-of-use. EDIT was recently developed in England by Southern Software, originators of the ACCEL2 compiler, and is available in the U.S. and Canada from Allen Gelder Software, Box 11721 Main Post Office, San Francisco, CA 94101. Price is $40.00

Circle 152

New artificial intelligence book

SAMS has introduced a new book called *Experiments in Artificial Intelligence for Small Computers*. Author John Krutch presents programs written in Microsoft's Level II BASIC. The book begins with an explanation of artifical intelligence. Game playing programs, problem solving, reasoning, creativity, natural language processing and verbal communications are areas covered by subsequent chapters. It is number 21785, contains 112 pages, costs $8.95 and is available from Howard W. Sams & Co., Inc., 4300 West 62nd Street, Indianapolis, IN 46268 (317) 298-5400

Circle 158

New computer simulations

Creative Computing Software has released two simulations for the TRS-80, Atari and Apple computers. TRUCKER allows the user to experience a trucker's haul from coast to coast. STREETS OF THE CITY is a simulation model of Grand Rapids, Michigan. The objective of this simulation is to complete a ten-year plan of street and transit improvements while retaining the support of the majority of the city commission. They are $24.95 each on diskette. Creative Computing Software, 39 East Hanover Ave., Morris Plains, NJ 07950 (201) 540-0445

Circle 159

Graphics Editor/Programmer

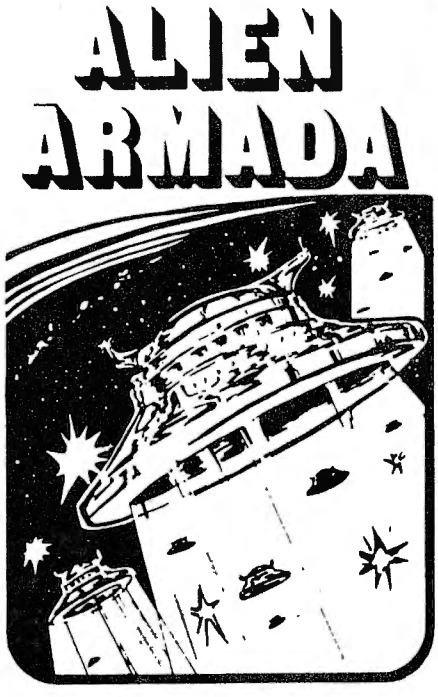
J. F. Consulting has announced the Graphics Editor and Programmer which is a hybrid program that is part text editor, screen drawing utility and BASIC program creator. The price is $25.99 for the Model I and III, 16K and up. Also available are the Expansion Modules I, II and III for the Graphics Editor and Programmer. Module I adds magnification and rotation features; Module II, large alphanumeric characters; Module III, an alternate set of large alphanumeric characters. All three modules are included in one package at $16.99. Contact J. F. Consulting, 74355 Buttonwood, Palm Desert, CA 92260 (714) 346-2051

Circle 151

New games from Liberty Software

Liberty Software Company, a division of Acorn Software Products, announces the release of its first two programs for the Radio Shack Model I and III: Golfer's Challenge and Alien Armada. Alien and Golf are available on cassette for $13.95 each and Alien on diskette for $17.95. Both feature good graphics, sound effects, fast speed, and one or two player options. Liberty Software Co., 635 Independence Ave., S.E., Washington, DC 20003 (202) 544-6674

Circle 154



by Waldron P. Hodsdon

by Charles S. Butler

Color computer mail list

D & M Software has announced COLORFILE, a simple menu driven mail list system for the color computer. Designed to be used with or without a line printer, options allow for creation, review and editing of a file which may be saved to cassette for storage. Price is $24.95 postpaid. D & M Software, 1510 South 97th Street, Tacoma, Washington 98444 (206) 537-8155

Circle 156

BASIC Handbook in 2nd edition

The second edition of The BASIC Handbook by Dr. David A. Lien, has been released by CompuSoft Publishing. This edition is fully revised to document and explain 238 additional BASIC words from the hundreds of new computers which have been introduced since the first edition, published in 1978. The Handbook provides an easy to follow format that allows the user to learn and thoroughly utilize the hundreds of known BASIC dialects. It contains 480 pages and is priced at $19.95 plus $1.65 shipping. CompuSoft Publishing, 1050 Pioneer Way, Suite E, El Cajon, CA 92020 (714) 588-0996

Circle 157

Orchestra-85

Stereo music synthesis and percussion for the TRS-80 is now possible with Orchestra-85, a software/hardware product from the Software Affair. The package includes tape and diskette versions plus sample music files on cassette, instruction manual, and a fully assembled and tested printed circuit board which plugs into any Model I Level II keyboard or Expansion Interface. The high level stereo output may be connected to the AUX/TAPE/TUNER inputs of any stereo amplifier. No external power supply is required. The system sells for $129.95 plus $2. shipping. Software Affair, 858 Rubis Drive, Sunnyvale, CA 94087 (408) 295-9195

Circle 155

5-Game Educational History

An educational software package for the microcomputer is being issued by Advanced Operating Systems. "The Time Dungeon-American History" is a 5-game package designed to help the user become knowledgeable in five eras of U.S. History "1848-1914", "American History 1916-1975", "American History-Civil War 1850-1865 and "American History Presidents 1789-1981". The package is written in BASIC.

When the game begins, the user finds himself at an unknown location in a dungeon with 1000 pieces of gold. He must answer questions concerning the history of the U.S. during the era chosen. The object of the game is for the operator to map his way out of the dungeon with as many pieces of gold remaining as possible. Gold can be gained, among other ways, by answering questions correctly.

Time portals, a Crystal Key, Closet doors, Secret doors, Time Traps and Alien Travelers all add to the mystery of the game.

The package is available through computer retail outlets. Advanced Operating Systems is the microcomputer software division of Howard W. Sams & Co., Inc., a subsidiary of International Telephone and Telegraph Corporation.

Tandy topics

Ed Juge, Director Computer Merchandising, Tandy Corp.

1500 One Tandy Center, Fort Worth, TX 76102

Our faithful mail carrier has had more than normal exercise this month. We continue to hear several common questions... ones I'd like to address before we get started with some other subjects I think you'll be interested in. Most common seems to be the one on software. Why don't we sell software written by other people? The answer is, we do! More than half of Radio Shack's software was written by outside professional software developers. But because it is modified, edited, tested, and most important —supported by Radio Shack, it goes out under our name. In some cases, our contract with the vendor even specifies that we will furnish all necessary customer support, so the vendor won't have to answer lots of user calls.

Next logical question is, how can you sell your software to Radio Shack? Well, first of all, we have a large backlog of software to look at most of the time, and frankly we're very short-staffed for that kind of activity. Second, we probably look at 200-plus for every one we select, because they're 1) not professionally designed and/or coded, 2) not professionally documented, 3) cute or impressive but of little real benefit to the user, 4) of interest only to a very limited market, or 5) a direct "knockoff" of an existing program somewhere. But, if you think you have a winner, here's the procedure:

Submitting Your Software to Radio Shack

1) Don't send the program to us right off the bat, please! Send a one-page letter describing the program, who would want it, how big you think the market is, and why you feel we should market it. And please remember to say which computer you have it written for! And we need to know whether or not your program has been copyrighted and sold (at least one copy). Don't be in a rush, it could take us 60 days to reply.
2) If we're interested, we'll contact you for a copy of the program and documentation. Our people will look over the program and your code, and contact you.
3) If we proceed, it could be 6 to 12 months before editing, testing, etc. is complete, and your program reaches our stores.

So that's how it's done. We are looking primarily for programs with a broad appeal to a wide market. Truly useful home programs would be of interest, but please no checkbook balancers or cupboard inventory schemes. Good vertical market business or professional packages are of interest if the market is large enough. Games must be original and have exceptional graphics . . . and we aren't interested in games or home applications for Model II.

Why Don't We Have More Software?

A common question is why does it take so long to get more software out? Right now, there are 149 different software packages in our warehouses. A few months ago, I counted in one of our competitor's catalogs and found a total of 15. But then the Medflies did hurt the fruit crop in his area . . . ! That's no excuse for us, and we're not satisfied with our development speed either. Let's look at the development pipeline for Color Computer software . . . It takes about one month per thousand bytes of code to develop and debug a program. 8K means 8 months' time. Then comes 60 to 75 days minimum testing, followed by 3 months to get ROMS, and another month to assemble the packages and get it to our warehouses. That means 13 months for an 8K color package. Although Model II and III software do not have the ROM time, most of those packages are considerably more complex and require more time in other areas. Of course, these are very generalized examples.

You might be interested to know that we currently have almost as many packages in various stages of development as we have in the warehouses today. And, for you educators, there will be some educational software for the Color Computer . . . as requested.

Still Other Questions . . .

Why is our TRSDOS primitive compared to some of the other DOS's available? Well, beauty is in the eye of the beholder, but I don't think "primitive" is a fair judgement. TRSDOS is a good, reliable, forgiving operating system on which the average *non-technical* user can run applications software with as little hassle and chance of error as possible. It wasn't intended to be a "programmer's dream" development system. TRSDOS does a lot of error checking and attempts to prevent and recover from operator errors. We use techniques like dual directories, verify detect, verify after write, etc. Systems without these capabilities run noticeably faster, and of course you can "turn off" most of these items in TRSDOS if you're in that much of a hurry, and willing to take your chances. I don't, and I suggest that you don't either, unless you're a very competent professional programmer and fully understand what you're getting into.

TRSDOS is a good utility product — and the price is certainly right! If your needs differ from what we offer, by all means, look into CP/M, NEWDOS, LDOS, DOSPLUS, or one of the other aftermarket products available. (Sorry if I left anybody out!) Remember that these systems are supported only by their authors . . . not by Radio Shack. Should you have a problem, it's strictly between you and them. We can't answer any questions about them, because our people do not know them. We can check your hardware (using TRSDOS), but if a problem remains with XYZDOS, it's strictly between you and XYZ Company.

TRS-80 Microcomputer News

Another common question is "How can I get back issues of the TRS-80 newsletter?" Well, I finally have a good answer — in our stores! We've packaged every issue in reprint form, from issue Number 1 to

and including December, 1980. Twenty issues in all, and available under Catalog Number 26-2115 for just $4.95.

So Much For Questions . . . Now On to the Good Stuff!

With the express caveat that any "advance information" you find in this column is not 100% cast in stone . . . and is subject to Murphy's law and a variety of unforseen dark and sinister forces that affect software and hardware development, I'll try to give you some of the details about upcoming items as often as I can.

Hard Disk!

For example, our long-rumored hard disk should be showing up in the field about the time you read this. As of this writing, it's on schedule for a December 31 release date. Initial testing of our existing application software indicates that we may have to do significant rewriting to only one package . . . Scripsit. You may not be able to scan through Visicalc's directory with hard disk but it appears everything else works... so far, including Profile and the accounting packages. There may be some minor patches required for some programs, but they don't look bad at all. The disk has been advertised as 8.5MB formatted. We were hedging a bit... it will actually be 8.9MB, less systems software and directory. The first drive should net out at about 8.6 useable, and the remainder of the drives 8.9 less the directory. Installation is required on the first and second drives. When you buy your first one, you'll need to bring in your Model II CPU for connector and board installation, a new boot ROM, and possible board changes. When you buy the second, bring in the first hard disk unit — a terminator must be removed and put in the second disk. To add the third and fourth, we think you'll be able to take them home and plug them in between the other two.

Backup will be accomplished with SAVE and COPY commands. You'll be able to save from hard disk to a TRSDOS 2.0 floppy, or to special "Hard Disk Formatted Floppies" which accept a little more data, and are specifically for backup purposes. You will be able to read data onto the hard disk from either TRSDOS 1.2, 2.0, or hard disk floppies. A full disk should take 12 or 13 hard disk floppies for complete backup, but you won't have to do a full backup daily. (By the way, we expect the final backup onto hard disk floppies to require somewhere in the 60 to 90 second per diskette range).

Backup options will include full, everything created before/during/after specified date(s), everything updated before/during/after . . . , or you can specify files to backup using wild cards, dates, extensions . . . or you can effectively create a DO file listing those files you want backed up.

The number of directory entries possible on the disk is effectively limited only by the amount of available disk space. You'll be asked how much directory space to allocate up front, but if the system needs more, it will grab it, assuming it's available. You will, by the way, be able to boot up under either hard disk or floppy, so your old floppy programs will run in that mode without transfer to hard disk. And, yes, it will be possible to have 4 floppies and 4 hard disks attached at the same time. ■

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Mike Schmidt (EDITOR) 80-US Jan/Feb pg 94

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TRS-80 A Trademark of Tandy Corp

A 12-column ledger program

For Models I, II & III 16K and up with printer

Fred Blechman
7217 Bernadine Avenue
Canoga Park, California 92307

Were it not for the Internal Revenue Service, I wouldn't keep books at all! Operating a small home-based business without employees is simple and has many tax advantages. It requires some recordkeeping to justify deductible expenses, and to complete the required IRS Schedule C with your tax return. Faced with this need, I wrote a TRS-80 Model I/III Level II 16K program in BASIC to do the necessary recordkeeping with a minimum of time, effort and cost.

The old way

For 17 years I've used a simple 12-column method to record income and expenses for my Amway Direct Distributorship, and more recently for my "Blechman Enterprises" TRS-80 microcomputer software business. Income is merely the total of all sales: wholesale and retail plus bonuses received. I use monthly totals of all invoices, so that's easy enough. Expenses, however, require more detail. Larger businesses seem to require dozens of expense account numbers. At least, that seems to be what bookkeepers and accountants insist on using. I suspect this may serve to create a mystique about their work that will keep you from ever considering doing it yourself! Another popular accounting method is that of double-entry bookkeeping, with balancing of debits and credits. Income and expenses I can understand, but all this other jargon leaves me cold, so I just keep things very simple. My hand-written 12-column ledger book (about $2.50 in stationery stores) used column one for the total expense amount, and the other 11 columns were expense categories, such as: Merchandise, office expense, utilities, promotion, petty cash, etc. I simply wrote the date, check number and description followed by the amount in column one, and then wrote the amount again under the approriate category column. If an expense was split between categories (such as a telephone bill, which might be partly business and partly personal) each portion was listed under the appropriate heading. I used a column headed "Draw" for nondeductible personal expenses, such as transfers to another bank or savings account, or cash drawn for personal use. In all these years, I've yet to find an expense that I couldn't fit into one or more of the 11 categories.

Enter the TRS-80

However, all this still involved considerable time and effort to hand-enter the numbers, total all columns per page, then add page totals for monthly totals, then add monthly totals for annual totals to use on the Schedule C. Therefore, a couple of years ago I wrote a TRS-80 Model I Simplified Bookkeeping Program as part of my $30 "Amway Product Distributor Programs" package of seven BASIC programs. It still required a ledger book to make all the entries by hand, but did all the column addition and page, month and annual totals for all columns. This was better than before, but I still needed to make hand entries in a ledger book. Why couldn't the computer do it?

Last year I acquired an Okidata Microline-80 printer and wrote a program to completely replace my ledger book. It prints out individual 8 X 11 sheets using only 80 characters on a line, so most printers can be used.

This is a ledger??

A conventional ledger page consists of titled columns of numbers. Since 12 columns of numbers ranging to 999,999.00 would need at least 120 character spaces per line, printers limited to 80 characters per line could not use this format. Furthermore, unless condensed-width characters were used, this would require paper wider than 8½ inches, the standard width, also eliminating many printers. Although the Okidata Microline-80 can provide 132 condensed characters on 8 inch paper, the maximum TAB allowed by TRS-80 BASIC is 64, so complex PRINTUSING strings, or other special programming techniques, would be necessary to print 120 or more characters on a single formatted line. Another limitation is the fact that the TRS-80 screen only shows 64 characters on a line. For all these reasons, and perhaps a few I've forgotten, I chose to use a totally unconventional format, as shown in the sample run.

Ledger format

This format is easy to read, compact and complete. Each line contains the date, check number (or

"-" if cash), the amount, to whom, purpose and column number two to twelve. The amount is shown in two decimal places, with aligned decimal points. When totals are requested, columns one through six, with complete headings (up to 14 characters per heading) appear along the left side of the printer sheet, and columns seven through 12 appear in the center of the sheet. All totals include two decimal places, with aligned decimal points. The maximum amounts and totals are 99,999,999.99. After the page totals, you can add additional entries, additional pages, and additional months. Following page totals are monthly totals. After any monthly total you can request a grand total. These ledger sheets replace a ledger book; just clip them together to make your own "book".

If you ever need a breakdown of a page total, just look at the column numbers along the right side of the page. If you want the items which created the total of column two, for example, look for a "2" in the right column and those are the items, including date, check number, purpose and amount. Isn't that simple?

Running the program

Optional screen instructions provide the essential information as a refresher if you haven't used the program for some time. Practice with the column headings in DATA statements 3060 to 3090, then change them for your own needs. Be sure there are three column numbers and headings per DATA line, for a total of twelve - and don't forget the commas between the entries, as shown. Each column heading title is limited to 14 characters - more than that will not appear on the printer (although they might on the screen). Column one is always TOTAL. The headings shown in the listing and run are the ones I used for Blechman Enterprises.

If you are starting at the beginning of a year, bypass the "previous grand totals" option. If you wish to enter previous totals, the program will request an entry for each column, by column number and heading. Next, the screen clears and shows all categories by title and number, followed by a reminder of how to obtain page totals. A dotted line is drawn on the screen, followed by the last printed line number and the contents of that line. This lets you know where you are on the printed page, so you can command a total if you're getting near the bottom of the page - around line 55. If you pass line 58, the printer will automatically advance to the next page so you don't have totals split between two pages.

Next come input prompts and verification. When entering "To whom-purpose" information, don't type beyond the end of the screen line or the printer format might be disrupted for that line. You can get page totals by typing TOTAL,0,0 and ENTER at any date, check#, amount? prompt, and this is followed by additional entries, or additional pages of monthly totals. You can also get grand totals after any monthly totals. Input a minus amount to subtract an entry error.

The program is written for the TRS-80 Model I Level II or Model III BASIC, and will easily fit in 16K of RAM. No disks are required and no information is saved except on the printed ledger sheet. The program can be applied to other microcomputers, though formatting might need to be modified (since the PRINTUSING line formatting statement is not available on some other micros). The PEEK and POKE commands in this program are used merely to identify and reset printer line numbers and are not essential for program operation. Double precision is used for all ledger entries, or numbers above 9999.99 would lose penny accuracy, and amounts over 99,999.99 would lose dollar accuracy!

Modular Program

The program is mostly modular. Lines 100 - 190 initialize 300 bytes of string space, define the double precision variables, dimension twelve A$-array locations (actually, thirteen if you include A$(0), which is not used), define strings for PRINTUSING, initialize program variable values at zero, and set the printer line counter to the first line. Lines 200 - 220 and 7000 - 7300 provide optional screen instructions. Lines 300, 310 and 3000 to 3090 display the column numbers and headings held in easily-changed DATA statements.

Lines 400 - 420 and 4000 - 4140 allow you to enter the grand totals from your last run. This saves the trouble of making a data tape at the end of each run to preserve totals for later use. It's simpler and easier to just hand-enter the grand totals from your last ledger sheet than to try and locate and load a data tape probably made months before! With this technique you can stop your ledger anytime and start again with previous totals as a new beginning. If your business is small, you may not need or want to bother with monthly totals - just use page totals and grand totals, and ignore the monthly totals. If you do enter previous grand totals, lines 2170 2190 and 1680 - 1730 print these totals at the top of the printer page, so you have a record of starting values.

Lines 500 - 540 initialize variables for a new page and lines 550 - 560 provide printer headings. Lines 600 670 display column numbers and headings and the "page totals" command, draw a dotted line across the screen and display the last line entry. (On a new page, the last line entry is blank, with a 0 amount). Lines 1000 - 1060 provide multiple input prompts and verification. Lines 1070 - 1240 print the input information and add the column entries. Lines 1500 - 2030 print page, monthly or grand totals with column headings. The PRINTUSING statements use S$ and N$ defined in lines 130 and 140 for proper formatting and decimals.

Lines 2040 - 2250 provide options for more page entries, additional pages, monthly totals, grand totals, another month and program termination. Line 10000 allows you to make two cassette copies with your own custom headings in DATA lines 3060 - 3090, just type RUN10000 and ENTER with the recorder ready to record. (Note: For Model III, change OUT 255,4 to OUT 236, 2).

Fire your accountant?

This program is not intended to replace your bookkeeper or accountant if your business requires a finer breakdown of expenses or must handle payroll deductions. I have found it entirely practical for my Amway business, my software business, and to define and total deductible household expenses. It could also be used to determine home budget allocations and performance. And, of course, it could be used to tabulate and total various incomes as well as expenses. It is easy to learn, "crashproof" (just GOTO600 without loss of any totals), and it is versatile.

This program is available from the author on a 500-baud cassette for Model I or III, with step-by-step documentation, for $10 postpaid in the USA. It is also included as one of five "Small Home-Business programs" on cassette with documentation, for $25 ppd. USA from the author. CA residents add 6% sales tax. ■

Not all Spelling Checkers are the same.

MICROPROOF T.M. stands out!

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 MICROPROOF proofreads your document, displaying misspellings and typos on the screen. Then correcting MICROPROOF 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 MICROPROOF's 50,000 word vocabulary. Finally, MICROPROOF corrects your document. All in less than a minute.

```
SELECT APPROPRIATE RESPONSE:

CORRECT MISSPELLED WORD:    ENTER CORRECT WORD
LEAVE WORD "AS IS":         HIT <ENTER> KEY
DISPLAY WORD IN CONTEXT:    ?
ADD WORD TO DICTIONARY:     +
EXIT:                       !

WORD:          (Your error)
RESPONSE:
```

Correcting MICROPROOF Screen Display

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. MICROPROOF's speed is outstanding. It can proofread a several page letter in 20 seconds.

LOW PRICES: Standard MICROPROOF is available for either $89.50 (TRS-80® Models I or III) 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 $60.00. Optional patches to integrate MICROPROOF into your word processing software can also be added at any time for an additional $35.00. (Integration patch not needed for Wordstar®.)

MICROPROOF'S FULL 50,000 WORD VOCABULARY saves you time and allows you greater confidence in the lists of potential errors that MICROPROOF identifies. The mini-dictionary programs, with their 10,000 and 20,000 word vocabularies, have many correctly spelled words omitted from their vocabularies. Consequentially, they identify as potential "errors" many words that are actually spelled correctly; five to ten times as many such words as does MICROPROOF. So, when you use MICROPROOF you will have far fewer extra words to evaluate, a major time savings. There will be less need to look up words in order to verify that they are in fact spelled correctly. The extra 30,000 words in MICROPROOF's vocabulary assures you confidence in the error lists that MICROPROOF generates.

There are other proofreading programs available to choose from. Since MICROPROOF became available in December of 1980, a number of companies have announced programs with small dictionaries. It took us almost two years to develop MICROPROOF. During that time we were able to compress our full 50,000 word dictionary into a manageable size (fits on one single density 5¼ inch disk). And we were able to design a proofing program which operates remarkably fast. The chart below illustrates the comparative advantages of MICROPROOF.

ADVANTAGES OF MICROPROOF

	MICROPROOF DICTIONARY SOFTWARE	OTHERS (Mini-Dictionaries)
DICTIONARY SIZE	50,000 Words	20,000 Words
DISK SPACE REQUIRED FOR DICTIONARY	70,000 BYTES (fits easily on one 5¼" disk)	170,000 BYTES
DICTIONARY ENLARGEMENT	VIRTUALLY UNLIMITED	EXTREMELY LIMITED
SPEED—400 Words	20 Seconds	1 to 5 Minutes
SPEED—3,000 Words	1 Minute	2 to 10 Minutes
CORRECTION FEATURE	Optional	Not Available

See your local microcomputer dealer or write to:

CORNUCOPIA SOFTWARE

Post Office Box 5028, Walnut Creek, California 94596 • (415) 893-0633

The following lines are replacement lines to make the 12-column ledger program work with the Model II.

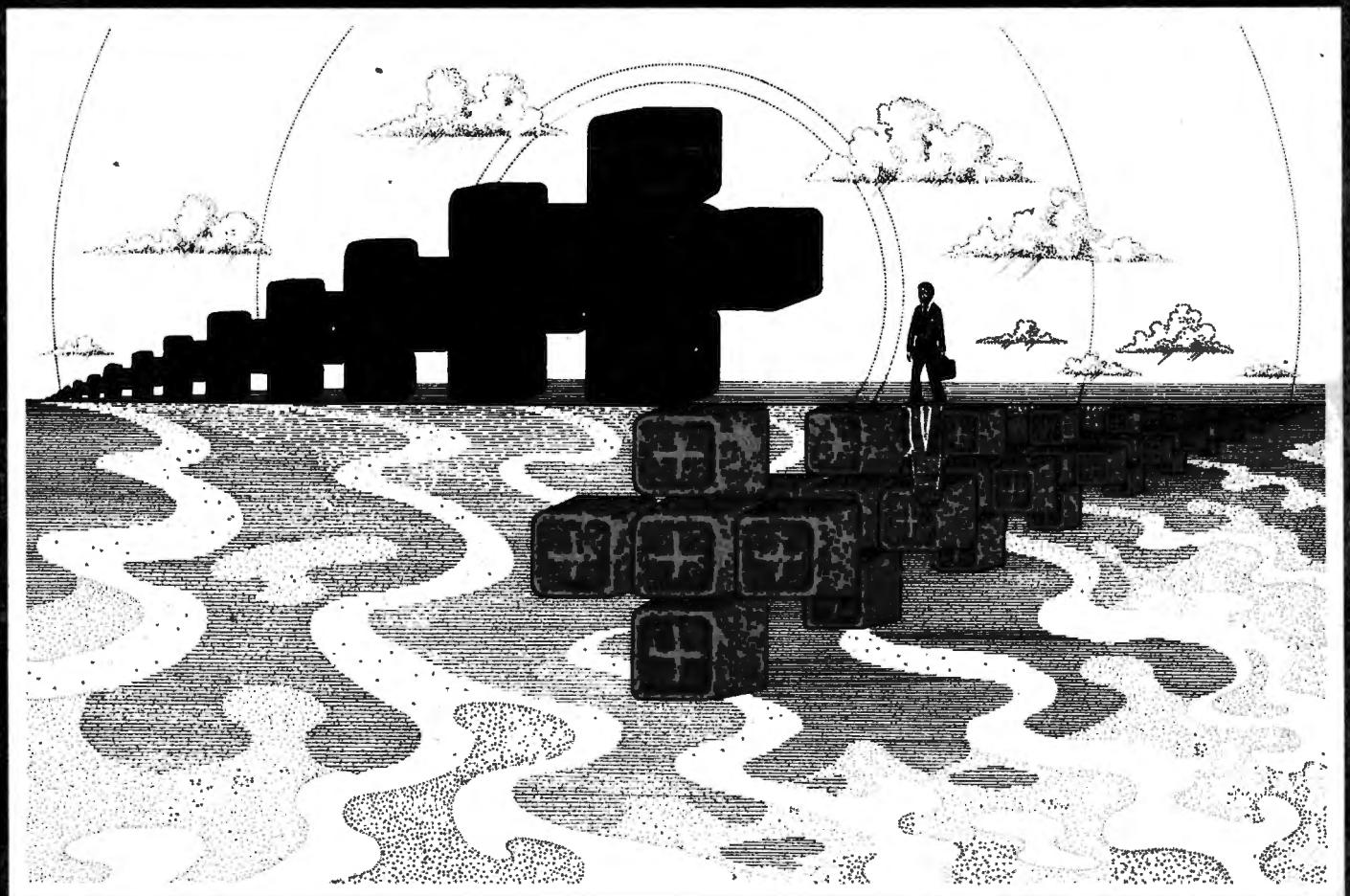
```
130 S$ = "\                \   ##,###,###.
##      \                \   ##,###,###.#
#"
190 PL=1
500 GOSUB 5000 : CLS : SYSTEM"T" : LPRI
NT "      BEGINS NEW PAGE..." : LPRINT
" "
670 PRINT : PL = PL + 1 : PRINT "LINE #
"; PL-1; ":"; D1$; ","; C1$; ","; A1; "
,"; W1$; "...COLUMN "; X1
5000 REM * LINE 5020 ADVANCES PRINTER T
O NEXT PAGE *
5010 REM * ASSUMES 66 LINES PER PAGE MA
XIMUM *
5020 IF PL>58 THEN SYSTEM "T" : PL=1 :
RETURN
5030 REM
5040 RETURN
5050 REM
10000 SAVE "TWELCOL/BAS"
```

Program listing for 12-Column ledger program for Models I, II, and III.

```
100 REM * COPYRIGHT FRED BLECHMAN 1981
  *  VERSION 5/4/81 *
110 CLEAR 300
120 DEFDBL A - L, S : DIM A$(12)
130 S$ = "%              %   ##,###,###.
  ##      %              %   ##,###,###
  .##"
140 N$ = "##,###,###.##"
150 REM * INITIALIZE VALUES AT ZERO *
160 A = 0 : B = 0 : C = 0 : D = 0 : E =
   0 : F = 0 : G = 0 : H = 0 : I = 0 :
 J = 0 : K = 0 : L = 0 : M = 0 : P = 0
   : R = 0 : S = 0 : W = 0 : X = 0 : Y
  = 0
170 S1 = 0 : B1 = 0 : C1 = 0 : D1 = 0 :
   E1 = 0 : F1 = 0 : G1 = 0 : H1 = 0 :
  I1 = 0 : J1 = 0 : K1 = 0 : L1 = 0
180 S2 = 0 : B2 = 0 : C2 = 0 : D2 = 0 :
   E2 = 0 : F2 = 0 : G2 = 0 : H2 = 0 :
  I2 = 0 : J2 = 0 : K2 = 0 : L2 = 0
190 POKE 16425, 1 : REM * SETS PRINTER
  LINE COUNTER AT FIRST LINE *
200 CLS : PRINT : PRINT "
      12-COLUMN LEDGER" : PRINT
210 INPUT "DO YOU WANT INSTRUCTIONS (Y/
  N)"; A$
220 IF LEFT$(A$, 1) = "Y" GOTO 7000
300 CLS : PRINT "THESE ARE THE HEADINGS
   ENTERED IN DATA LINES 3060 TO 3090."

310 PRINT "      ......CHANGE THEM IF N
  ECESSARY......." : GOTO 3000
400 CLS : PRINT : PRINT "     ***** TUR
  N ON PRINTER OR PROGRAM WILL 'FREEZE'
  !! *****"
410 PRINT : INPUT "DO YOU HAVE PREVIOUS
   *** GRAND TOTALS *** TO ENTER (Y/N)"
  ; O$
420 IF LEFT$(O$, 1) = "Y" GOTO 4000
500 GOSUB 5000 : CLS : LPRINT " " : LPR
  INT "      BEGINS NEW PAGE..." : LPRI
  NT " "
510 A = 0 : B = 0 : C = 0 : D = 0 : E =
   0 : F = 0 : G = 0 : H = 0 : I = 0 :
  J = 0 : K = 0 : L = 0 : S = 0
520 IF LEFT$(R$, 1) = "Y" THEN S1 = 0 :
   B1 = 0 : C1 = 0 : D1 = 0 : E1 = 0 :
  F1 = 0
530 IF LEFT$(R$, 1) = "Y" THEN G1 = 0 :
   H1 = 0 : I1 = 0 : J1 = 0 : K1 = 0 :
  L1 = 0
540 X = 0 : Y = 0 : P = 0 : M = 0 : R =
   0 : R$ = ""
550 LPRINT "DATE"; TAB(6)"CHECK#"; TAB(
  19)"AMOUNT";
560 LPRINT TAB(32)"TO WHOM AND PURPOSE"
  ; TAB(60)"COLUMN#"
600 CLS : PRINT A$(1) TAB(32)A$(7)
610 PRINT A$(2) TAB(32)A$(8)
620 PRINT A$(3) TAB(32)A$(9)
630 PRINT A$(4) TAB(32)A$(10)
640 PRINT A$(5) TAB(32)A$(11)
650 PRINT A$(6) TAB(32)A$(12)
660 PRINT "....FOR PAGE TOTALS:      TO
  TAL,0,0     ENTER"
665 PRINT "----------------------------
  --------------------------------"
670 PRINT : PRINT "LINE #"; PEEK(16425)
   - 1; ":"; D1$; ","; C1$; ","; A1; ",
  "; W1$; "...COLUMN "; X1
1000 GOSUB 5000 : PRINT : PRINT "DATE,C
  HECK#,AMOUNT"; : INPUT D$, C$, A
1010 IF D$ = "TOTAL" THEN 1500
1020 PRINT "TO WHOM - PURPOSE.........
  ..."; : INPUT W$
1030 INPUT "       COLUMN"; X
1040 IF (X < 2) +(X > 12) PRINT "COLUMN
   ENTRY ERROR!! ONLY 2-12 VALID" : GOT
  O 1030
1050 INPUT "CORRECT? (Y/N)"; Z$
1060 IF LEFT$(Z$, 1) = "N" GOTO 600
1070 D1$ = D$ : C1$ = C$ : A1 = A : W1$
   = W$ : X1 = X
```

DOSPLUS ADDS UP



Double density software is definitely here, but conversion of your old single density software library is unnecessary. With *DOSPLUS from Advanced Operating Systems, for your †TRS-80 Model I or III, *both* single and double density diskettes can be utilized. DOSPLUS, when combined with a double density controller board, essentially converts your Model I to a Model III at a fraction of the cost of a new Model III. If, however, you wish to transfer some of your single density software over to double density and you own a double density controller board, this is easily accomplished under DOSPLUS with a *single* command. When used with a Model III, DOSPLUS allows the user to SAVE, COPY and FORMAT *single density* diskettes.

DOSPLUS offers you greater speed with its ability to chain functions and to accommodate various logical record lengths for the ISAM programming techniques.

The DOSPLUS package also contains an easy-to-read operator's manual designed to help you realize the full potential of your computer.

Give your TRS-80 Model I or III that added plus with DOSPLUS from Advanced Operating Systems, available as DOSPLUS 3.3D (double density) or DOSPLUS 3.3S (single density) for Model I, or DOSPLUS for Model III.

Now available at your local software dealer, or call 1-800/348-8558 to order. MasterCard and VISA accepted. (Indiana residents call 1-219/879-4693).

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DOSPLUS 3.3D 26063
DOSPLUS 3.3S 26064

160+ PAGE MANUAL AVAILABLE SEPARATELY

ADVANCED OPERATING SYSTEMS
450 St. John Road
Michigan City, IN 46360

```
1080 S = S + A
1100 LPRINT D$; TAB(6)C$; TAB(12); USIN
  G N$; A; : LPRINT TAB(28)W$; TAB(62)X

1110 REM * SELECT COLUMN AND ADD TO PRE
  VIOUS TOTAL *
1120 ON X - 1 GOTO 1130, 1140, 1150, 11
  60, 1170, 1180, 1190, 1200, 1210, 122
  0, 1230
1130 B = B + A : GOTO 1240
1140 C = C + A : GOTO 1240
1150 D = D + A : GOTO 1240
1160 E = E + A : GOTO 1240
1170 F = F + A : GOTO 1240
1180 G = G + A : GOTO 1240
1190 H = H + A : GOTO 1240
1200 I = I + A : GOTO 1240
1210 J = J + A : GOTO 1240
1220 K = K + A : GOTO 1240
1230 L = L + A
1240 GOTO 600
1500 GOSUB 5000 : PRINT : PRINT "* PAGE
   * TOTALS BEING PRINTED...."
1510 LPRINT " " : LPRINT " " : LPRINT "
  * PAGE TOTALS *" : GOTO 1540
1520 GOSUB 5000 : PRINT : PRINT "** MON
  TH ** TOTALS BEING PRINTED...."
1530 LPRINT " " : LPRINT " " : LPRINT "
  ** MONTH TOTALS **"
1540 IF M = 1 GOTO 1680
1550 IF P = 1 GOTO 1620
1560 LPRINT USING S$; A$(1); S; A$(7);
  G
1570 LPRINT USING S$; A$(2); B; A$(8);
  H
1580 LPRINT USING S$; A$(3); C; A$(9);
  I
1590 LPRINT USING S$; A$(4); D; A$(10);
   J
1600 LPRINT USING S$; A$(5); E; A$(11);
   K
1610 LPRINT USING S$; A$(6); F; A$(12);
   L : GOTO 2000
1620 LPRINT USING S$; A$(1); S1; A$(7);
   G1
1630 LPRINT USING S$; A$(2); B1; A$(8);
   H1
1640 LPRINT USING S$; A$(3); C1; A$(9);
   I1
1650 LPRINT USING S$; A$(4); D1; A$(10)
  ; J1
1660 LPRINT USING S$; A$(5); E1; A$(11)
  ; K1
1670 LPRINT USING S$; A$(6); F1; A$(12)
  ; L1 : GOTO 2000
1680 LPRINT USING S$; A$(1); S2; A$(7);
   G2
1690 LPRINT USING S$; A$(2); B2; A$(8);
   H2
1700 LPRINT USING S$; A$(3); C2; A$(9);
   I2
1710 LPRINT USING S$; A$(4); D2; A$(10)
  ; J2
1720 LPRINT USING S$; A$(5); E2; A$(11)
  ; K2
1730 LPRINT USING S$; A$(6); F2; A$(12)
  ; L2
2000 PRINT : PRINT
2010 IF P = 1 GOTO 2110
2020 IF M = 1 GOTO 2200
2030 PRINT
2040 INPUT "DO YOU WANT TO ADD MORE ENT
  RIES (Y/N)"; Y$
2050 IF LEFT$(Y$, 1) = "Y" GOTO 550
2060 S1 = S1 + S : B1 = B1 + B : C1 = C
  1 + C : D1 = D1 + D : E1 = E1 + E : F
  1 = F1 + F
2070 G1 = G1 + G : H1 = H1 + H : I1 = I
  1 + I : J1 = J1 + J : K1 = K1 + K : L
  1 = L1 + L
2080 PRINT : INPUT "ADDITIONAL PAGES TH
  IS MONTH (Y/N)"; W$
2090 IF LEFT$(W$, 1) = "Y" GOTO 500
2100 P = 1 : GOTO 1520
2110 S2 = S2 + S1 : B2 = B2 + B1 : C2 =
   C2 + C1 : D2 = D2 + D1 : E2 = E2 + E
  1 : F2 = F2 + F1
2120 G2 = G2 + G1 : H2 = H2 + H1 : I2 =
   I2 + I1 : J2 = J2 + J1 : K2 = K2 + K
  1 : L2 = L2 + L1
2130 M = 1
2140 PRINT : INPUT "*** GRAND TOTALS **
  * (Y/N)"; A$
2150 IF LEFT$(A$, 1) = "Y" GOTO 2170
2160 GOTO 2200
2170 GOSUB 5000 : PRINT : PRINT "*** GR
  AND TOTALS *** BEING PRINTED...."
2180 PRINT : P = 0
2190 LPRINT " " : LPRINT " " : LPRINT "
  *** GRAND TOTALS ***" : GOTO 1540
2200 PRINT : INPUT "ANOTHER MONTH (Y/N)
  "; R$
2210 IF LEFT$(R$, 1) = "Y" GOTO 500
2220 CLS : PRINT : PRINT : PRINT : PRIN
  T
2230 PRINT "        END OF PROGRAM - SE
  E YOU AGAIN SOMETIME...."
2240 PRINT : PRINT : PRINT : PRINT
2250 END
3000 REM * ENTER COLUMN HEADINGS (14 CH
  ARACTERS EACH, MAX.) *
```

```
3010 FOR Z = 1 TO 12
3020 READ A$(Z) : PRINT TAB(10)"COLUMN
  "; A$(Z)
3030 NEXT Z
3040 PRINT : INPUT "***** PRESS ENTER T
  O CONTINUE..."; A$
3050 GOTO 400
3060 DATA 1-TOTAL AMOUNT, 2-MERCHANDISE
  , 3-PARTS/SAMPLES
3070 DATA 4-PROMOTION, 5-DELIV/POST, 6-
  OFFICE EXPENSE
3080 DATA 7-UTILITIES, 8-TAX/INSUR/LIC,
   9-PETTY CASH
3090 DATA 10-NOT USED, 11-NOT USED, 12-
  DRAW
4000 PRINT : PRINT "     ENTER PREVIOUS
   *** GRAND TOTALS *** :"
4010 PRINT
4020 PRINT A$(1); : INPUT " TOTAL"; S2
4030 PRINT A$(2); : INPUT " TOTAL"; B2
4040 PRINT A$(3); : INPUT " TOTAL"; C2
4050 PRINT A$(4); : INPUT " TOTAL"; D2
4060 PRINT A$(5); : INPUT " TOTAL"; E2
4070 PRINT A$(6); : INPUT " TOTAL"; F2
4080 PRINT A$(7); : INPUT " TOTAL"; G2
4090 PRINT A$(8); : INPUT " TOTAL"; H2
4100 PRINT A$(9); : INPUT " TOTAL"; I2
4110 PRINT A$(10); : INPUT " TOTAL"; J2

4120 PRINT A$(11); : INPUT " TOTAL"; K2

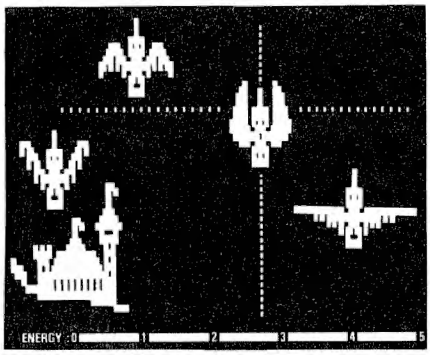
4130 PRINT A$(12); : INPUT " TOTAL"; L2

4140 M = 1 : GOTO 2170
5000 REM * LINE 5050 ADVANCES PRINTER T
  O NEXT PAGE *
5010 REM * ASSUMES 66 LINES PER PAGE MA
  XIMUM *
5020 PL = PEEK(16425)
5030 IF PL > 58 GOTO 5050
5040 RETURN
5050 FOR PE = 1 TO(66 - PL) : LPRINT "
  " : NEXT PE : POKE 16425, 1 : RETURN

7000 CLS : REM * INSTRUCTIONS WHEN REQU
  ESTED *
7010 PRINT : PRINT "     THIS PROGRAM,
  USED WITH YOUR PRINTER, PRODUCES AN I
  NCOME"
7020 PRINT "OR EXPENSE LEDGER FOR HOME
  OR SMALL-BUSINESS USE. YOU MUST"
7030 PRINT "HAVE AN 80-COLUMN PRINTER,
  BUT NO DISK IS REQUIRED....."
7040 PRINT : PRINT "     THE PROGRAM KE
  EPS TRACK OF 12 'COLUMNS'. COLUMN 1 I
  S"
7050 PRINT "ALWAYS THE AMOUNT. COLUMNS
  2-12 ARE THE CATEGORIES THIS AMOUNT"
7060 PRINT "MIGHT FALL INTO. COLUMN HEA
  DINGS ARE ASSIGNED IN DATA LINES"
7070 PRINT "3060-3090, WHICH YOU CAN CH
  ANGE FROM THE KEYBOARD BEFORE"
7080 PRINT "ACTUALLY USING THE PROGRAM.
   HOWEVER, FIRST PRACTICE WITH THE"
7090 PRINT "HEADINGS ALREADY ASSIGNED..
  ....."
7100 PRINT : INPUT "PRESS ENTER TO CONT
  INUE...."; A$ : CLS
7110 PRINT : PRINT "ENTER THE FOLLOWING
   FOR EACH AMOUNT:
7120 PRINT "     DATE (MM/DD).....
  .....(COMMA)
7130 PRINT "     CHECK # ( OR USE - FOR
   CASH).....(COMMA)
7140 PRINT "     AMOUNT (XXXXX.XX).....
  .....(ENTER)
7150 PRINT "     TO WHOM - PURPOSE.....
  .....(ENTER)
7160 PRINT "     COLUMN # ( 2-12 ONLY!)
  .....(ENTER)
7170 PRINT : PRINT "ENTER.....TOTAL,0,0
  .....FOR PAGE TOTALS"
7180 PRINT : INPUT "PRESS ENTER TO CONT
  INUE....."; A$ : CLS
7190 PRINT : PRINT "     AS YOU CONFIRM
   EACH BLOCK OF INFORMATION REQUESTED
  BY THE"
7200 PRINT "PROGRAM, A SINGLE LINE CONT
  AINING THIS INFORMATION IS PRINTED"
7210 PRINT "ON STANDARD 8-1/2 INCH WIDE
   PAPER. PRINTER LINE NUMBERS ARE"
7220 PRINT "SHOWN FOR EACH ENTRY SO YOU
   KNOW WHERE YOU ARE ON THE PRINTED"
7230 PRINT "PAGE. WHEN YOU REQUEST TOTA
  LS, EACH COLUMN HEADING WILL BE"
7240 PRINT "PRINTED WITH THE TOTAL FOR
  EACH COLUMN FOR THAT PAGE. YOU CAN"
7250 PRINT "THEN REQUEST ADDITIONAL PAG
  ES. IF NOT, MONTHLY TOTALS WILL BE"
7260 PRINT "PRINTED. YOU THEN CAN DO AN
  OTHER MONTH, OR PRINT GRAND TOTALS"
7270 PRINT "OR EXIT THE PROGRAM.....
7280 PRINT : PRINT "     THE FORMAT ALL
  OWS TOTALS TO $99,999,999.99!!"
7290 PRINT : PRINT "  ** CRASH RECOVERY
  : TYPE....    GOTO600    ....AND ENTE
  R."
7300 PRINT : INPUT "PRESS ENTER TO CONT
  INUE...."; A$ : GOTO 300
10000 CSAVE "1" : OUT 255, 4 : FOR I =
  1 TO 2000 : NEXT : CSAVE "1"
```

THE PROGRAM STORE

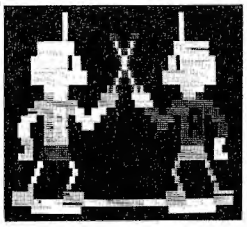
VOYAGE OF THE VALKYRIE



By Leo Christopherson from AOS
Combine the animation and music techniques pioneered by Christopherson with the challenge of his first fast-moving arcade game and you have VOYAGE TO VALKYRIE!

You speed through a magical maze guarded by ferocious birds that swoop down to attack if you don't get them first. To list all the play and options of this exciting game would take the 16 pages of instruction included.

Tape (TRS-80 16K) $34.95
Disk (TRS-80 16K, Apple 48K) $39.95



DUEL «N» DROIDS

By Leo Christopherson from Acorn
Teach your "animated android" how to wield a laser sword! Leo Christopherson, author of "Android NIM," "Dancing Demon," "Voyage to Valkyrie" and other animations, has developed a new type of animation and high-quality sound in this work.

Starting out as a lowly clown, you teach your 'droid to use a laser sword by controlling its movements -- advance, attack, even retreat if necessary. Then you enter the tournament against the program's skilled 'droid. Revel in the fanfares of the victorious -- or hear the funeral dirges of the defeated! Entertainment for all ages.

16K protected tape...$14.95
16K protected disk...$20.95

BATTLE OF SHILOH

From Strategic Simulations
Now Civil War buffs can engage in a realistic simulation of a major battle. Marching through the war-torn countryside, strategically using the forests, creeks, hills for defense, you re-create every facit of the battle on a hex-grid map. If you had been in charge, would we still be whistling "Dixie?"

16K tape...$24.95

From Med Systems
You are sitting alone at 2 AM. Your eyes are bloodshot as you peer into your computer's screen and cry, "I must be CRAZY!" If this has never happened to you, you've never tried ASYLUM. It's Med Systems most ambitious 3-D graphics adventure yet!

ASYLUM places you on a cot in a small (padded?) room. Periodically the janitor lobs a hand-grenade through the window. What you do next could mean escape -- or disaster.

16K tape...$14.95
32K disk...$19.95

Also order DEATHMAZE 5000, Med System's challenging 3-D maze game. Same prices as above.

FORBIDDEN PLANET I

By Wm. Demas from Fantastic Software
The first TALKING adventure! With skill, luck, and tenacity -- and a little help from your chatty TRS-80 -- you may survive Part One of this multipart adventure! You don't need a voice synthesizer, this program talks to you via the cassette port. And it's a good thing it does, 'cause otherwise you'd get mighty lonesome on desolate FORBIDDEN PLANET.

48K disk...$39.95

LOST COLONY

By David Feitelberg from Acorn
It's the world's first deep space colony and you are the economic manager. A remarkable simulation, LOST COLONY arms you with maps and charts as tools for resource management. You assign human and robotic labor, explore new land, and set production quotas. At the same time you must determine equitable pay scales and taxes.

Communicate through your model I or III using full sentences or short commands. A challenging game, it might give you insight into real life management as well.

16K protected tape...$19.95
32K protected disk...$19.95

Crush, Crumble and Chomp!

From Epyx
It's a monster movie, and you are the monster! You can be The Glob, Kraken, Mantra, Mechismo, Arachnis, or Goshilla -- or even design your own "custom" monster (disk version only). This hilarious action game is loaded with graphics and sound as you practice your villany. With 6 monsters, 4 cities, and 5 game objectives, you get a choice of more than 100 possible scenarios. A monster's life is not all carnivorous crunching, though: The combined resources of the police, science, and armed forces are bent on your destruction.

TRS-80 (16K tape or 32K disk), Apple (48K disk)...$29.95

TIGERS IN THE SNOW

From Strategic Simulations
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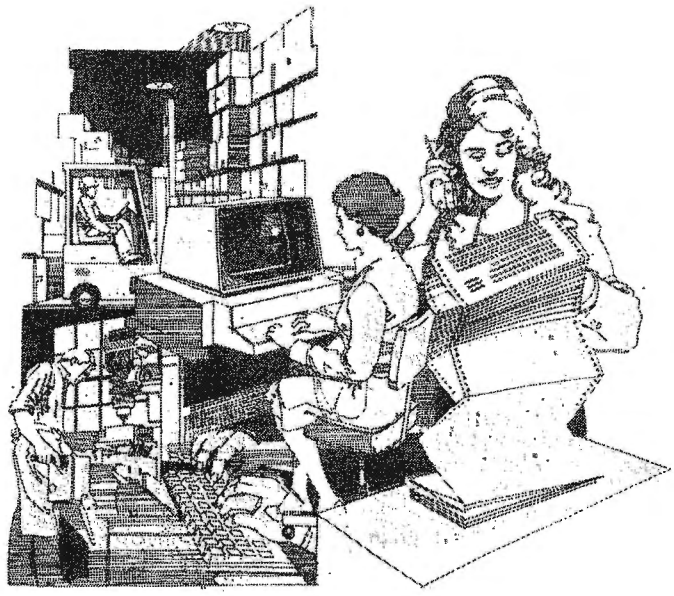
Business computers: a planning guide

Joel Makower, Washington, DC



A business computer is like a tuning fork: when it works, it hums; when it doesn't, it's useless. Assuring that your system hums is most often a matter of how well you plan before you make your purchase. The planning stage, says one expert, is where 80 percent of the problems occur.

Planning takes on ever-increasing importance these days, as the computer becomes not merely an essential element of nearly every business's financial, word-processing and other record-keeping processes, but is also linked with other parts of office systems-telephones and photocopiers, for example-to create an efficient and powerful information network.

Integration of office equipment is going on at a feverish pace, with the computer taking center stage. Photocopiers are being replaced by "telecopiers"-computerized copying machines that instantaneously transmit copies to other copiers or to computer screens a continent away. "Filing" has virtually gone the way of the V-8 engine; it's being replaced by "information storage and retrieval systems," which zip documents in and out of computers and micro-image devices whenever and wherever needed.

Computers are shrinking both in size and in price. This year may well be remembered as the year of the "micro-microcomputer" - the portable microprocessor that easily slips into a briefcase or, with some models, even a suit pocket. Such devices have the capabilities of computers that once filled the better part of a good-size room, and can be hooked into a telephone in a hotel room or phone booth for instant transmission of words or numbers to virtually anywhere in the world. A few models even feature tiny printing devices.

And what we're seeing is just the tip of this Alice-in-Computerland iceberg. Earlier this year, a number of major breakthroughs in computer chips were announced, with up to one thousand separate circuits being crammed onto a quarter-inch computer chip. The new "supercomputers" being developed are said to have ten to fifteen times the power of current models.

In addition to going on business trips, business computers are staying home. If last year's buzz word was "telecomputing" (the transmission of computer data over telephone lines), this year's is "telecommuting"-computer hook-ups from office to home, allowing employers to tap labor pools that

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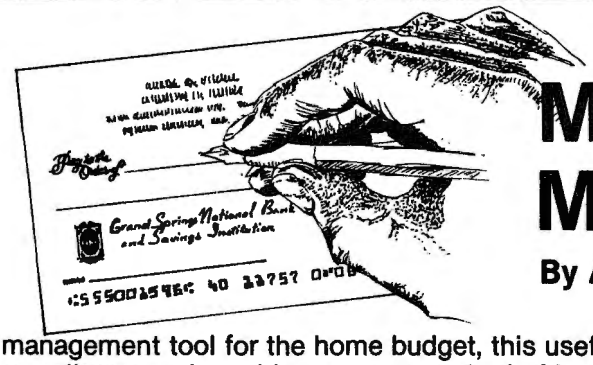

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By Andrew P. Bartorillo

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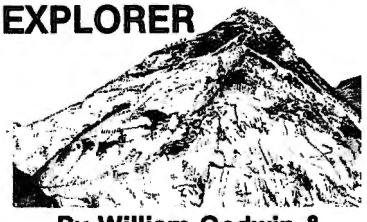

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could not otherwise be reached, such as the handicapped parents who prefer to work at home. In an age of increasing transportation costs and decreasing computing costs, this is truly the wave of the future.

Trends like telecommuting and portable computers create a bold new challenge for today's managers and executives: how to manage a disparate and mobile network of indispensable business tools. One major roadblock to that challenge is the lack of knowledge of computers that plagues the upper echelons of most majors companies. That information gap often hinders every aspect of a firm's computer operations, from purchase to operation to security.

Increasingly, however, executives are becoming more computer savvy. Many corporate-ladder climbers who have scarcely touched a typewriter keyboard are suddenly finding themselves in three-day-long classroom seminars that teach not only the ABC's of business computers, but often send managers home with new computer-programming hobbies.

"The fear of computers is eroding at a very high rate," says John M. Nevison, a Concord, Massachusetts,computer consultant who teaches "computer literacy" to business executives. "Most people know that it's only a matter of time before they'll have to learn." In Nevison's courses, which last for three days, students write and run their own computer programs within the first two hours of the first day. "We hit them between the eyes with it so fast that they don't have the chance to really get scared," says Nevison.

Students of such courses walk away with a newfound respect for business computing, but also with two seemingly contradictory outlooks on the relationship between computers and their business. On one hand, the "new" technology might not be as complex and as scary as it once was; on the other hand, having better understood the technology, "going computerized" may not be as simple as it once appeared.

Wait or buy now?

Another benefit of computer courses can be to abolish some of the myths and misunderstandings of buying business computers. One point of confusion is whether, in the light of the fast-changing technology - with a new generation of machines appearing almost annually - it makes sense to buy now or to wait. It's a question on the minds of virtually all executives considering buying a computer.

"I get this question all the time," says one California computer consultant. "It's a major source of puzzlement for me.

Virtually no clear-thinking businessman would consider posing such a question for a car, a printing press or any other business tool. My answer is always the same: If you've determined that you need it now, buy it now."

Granted, it's a dilemma. How do you resist the temptation to jump into the sleek world of computers, in light of the myriad ads and sales pitches you encounter at nearly every turn? It's difficult to stand back and ask, "What is this equipment really going to do to the way that I run this business?" All those fancy colors and graphs and bells and whistles of today's computers often make those important questions fall by the wayside.

On the other hand, it may be unwise to resist the temptation. "It's crucial that you try out the new technology, or you're not learning to absorb it," says Amy D. Wohl, president of Advanced Office Concepts Corporation, an office-automation consultant firm in Bala Cynwyd, Pennsylvania. "If you decide to 'wait until the market straightens itself out,' you'll find yourself facing very sophisticated technology with absolutely no understanding of how you get such systems to work."

Wohl believes that executives who put off buying decisions in the hope that products will become cheaper or more powerful or more reliable are causing themselves more harm than good. "I tell those executives, 'If you choose to stand with your head in the sand, you can be assured that your competitors will not do likewise,' " she says. "I come out of an economics background; there's something called comparative advantage: If your competitor chooses to use a business technique and you choose not to use it, you just may be choosing to go out of business."

Creating a plan

If there is one mistake in computer purchasing that is virtually universal among businesses, it is purchasing without proper planning. "A lot of very expensive computers are purchased on impulse," says Fred Amport of Amport and Associates, a management consultant based in Chagrin Falls, Ohio. "The typical business president will look out at his sales office and see twenty or thirty people doing a variety of paperwork and handling phone calls and say, 'There's got to be a better way to do this.' Typically, he'll go out and look at a couple of computers and make a decision without studying it any further. They make decisions that come back to haunt them several years down the road."

Instead, says Amport,"you should launch into some kind of a cost/benefit study. It can be done informally or it can involve professional help. Not only are you looking at your current operation, you also should be looking at your operation as it will be several years from now. It is not a simple task. Unfortunately, many people reduce it to simple terms that they can understand but which may not have their best interests at heart."

A proper analysis examines the full impact of the computer system on a business: what the full costs will be, including installation, training, redesigning of workspace; what the tax implication will be; which departments will be hooked into the system; what the restaffing or reorganizational requirements will be; who will use it, who will have access to it, who will manage it; how it will all be protected from abuse; and-probably the most difficult and least-asked question of all-is a computer really needed in the first place?

The answers you get to such questions may surprise you. You may even learn something new about your operation.

Even firms that already have computerization may want to indulge in a bit of "post-purchase" planning. Amport cites the example of a large client who has acquired a number of computers over the years, all of which have proved to be effective problem solvers for their various applications. Nevertheless,

See BUSINESS, page 28

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*Optional at extra cost

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Print in four different sizes 10 pitch pica, 12 pitch elite, 15 pitch micron
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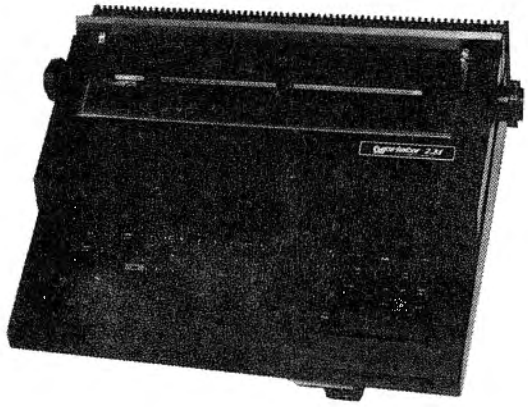

Backspace 1/10, 1/12, 1/15 or even 1/60 of an inch.
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BUSINESS,

continued from page 24

an evaluation revealed that new and improved software technology could allow a number of separate and disparate computer operations to be merged into a much more coherent operation. "They changed the whole way that they were doing computing," says Amport. "But there was no way to know it was possible without studying it intensively. In the long run, it really pays off."

There are a few other major considerations that are often overlooked when making purchase decisions. First and foremost is computer software-the programmed instructions that allow you to perform the various applications, from word processing to report generating to number manipulations. In the midst of all of the sexy computer hardware demonstrations, most potential purchasers don't fully consider this crucial element.

Software comes in a variety of styles. You can buy prepackaged software, which is designed for the "typical" business. Such products require that you bend your operation to fit the software, which is not always possible-or desirable-particularly with large organizations.

An alternative is to purchase "custom" software designed for your specific purpose. Custom designs, as is true with most other products and services, are not inexpensive, and they require an in-depth analysis of how your business functions (something you should do in the first place). But there is usually little question of whether it will meet your needs. Another option is to do the programming yourself, a logical solution if you have a system large enough to justify employing a computer programmer.

Another frequently overlooked question is that of service. Any computer system-whether it's a state-of-the-art model or one that is three generations old-requires regular maintenance, in addition to the inevitable "down time" that pops up when you least expect it. Computer manufacturers vary widely in their ability to service their machines. Some computer makers farm such operations out to independent contractors. Others maintain fast and efficient fleets of on-call technicians. Still others require that you pack up your troubles and bring them in to their shops. In some cases, businesses purchase equipment from firms with no local service presence. When it comes time for repairs, they find that the nearest expert is several states away.

In the end, says Jack Nevison, "buying a computer is like buying a car. If you are a business buying a computer, probably the least important thing is the piece of equipment. The most important thing is that you understand your business well enough to know that you have a function that you want to automate. If you buy a car, you do exactly the same thing. You buy partly for what you need, partly for what you can afford in terms of sticker price and options, and, finally, you buy a car that your mechanic says he can keep in running order."

Words to the wise

If you're a typically busy manager or executive, you probably don't have a lot of time to scour the town in search of the right computer system for your business. In fact, you may not have the time to learn enough about this new technology to even make intelligent decisions. After all, modern computer technology is the product of several thousands of technological geniuses, and it's unlikely that even the brightest of business people can pick it up just like that.

Or is it? As is true with almost everything from acupuncture to zero-based budgeting, there is expert advice available, often at little or no cost. For one thing, whatever you're doing, from running a diaper service to mixing paint dyes, there's a trade association and a professional journal that covers your business. "Unless you're on the cutting edge of your industry, somebody else has probably solved half the problems that you are about to run into," says Jack Nevison.

Computer manufacturers often hold introductory seminars, which can provide a wealth of information. The seminars, of course, are geared to sell computers, and having signed the seminar guest register, you are sure to hear a lot about the products of your host. But the seminars often can serve as good primers on the state of the art, and will probably create a lot more questions than they will answer, which will give you a good basis for further inquiry.

Another source of help are courses aimed at teaching executives and managers about computers. Many are offered at colleges and university extension services. The American Management Association offers a series of courses entitled "Data Processing for the Non-Data Processing Manager" that is offered at various locations around the country.

There is also wide variety of business computer and office automation shows held throughout the country each month. Such shows typically feature seminars for both novices and experts, as well as give you immediate access to the many manufacturers exhibiting their wares on the premises.

And, of course, as with just about everything else, you can hire a consultant. In recent years, the computer consultant population has grown nearly as fast as the computer systems themselves. Choosing the right one can be a complex matter in itself, since, like computers, consultants vary widely in their specialties, abilities and rates.

But the information they provide

can be invaluable. By providing an objective evaluation of your organization and its computing needs, a good consultant can rise above the chaos and provide a unifying force among the many diverse interests of the typical modern business. Moreover, a good consultant can cut through the ad claims and computer jargon of manufacturers to line up the best system of hardware and software for your needs, and can help arrange financing as well as oversee the system's installation and implementation.

Staying out of trouble (and court)

Despite the best-laid plans, a distressing percentage of businesses fail to find happiness with their computer systems. Lawsuits over faulty systems are increasing at a rapid rate, with epithets flying about between computer manufacturers and users over who's to blame. In some cases, the problems originate with the computers, or the lack of service available when problems arise. Sometimes, the problems arise at a frequency that even the finest service fleet can't handle. Other times, problems originate with the naivete' of first-time buyers, particularly from small and medium-size companies.

A lot of the problems come down to basic misunderstandings. "One major problem is an underestimation of the time it takes to implement a system," says Thomas Christo, a New Hampshire attorney who has represented many dissatisfied computer buyers. "It is a major effort, and rarely can a new user expect to plug in a bunch of hardware and have it operate to his satisfaction within thirty, sixty, or ninety days. It takes time for the user to adapt to the system and for the system to adapt to the user. It is not something that can happen overnight."

Another problem, he says, is that "many companies get into data processing when they don't need to. By streamlining their manual systems they'd be much better off."

But the biggest source of misunderstanding, says Christo, is an inadequate contract, one that fails to fully spell out the responsibilities of the manufacturer and of the user. Normally cautious executives, who wouldn't sign a sizable check without consulting with counsel, fail to seek advice when locking themselves into a multiyear financial arrangement with a computer vendor.

Of course, what you purchase is important, too. "That's where most of the mistakes are made," says Hillel Segal, president of the Association for Computer Users, a Boulder, Colorado-based nonprofit membership organization of individuals and businesses that buy and use computers. Segal points to a number of pitfalls he says are the source of a large number of the problems most computer users face:

★ *Failing to "test drive" the equipment.* "Before you sign on the dotted line, you should let your programs run on the equipment, measure the response time, determine how much time it takes to run your payroll or your general ledger," says Segal. "Any computer company, if it sees that your purchase of their equipment is dependent on allowing you to do that, will make that computer time available."

★ *Passing the buck.* The buying decision should rest with top management, rather than with someone in a lesser position. "That person doesn't necessarily know what you had intended for that machine," says Segal. "Upper management has to be involved."

★ *Unrealistic expectations.* "Some people think that all they have to do is to get a computer with a financial modeling package on it and it is going to help them be profitable," says Segal. "If you don't know what you are doing, the computer is not going to help you-instead, it will make you aware of what it is you are not doing."

★ *Ignoring hidden costs.* "There are a million costs to bear in mind when you buy a computer," says Segal, "and if you don't build it into you equation in the beginning, you could vastly underestimate what it is going to cost you. For example, there are peripheral devices, like printers, extra storage supplies, software, personnel training, installation costs, insurance, conversion, parallel operations, consultants, finance charges, legal fees. A lot of people tend to forget about these."

★ *Trying to defy Murphy's Law.* Something is inevitably going to go wrong, and you need to be prepared, whether the problem is in budgets, installation and conversion schedules or equipment glitches. "The people who inevitably get into trouble are the ones who say, 'It won't happen to me,' " says Segal.

Computer systems - safe and secure

Two other aspects of owning and operating business computers that are generally left out of sales brochures and pitches involve keeping computers safe for your business and for your employees.

Computer security is an area of increasing interest and concern, as "computer crime" begins to penetrate small businesses as well as bigger ones. Smaller firms are the ones that suffer most, since even a tiny embezzlement can be enough to bankrupt a small business with a tight cash flow.

Theft is made easier by computer in two ways. First and foremost is that the mere existence of computers in a business increases access to company records and accounts. Computerization means that all kinds of information is available right at employees' desks-if they are situated at computer terminals.

The second reason why computerization encourages crime is that it makes theft more difficult to trace. Handwritten records that had to be erased or altered were considerably better proof than a series of electronic beeps made anonymously by a computer-operating embezzler.

Of course, computers can be programmed to guard against such abuses, and security codes can prevent unauthorized individuals from access to confidential data. But the best protection is periodic perusal of computer records by yourself or a trusted employee. For this reason alone, it is important that top management fully understand the workings of the computer systems in their operations.

If security is rarely considered by computer buyers, worker safety is an unknown entity. But it is a vital one, according to a growing population of physicians and researchers, who are finding that computer terminals can cause a wide range of adverse health effects for users-effects that can substantially reduce productivity, increase absenteeism and possibly make you liable for health-care claims that could come up even after employees leave your firm.

At issue are the video display terminals (VDTs) that comprise the basic work station for most computer users. It's just becoming recognized that the designs of many such systems are poor, resulting in

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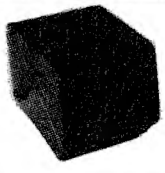

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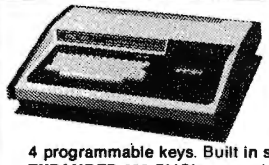

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physical and psychological hardships for system users.

For example, keyboards that aren't separate from screens can be harmful to the back; screens that don't adjust vertically or horizontally, or that don't have adjustable contrast, can result in increased glare that can lead to a wide range of visual problems. Many products do offer such flexibility, although these aspects are rarely made prominent in manufacturer literature, if they are mentioned at all.

The physical working environment can cause problems, too. For example, the lighting conditions needed for VDT work are far different from those needed for typing on traditional typewriters and doing filing and other typical office work. VDT users need subdued lighting. Moreover, glare from white walls, shiny desk tops and windows often contributes to high levels of glare that make it difficult for employees to work efficiently.

Such considerations may seem less than earthshaking to an executive burdened by price/earning ratios and investment tax credits, but they're issues that you'll have to face in the coming years of the increasingly computerized workplace. But with a little planning, the savvy executive can easily nip such problems in the bud.

Perspectives from three users:

PPG Industries

"As the result of an internal study of office technology, we installed a minicomputer system, with fourteen work stations," says Ken Myers, supervisor of programming support for the chemical division of PPG Industries in Pittsburgh.

"During the first few months, we're concentrating on the people aspect of the system, making sure that the capabilities are being fully utilized, that the training is sufficient and that the personnel is adequate. We've started the system primarily on word processing, although we intend to explore some of the additional advantages as we get moving.

"In our original investigation, during which we talked with a number of computer companies, the discussions always seemed to deal more with people than with technology. We realize that it was important to pay due respect to the human element when going into something as new as word processing. We kept close touch with the personnel aspects of our system. We had orientation sessions prior to the actual installation. We made sure that everyone had training that was offered through our vendor, so that when the machine showed up they had some background on what it could do and had the ability to start using it.

"So we tried a combination of all those things to take a little pressure off the secretaries, and at the same time see them accelerate and get through the learning curve as soon as possible, without expecting full proficiency for six to eight weeks. I think that it has been a big success, because our people have almost unanimously indicated that they really enjoy working with the equipment. They feel that it has been a big benefit to them."

United Mineralogies Inc.

and

Johnnycake Inc.

"Our core group of companies is involved in many activities, including active real estate development, agriculture, and the development of oil, gas and coal properties," says Daniel F. Flynn, president of United Mineralogies Inc. and Jonnycake Inc., two jointly owned companies based in Farmington, Connecticut. "Our interest in data processing was instigated by the need to assemble raw data from our various operations around the country, and to be able to analyze these operations and the opportunities that they present in order to determine which are most deserving of our attention. Our data-processing operation, therefore, is broken down into two parts: the gathering and assembly of data, whether statistics or financial reports, and the manipulation of this data into usable form.

"I would recommend highly that any executive who is involved with analysis spend a couple of days taking an executive computing course. Not simply to become a proficient data-processing operator, but to understand the dimensions and capabilities of the current state of the data-processing art.

"We purchased terminal equipment but decided to go with a service bureau for the software because the technology is changing so quickly that by the time we invested or committed ourselves to one system, developments would have taken place that would leave our equipment out of the top of the market. So we chose for flexibility to go for terminal equipment that is plugged into the service bureau's larger system.

"Our uses and benefits have expanded almost geometrically over the past couple of years, and we couldn't be happier. I suppose that there could be a point in time when we might purchase our own system, but for the volume of information that we store, it simply isn't cost effective."

International Harvester

"About a year ago we realized there were numerous cases where we couldn't obtain routine data for reports," says E. C. Yerian, manager for industrial engineering and distribution planning for International Harvester in Broadview, Illinois. "We knew that the data was available, but we'd go to our data processing people and have to write out a project request and go through a lot of bureaucratic red tape. It was taking us weeks to get what we needed. The DP department was concerned with maintaining inventory of the five million square feet of warehouse space we have scattered around the world, so we got the idea we could do it ourselves.

"We went out and purchased a small microprocessor and started learning basic programming. All of a sudden we had about six departments that wanted to use it. Within a year, the thing was in use from 6 A.M. to 10 P.M.

"After one year, we expanded our processing capacity. We purchased a system with five terminals. It's totally operated by the users-representatives from the supply department, the accounting department, the transportation department, engineering.

I think that we have eighteen steady users on it now, and that number is growing by the hour. The data processing department, which is still running its big mainframe system, has offered to give us support, but so far we haven't felt the need for any assistance.

"It's not a duplication of effort. The functions that we are running on this system are entirely our own creations, like simulations and employee reports that we used to type manually. Now, once we key in information, we can quickly manipulate the data and restructure reports for any level of management."■

BASIC compilers

For Models I, II, III; tape, disk or stringy floppy

80-U.S. Staff

Last year we compared two BASIC compilers for the TRS-80 Model II: Microsoft's BASIC Compiler (BASCOM) and Radio Shack's Compiler BASIC (RSBASIC). They are now available for the Model I. In addition, a third compiler, ACCEL2 from Southern Software in England (via Allen Gelder Software in this country), has made its appearance.

The usual reason for using a compiler is to gain speed. This is not always the case. CBASIC, long a favorite of CP/M users on non-Radio Shack computers, is not fast. Even on machines with identical processors (Zilog's Z-80), the built-in BASIC in the Model I can outrun CBASIC in speed tests.

Another reason for using some compilers is for accuracy. Put the following code into your computer and run it.

```
10 A = 0.1
20 B = B + A
30 PRINT B
40 GOTO 20
```

Now you have a stream of numbers running down the video. Everything is accurate to the nearest tenth of a whole number, right? No?

Now make A = 0.01 in line 10 and run the test again. Same results? No, they are different this time. At any rate, it doesn't take long to see that accuracy is *not guaranteed* with standard Radio Shack BASIC (which we will simply call Standard BASIC for the remainder of this article). Many versions of BASIC are plagued with the same problem. Some decimal numbers cannot be accurately represented as a binary number. In most cases the conversion process from decimal to binary and back takes care of the inaccuracies. However, when two binary numbers are added, the inaccuracy can become greater than the binary to decimal conversion can handle. Hence, the eventual loss of visible accuracy.

In business applications where numbers must balance to the penny, this inaccuracy eventually becomes intolerable. Two possible solutions present themselves: Use a language which works in binary coded decimal, or run all numbers through a self-correcting subroutine. Usually the former solution means COBOL and the latter means number to string and back again, with a loss of time.

The following routines demonstrate a double conversion correction routine. Note that this routine does not always work. Try the double precision routine with A = 0.0001. The first listing is for single precision numbers and the second is for double precision.

Listing 1

```
5 CLEAR 100
10 DEFSNG I
30 INPUT "VALUE OF A";IA
40 A$ = STR$(IA)
50 IA = VAL(A$)
70 I = I + IA
80 PRINT I;
90 GOSUB 10000
100 PRINT I
110 GOTO 70
10000 REM SUBROUTINE TO FIX I
10010 I$ = STR$(I)
10020 I1 = LEN(I$): I2 = INSTR(I$,".")
10030 IF I1<7 OR I2 = 0 THEN RETURN
10040 I3 = 0.5*10↑(-I1 + I2)
10050 I = VAL (LEFT$(STR$(I + I3),I1-1))
10060 RETURN
```

Listing 2

```
 5 CLEAR 100
10 DEFDBL I
30 INPUT "VALUE OF A"; IA
40 A$ = STR$(IA)
50 IA = VAL(A$)
70 I = I + IA
80 PRINT I;
90 GOSUB 10000
100 PRINT I
110 GOTO 70
10000 REM SUBROUTINE TO FIX I
10010 I$ = STR$(I)
10020 I = LEN(I$): I2 = INSTR(I$,".")
10030 IF I1<17 OR I2 = 0 THEN RETURN
10040 I3 = 0.5*10↑(-I1 + I2)
10050 I = VAL(LEFT$(STR$(I+I3),I1-1))
10060 RETURN
```

By adding these routines, execution will be slowed considerably since the routine must be run each time calculations involving decimals are

used. Some of this lost time can be made up by using one of the two standard BASIC compatible compilers discussed later. However, the easiest answer for business software may be an entirely new language: COBOL or RSBASIC from Radio Shack.

As we are considering only BASIC in this article, we will not look at COBOL now.

Radio Shack Compiler BASIC

It has previously been pointed out that RSBASIC is not compatible with standard BASIC. However, it would be well to treat RSBASIC as an entirely new language. Its power and capabilities, while not necessarily superior to standard BASIC, are impressive.

First, RSBASIC offers total cross-compatibility to the Model I, II and III *except* for screen size and some screen cursor control characters and commands executed as CHR$ functions.

Second, there is no longer the lack of decimal precision noted in standard BASIC. RSBASIC uses binary coded decimal in its functions and carries all real numbers to 14 significant digits within the range of $+/- 10^{-64}$ to $+/- 10^{63}$. RSBASIC uses the notation ** to indicate "raise to the power of" instead of the usual up arrow. There is also no single and double precision. Integers are retained with the same range as standard BASIC: -32768 to +32767. String space is no longer dynamic with the inherent "garbage collection" routines, but must now be defined as to length. Variable names can be as large as six significant characters.

The third significant difference is the addition of sub-program calls with their own local variables. Values (including entire arrays) are passed easily. This adds flexibility for the programmer who has developed a large number of standard routines and doesn't want to key them in for each new program.

The fourth major change is in the file structure. While the resultant files are *not* compatible with existing standard BASIC disk files, sufficient technical information is provided in the manual for conversion routines to be built for passing data via RS-232 communications channels should it be necessary.

RSBASIC has a total of nine different file structures. Three types of files are supported: Sequential, Random (or Direct) and Indexed Sequential (ISAM). There are three different methods of access for each type of file: Stream, Formatted, and Binary. Both fixed and variable record lengths are supported for the appropriate file type and access method.

ISAM file handling has real power. This method precludes the necessity of sort routines if handled properly. ISAM files are also accessable from the Radio Shack COBOL language, now also available to the Model I and III user.

Microsoft's BASCOM

BASCOM has been criticized for excessive space consumption. Microsoft has re-written the compiler and alleviated the problem somewhat. To do this, they created a run-time module which must be used with the compiled program. It is this run-time module which makes possible the space savings over the earlier version. Updates for registered owners are available from Microsoft's Consumer Products Division.

BASCOM's features are continually expanding as Microsoft further develops and refines this excellent BASIC. Now capable of compiling to version 5.2, it includes such niceties as WHILE-WEND, which essentially duplicates leaving a FOR-NEXT type loop in the middle, but cleans up stack space. Modules may be merged into the source with the %INCLUDE*filename* feature, although variables are not localized to the module. CALL replaces the USR function and is used to link machine language modules developed by the FORTRAN or disk EDITOR/ASSEMBLER packages.

Speed is claimed to be three to eight times greater than standard BASIC. Space is still critical. Stack space, rather than string space, is cleared, as in Radio Shack's Compiler BASIC.

The real plus comes from the compatibility with existing software. Except in a few instances where some complex contortions take place or space is at a premium, BASCOM will compile standard BASIC code without fail.

Yet, the major shortcoming of this compiler is still in decimal to binary number conversion. Microsoft also authored the standard BASIC and BASCOM. Both exhibit the same problem with accumulated inaccuracy with decimal numbers.

Microsoft is reportedly working on a new compiler which will use either binary coded decimal or another method to overcome accuracy problems.

Allen Gelder's ACCEL2

This compiler is the least expensive of the three and is designed to work with tape or Exatron Stringy Floppy systems of 16K or larger and disk systems of 32K and up, Models I and III.

ACCEL2 is not a complete compiler in that it doesn't compile the full program. Like the Compiler BASIC and BASCOM, it also requires a run-time module. However, this module can be made an integral part of the program and there are no royalty requirements for budding programmers who wish to sell and protect their source code.

Once a program is compiled, the results are impressive. It was used extensively in spacing programs in a book recently published by 80-Northwest Publishing Inc. The spacing program used is "Spacer", by Lou Pa. A run-time comparison of Spacer spacing itself was 16 minutes, 55.9 seconds under standard BASIC and 3 minutes 52.6 seconds after compiling with ACCEL2. The improvement is a ratio of 4.37. Due

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Software evaluation

to the fact that Spacer, as it appears in the magazine has so many remark lines, the compiled version actually was over 3K smaller. Spacer, as it appears, is 8,996 bytes long; compressed by itself it is 2,655 bytes and compiled by ACCEL2 it is 5,792 bytes. These figures are well within those claimed for it. Since ACCEL2 compiles standard BASIC and uses numerous ROM routines, the inaccuracy problem is still present.

Conclusions

ACCEL2, BASCOM and RSBASIC all benefit from good program design. Poorly designed programs are going to run slower and be harder to debug. Staying within conventions dictated by the compilers is a wise practice. The first time you use ACCEL2, you may be frustrated by your own programming techniques. Just make sure to clear and define your variables early in the code (like the first or second line). The compilers do not compile your program in the same sequence as the program is executed, but rather in line number sequence. Further, the compilers refuse to recognize more than one NEXT statement per FOR statement. This practice, although not widespread, is becoming more prevalent and is hard to debug if unexpected.

There are some rather clear preferences in this set of compilers. For the hobbyist and person who wants to limit his expenditures, and for those limited to tape or Stringy Floppy, ACCEL2 is the ideal choice. It is easy to use, does what it was intended to do (improve speed), and is the least expensive.

RSBASIC is a must to programmers of business software which requires complete precision. While it is a new language, it certainly does have its benefits over standard BASIC and the other compilers.

Microsoft's BASCOM is the most expensive of the three. However, it is a full compiler and will increase performance as much, if not more, than ACCEL2. The early complaint about space is no longer the critical problem, although space requirements are slightly higher than ACCEL2. The compatibility with modules produced by FORTRAN and the Disk Editor/Assembler (*not* Series I or any of the modified tape versions) makes BASCOM a good addition for the serious programmer who is not into business applications. ■

ACCEL2, Allen Gelder Software, Box 11721, San Francisco, CA 94101 (415) 387-3131, 32K Tape or Disk Model I or III $88.95 plus $2 s/h

Compiler BASIC, Radio Shack #26-2204, 48K Disk Model I and III, $149.00; #26-4705, 64K Disk Model II, $199.00

BASIC Compiler, Microsoft Consumer Products, 400 108th Ave NE, Suite 200, Bellevue, WA 98004, 32K Disk Model I, $195 plus s/h, 64K Disk Model II, $395 plus s/h

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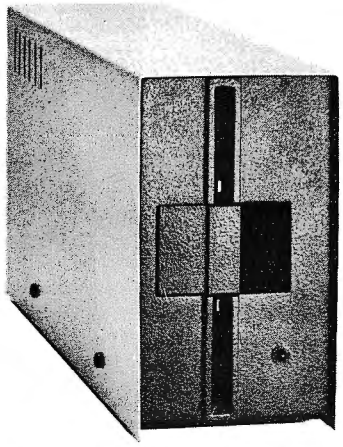

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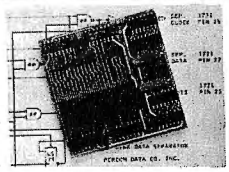

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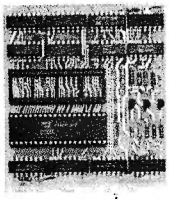

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Color computer techniques

Expand your color computer's memory without hardware

R. Wayne Day, Blue Mound, TX

One of the most frustrating things I saw upon unwrapping my brand-new Color computer, was the result when I asked it how much free space memory was available.

Free space is the amount of memory available for you to fill with programming, not counting the "overhead" the computer needs to run.

"PRINT MEM", I innocently commanded.

"8487 - OK?", said the computer.

Heck no, it's not OK! I bought a computer advertised as having 16K worth of RAM (Random Access Memory), and it tells me I only have 8487 bytes left...

Well, the people who designed the Color computer may have had a different idea in mind than I did, because they thoughfully decided they would "protect" 6.1K of memory for graphics. They have broken it down to four pages of 1536 bytes for each page, which are unavailable for you to use without some operator override.

For those among us who are having their first computer experience with the Color computer, I'll digress a little bit to explain some facts of life about these monsters. For those geniuses amongst the rest - go have a drink, and we'll be back with you in a couple of moments.

Why would you want to protect something in RAM, and what's all this about overhead?

Well, first off, a couple of definitions - very basic, but very important.

RAM is the abbreviation for Random Access Memory. You can read from this memory, or more importantly, write new data into the RAM; such as a new program.

ROM, on the other hand, stands for Read Only Memory. The only thing that can be done with the data in this type of memory is to read it and act upon it. It cannot be changed or modified! In fact, the only way to change ROM is to program a new one entirely, from start to finish.

The BASIC and Extended BASIC language is stored in two ROM integrated circuits in the Color computer, but without some RAM, the chips would just be little pieces of plastic.

"Why 'zat?", you ask.

Because it is necessary for a computer to be able to keep track of itself, to keep track of where in the program it currently is, to remember what the current value of the variable "A" is (i.e., A=13), a computer must provide a certain amount of RAM for what is commonly called overhead.

Did you ever wonder how the computer remembers that line 10 in your BASIC program comes after line 9? Without some overhead RAM, it couldn't.

OK, the geniuses are back from their drink now. Let's continue.

In the case of the Color computer, high resolution graphics were believed to be a high drawing card for the product, and they very well may be for some people.

For a game programmer, the protection of four pages of video memory may not be enough if he wants to do some fancy animation.

For example, if a program continually erases, then re-writes a video display (a lunar lander program is the most common example, where you keep the "Height" label, but change the data that tells you how high off the ground you are), the result would be quite "jerky" and not smooth at all.

On the other hand, by protecting various pages of video memory, you could update a page that is not currently being displayed then turn around and call it up to the screen. Then, while you're watching that page, you could update the next page, call it up, and go on like that forever.

This method of displaying video information would result in a smooth picture to the person running (watching) the computer.

But, saving a lot of memory for video has its drawbacks if you use the computer like I do.

Personally, games are not the reason I bought the computer. I tend to use the machine for keeping subscription and mailing lists, running some amateur radio programs that keep my station log, keep count of how many countries I have worked and gotten confirmation cards from, finding out what direction it is from my house to any point on Earth (so I keep my antenna pointed in the right direction), etc.

I tend to use a large amount of DATA statements for file searching, and that eats up the memory very, very quickly.

But, there is hope.

The Extended Color BASIC manual very briefly explains how you can "PCLEAR", but it doesn't go into too much detail. Here's what you need to know.

Remember when we said you start out with four pages of memory that were protected? Well, the direct statement (i.e., you don't put it into a program, but rather type a one-liner directly into the computer - like CLOAD) of "PCLEAR 4" will also

reserve four pages for your display.

Get it? "PCLEAR" = Page Clear.

Now, suppose you don't want to save four pages worth of memory... you've got some serious number crunching to do and you'll be needing all of the RAM you can get?

Do like the manual says and enter:"PCLEAR1".

This will protect only one page of video, or 1536 bytes, giving you a total of 13095 bytes to use for your programming.

By the same token, if you're going to need more than four pages, you can "PCLEAR 8" to protect eight pages of the RAM.

A PCLEAR8 will leave you with only 2343 bytes for your program (the same as a 4K machine).

"So what happens if I've got 14K worth of program, and only 13095 bytes when I "PCLEAR1"?, you ask, leading me up to the "Case of the Missing PCLEAR".

A little digression again. No, don't run off for something to drink, 'cause we'll be right back!

If you are like me, you didn't particularly like to take more math in high school than was absolutely necessary for graduation. And after that... forget it!

Well, it seems that I had forgotten one of the first things in math. That is that "Zero is a number, just like 1, 2 or 3!

For example, "2 minus 2 is the number 0", right? Not "2 minus 2 is nothing", although if we were talking about my checkbook, it very well may be.

Now, if we take a PCLEAR8 and subtract 1 from it, and do this seven times, we'll come up with a PCLEAR1.

If we do this subtraction again, we'll come up with a PCLEAR0.

"Hey, that's what I've been wanting... I don't want to reserve anything for color graphics. All Power to the Program!!

OK, let's try it. Enter PCLEAR0 and see what happens.

"Awwww, it was a good idea, anyway."

Wait a minute, don't give up. Just because Microsoft didn't include PCLEAR0 into the vocabulary of the computer doesn't mean we can't do it. We'll just have to fool the computer a bit and sneak up on it.

To do this miraculous trick, we're going to have to get into the overhead of the computer and do some manipulations.

Remember PEEK and POKE? PEEK looks at a specific memory location and tells you what's there. POKE lets you write something directly into a memory location.

Turn the computer off for about 15 seconds. That will give it time for everything to reset and lose its memory.

Now, turn it back on and enter: "PRINT MEM". It should give you 8487, meaning you have 8487 bytes of free space memory.

Now let's investigate.

Look at memory location 31, by entering "PRINT PEEK(31)". Does it say "30"? It should.

Enter a PCLEAR1 statement, and check location 31 again.

"12"? Hmmmmmm.

There seems to be some correlation between the amount of memory available and the data in 31; with 8487 bytes available it was 30 and with 13095 bytes it was 12.

See COLOR, page 42

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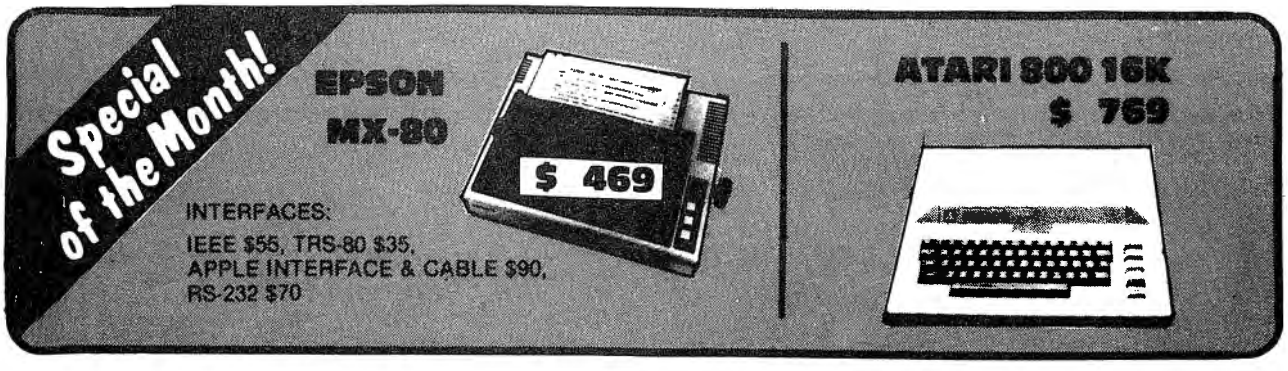

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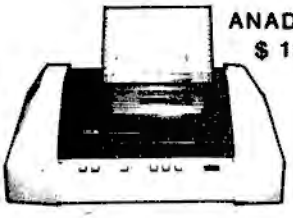

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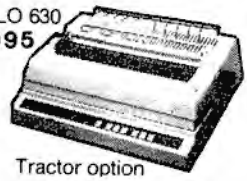

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COLOR,

continued from page 39

That's right, because 31 contains the information that is looked at when you PRINT MEM. The BASIC looks at 31, does some division and multiplication, and Voila!, there you are, instant memory.

However, just because the computer says you have a certain amount of memory available, doesn't make it so.

Do this, exactly in this order, and you will see:

1. PRINT PEEK(31) (ENTER) - 12?
2. POKE 31,6 (ENTER)
3. PRINT MEM (ENTER) - 14631?
4. LIST (ENTER) - There's nothing in there, so it will just say "OK".
5. PRINT MEM (ENTER) - 14631?
6. RUN (ENTER) - Again, with nothing in the program it will just say "OK".
7. PRINT MEM (ENTER) - ?????

Whoa! How did we lose the memory, when we didn't put anything into the memory?

Well, location 31 is just a mailbox where the computer temporarily deposits the memory information. After you hit "RUN", the computer resets all its pointers and counters, then checks everything against everything else, decides there isn't anything for it to do, and says "OK". But, one of those pointers it reset was the one that showed how much free memory was available.

"All right, wise guy. How do I get it in there and keep it in there?"

Well, assuming you would like to have 14631 bytes of memory available for your programs, you'll have to go in and POKE that "6" we put in 31, to a total of 4 places.

The data in memory locations 25, 27, 29 and 31 are all set to the memory that you have protected.

Don't believe me? Since we're still in PCLEAR 1, PEEK at 25, 27, 29 and 31 and see what you get. They should all give you "12".

Now, let's do one thing before we whiz everyone with our magic. Enter a PCLEAR 2 statement, then PEEK at 25, 27, 29 and 31 again.

Do they all say "18"?

They should, because for each increment of PCLEAR, the count of the data in these locations increases by six.

"Now I know what to do! I'll just subtract 6 from a PCLEAR 1 and that'll do it - instant PCLEAR 0."

Try it and see if it works: POKE 25,6: POKE 27,6: POKE 29,6: POKE 31, 6 (ENTER).

"PRINT MEM" should respond with 14631, and this time it isn't a temporary gain, it's locked in tight.

But, since you think it works in place of PCLEAR 0, we could do the same thing with the values of PCLEAR 1-8 and accomplish the same thing, just taking a bit longer to do.

For some reason, it doesn't work that way. The only POKE routines I've been able to get to work, are the POKE "6"... anything else causes the monster to misbehave, badly!

"But that's kinda long to remember each time I want to use the computer. Isn't there a shorter way?"

First off, unless you either power down the computer, or use another PCLEAR value in your program, you'll have the full 14631 bytes available for each program you use.

And yes, there is a shortcut, fortunately. First, power down your computer and wait 15 seconds, then turn it back on. Now, enter: POKE 25,6:NEW - all in one line.

A check of memory should also show 14631, right?

What's happened here is that a routine in the BASIC ROM has done the same thing you were doing... checking the value in 25 and resetting all of the other pointers in 27, 29 and 31 to match.

"Gee, computers are smart!"

Be sure to expand your memory before you begin programming if you think you will need the extra space. Once you're under way, you can't change your memory with this routine and keep your program intact.

"Why not?" Well, I didn't promise to tell everything about the Color computer. You just got 1500 bytes for free. ■

```
MEMORY SPACE AVAILABLE WITH

DIFFERENT "PCLEAR" STATEMENTS


P CLEAR 8     =  2343

P CLEAR 7     =  3879

P CLEAR 6     =  5415

P CLEAR 5     =  6951

P CLEAR 4     =  8487

 (PCLEAR 4 IS THE NORMAL

  POWER UP CONDITION)

P CLEAR 3     = 10023

P CLEAR 2     = 11559

P CLEAR 1     = 13095

"PCLEAR 0"    = 14631

 (PCLEAR 0 = POKES INTO

  MEMORY LOCATIONS 25,27

  29 AND 31)
```

shift for UPPERcase

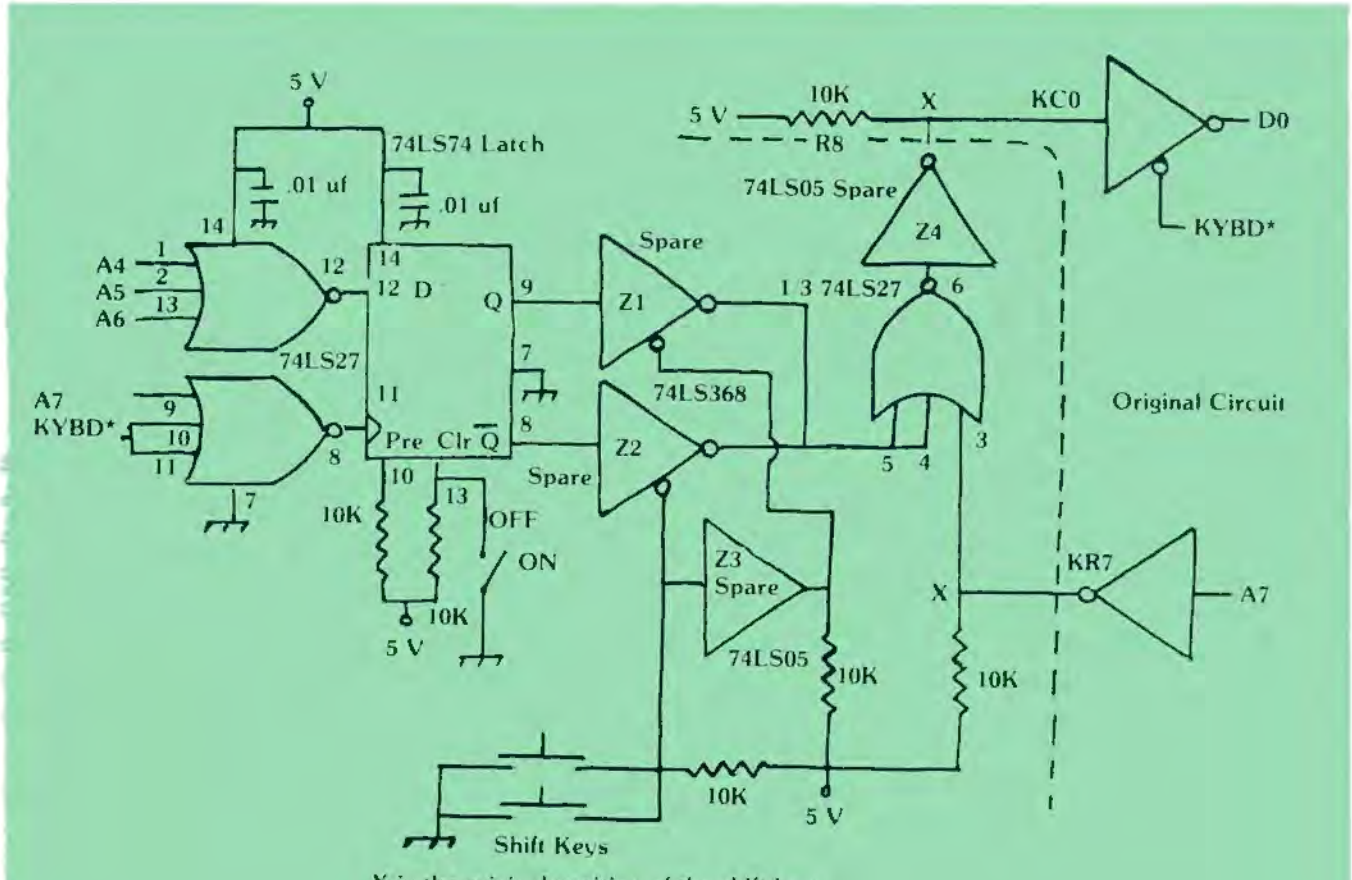
For Model I with lower case installed

William R. Bell, El Granada, CA

If you have a lowercase modification in your TRS-80 Model I Level II and a simple driver, you may find that you produce lowercase when you press the shift key with a letter. This is reverse from a typewriter, which normally will produce an uppercase letter when used with the shift key.

This hardware modification will give you a switch-selectable uppercase or lowercase when used with the shift key. The keys, other than letters and the @ key, are not affected. Two integrated circuits (IC's) are added to the keyboard.

The circuit is shown in Figure 1. The two NOR gates decode the keyboard and control the latch. The latch locks the shift keys in the inverted position (as if pressed) when a letter or the @ key is used and non-inverted position (not pressed) when any other key is pressed.



X is the original position of the shift keys.

Figure 1

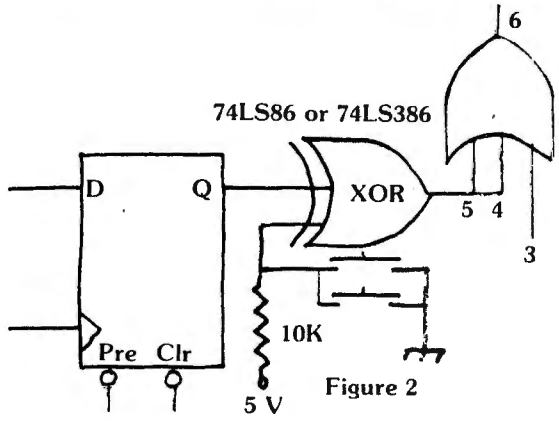


Figure 2

The switch locks the shift keys in the original position to make the keyboard act like the original regardless of which key is pressed. Chips Z1, Z2, Z3 and Z4 are spare inverters on the keyboard. I have not given any pin numbers on these inverters because my keyboard (and possibly yours, also) does not match the schematic in the TRS-80 Microcomputer Technical Reference Handbook. Locate the signals at the ribbon cable connector as per the schematic and follow the traces back to the inverter pins for your own modification.

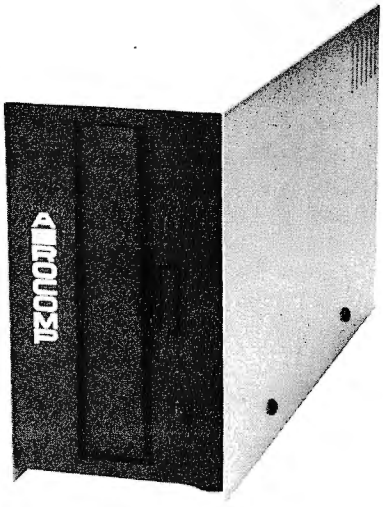
In my modification, I mounted two IC sockets on the left side of the keyboard by drilling holes for the socket pins. I then glued the sockets to the keyboard with the pins extending through to the other side. Then, turning the keyboard over, I wired the socket pins to the keyboard IC pins. The traces to the shift keys were cut. The shift keys were wired together as shown in Figure 1. If the spare inverter pins are connected to traces, cut these so the inverters are isolated.

Figure 2 shows an alternate hookup that uses another IC instead of the spare inverters. This is an XOR gate connected as a programmable inverter. The rest of the circuit is the same. If this modification is mounted on a separate board, the XOR gate will reduce the number of wires to the keyboard.

You will find that with the switch set for shifted uppercase, you can stop the scroll of a listing with the @ key instead of the shift-@ combination.

If you have any questions, feel free to write directly to me at my address. Please enclose a self-addressed, stamped envelope for my reply. ■

William R. Bell, PO Box 1231, El Granada, California 94018



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Exatron's floppy disk controller

Add disks to your color computer . . .

80-U.S. Staff

The Exatron Color Computer Interface (CCI) is the first of two disk systems now available for Radio Shack's Color Computer, the other being from Radio Shack. In this article we examine the Exatron unit and its associated disk operating system known as CCDOS.

The Hardware

The CCI consists of two high-quality, wave soldered circuit boards. One is a Memory Expansion Board containing 16 type 4116 integrated circuits (RAM), and a 2K Read Only Memory (ROM), voltage regulation and associated circuitry. The second board is smaller and contains the Floppy Disk Controller (FDC) circuitry built around the 1771 FDC integrated circuit. The two boards are joined with a 26-line ribbon cable.

The boards are housed in an attractive turquoise plastic case measuring 8" wide by 6½" deep by 2⅝" high. A short five-inch ribbon cable exits from the back of the case. The cable plugs into the program cartridge slot of the Color Computer. No power cable is necessary as power comes directly from the Color Computer.

Directly above the ribbon cable is the connector for the minifloppies. The configuration is identical to the Model I and the interface will accept the same cable and up to four drives.

Features

The 32K of memory is divided into two sections. One 16K bank resides directly above the 16K user memory in the Color Computer. The other 16K bank resides in the area normally used by the ROM program cartridges. The 2K ROM is co-resident in this area and may be electronically switched out for full use of the upper 16K RAM.

This upper 16K does not make the Color Computer into a 48K machine. The reason is that the 48K of memory is not contiguous. The 8K Color BASIC ROM and 8K Extended BASIC ROM occupy the area between the two groups of RAM. Take a look at the memory map accompanying this article (on page 114).

Although the BASIC interpreter will not recognize the upper 16K of RAM, machine language can be written to do so. However, some fancy load sequences might have to be written to make the most of this.

Putting It Together and Checking It Out

The accompanying manual (preliminary, as of this writing) was unusually clear and complete. The one area of complaint regarded the initial check-out sequence and may (according to Exatron) be deleted from future editions of the manual.

The instructions (as they are now written) tell the user to make sure that his color computer is working *before* plugging in the interface. After that is done, the computer is turned off and the interface connected. Power is again applied and after a momentary wait, the space bar is pressed. The system will then check out the interface memory and come back with the usual sign-on message.

The problem was that ours didn't. A call to Exatron on their toll-free line revealed the solution. After turning on the system, the space bar is pressed several times as if you were adding spaces to a line.

If you wait too long, the system will hang up trying to access the floppy disk which is still not plugged in; too early, and the system's power supply and associated ROM circuitry is not yet ready for the space bar signal.

We came to the conclusion that if you press the space bar from one to two seconds after power is applied, the system will power up correctly.

Actually, the checkout is not necessary and one can plug in the floppy disk and interface at the same time. Then, during power up, the floppy disk is accessed and if a disk operating system disk is present, the system will load and execute.

Exatron informed us that those units sold without the disk interface board contain a different ROM which does not require the space bar sequence for proper initialization.

CCMON

The Color Computer Monitor (CCMON) contains a number of features.

Accompanying this report is a chart of commands and features of the monitor. Although not extensive, they are complete enough to be useful. Coupled with the BASIC load and save commands for tape (and disk), the monitor is a good debugging aid for the machine language programmer.

The first-time user will probably use one of its features to check out the memory of the computer and interface. When invoked, the screen clears and a changing character appears in the center of the screen. At the completion of checking the upper 16K RAM, the message "TOP BANK PASSED", will appear. The lower 32K takes a bit longer to check.

The rest of the features are those common to other monitors of this type.

CCDOS

The disk operating system is complete, although not as sophisticated as other TRS-80 operating systems.

CCDOS is fully resident in the upper 16K RAM bank. None of the user RAM is occupied and all DOS commands are usable as a direct command. There is no "SYSTEM" level and "BASIC" level as in the other TRS-80 models.

Being fully RAM resident also means that a system disk does not have to reside in drive 0. This allows the user to dedicate a majority of his disks to data and programs without the disk overhead required by the operating system.

The operating system supports only 35-track drives and the FDC only single-density diskettes. Future compatibility with Radio Shack disk software is suspect due to this limitation. The single-density also limits the amount of data which may be stored on any one disk to 87, 040 bytes of information. While this compares favorably with Model I's storage capacity, it falls far short of the Model III and Radio Shack's disk for the color computer which is advertised as holding 156,672 bytes per diskette.

Since CCDOS acts as an extension of BASIC, we'll examine the commands as they appear in the user manual. The command syntax and file handling is very similar to Model I, II and III Disk BASIC. Also, users of the CCDOS system will feel very much at home with the programming techniques described for those models.

The Commands

The half-tracks mentioned in the discussion of several of the commands is equivalent to a Model I and II granule: five sectors of 256 bytes each for a total of 1,280 bytes per half-track.

CCDOS will automatically add a three character extension to certain types of programs: BIN for machine language, BAS for BASIC, and DAT for data files. These are default extensions based on the type of operation and can be overridden by supplying the proper extension. There is no provision for password protection or invisible file names.

Also, in loading or saving programs and in opening files, the disk drive number must be specified for any drive other than drive zero. The system will not automatically search all drives as in the other models.

NUDISK is the formatting command for CCDOS. It is not elegant and does not prompt for anything. Consequently, there is no disk name or creation date. The tracks are formatted and checked for flawed areas. The disk drive number must be specified and the disk is not checked for data prior to formatting. However, the prompt "ARE YOU SURE (Y/N)" is displayed and must be answered.

BACKUP is also very limited, allowing a single-drive backup (with appropriate disk exchange prompts) or a two-drive backup. As with NUDISK, the "ARE YOU SURE (Y/N)" prompt must be answered and allows the operator to abort the operation.

VERIFYON is a command to double-check diskette writes. It will slow down the BACKUP procedure, but is recommended to double-check disk accuracy. VERIFYOFF turns off this feature.

ASSIGN sets the default drive number. It requires the disk number, 0 to 3, to execute. As was noted earlier, CCDOS does *not* search all drives if the drive number is left off a file name. Only the default drive is checked.

FREE is not a direct command, but a function which returns the amount of free half-tracks available on a diskette. The drive number must be specified or a syntax error will occur.

CAT is the CCDOS equivalent of DIR and stands for CATalog. This is common to several other minicomputer operating systems. The drive number is optional, and if left off, defaults to the assigned drive. The display is simple and lists the drive number, the file name and extension, the size in half-tracks and the type: ASCII or Binary.

The COPY command allows both single-drive and two-drive copying of individual files.

RENAME is unchanged in its nature from other TRS-80 systems and renames the specified file.

The KILL command works on closed files and will produce an error with an open file. The file is then closed. The catalog (directory) is not scrambled as with some Model I operating systems.

The MERGE command is unchanged from the other TRS-80 systems and allows a BASIC program to be merged with one in memory. The program to be merged must be stored in ASCII format.

Some disk drives allow faster stepping rates than the 40 milliseconds specified by Radio Shack. For those drives that can handle a 10 millisecond or faster stepping rate, the command FASTON will set it. If, after checking your drive and finding it cannot handle it, FASTOFF will set the rate back to 40 milliseconds.

Three SAVE commands are available. Without any suffix, the system will save any BASIC program in memory and will provide a "BAS" extension if not specified.

With an "A" suffix following the file name, a BASIC program will be saved in ASCII format and the default extension BAS will be used.

If SAVEM is specified, a starting, ending and transfer address must be supplied. This will save the Binary code within those memory locations to disk. The BIN extension will be the default. The addresses may be in decimal or &H hex format. Armed with the necessary addresses, any machine language program may be saved to disk.

BASIC programs may be loaded and executed directly from disk with the RUN *filename* command. If no extension is specified, BAS is supplied. As indicated earlier, only the assigned default drive or the drive specified in the file name will be searched.

Four LOAD commands are allowed. A BASIC program may be loaded without any extension. The default BAS extension will be supplied if not specified.

LOADM will load a machine language file. The EXEC command will start execution of the program.

LOADR will load a ROM backup file, relocate it and start execution. With an optional ROM backup adaptor cable, Radio Shack cartridge packs may be downloaded to tape and then transferred to disk. By using the LOADR command, the program will be loaded, moved to the proper location in upper memory and executed, all without the cartridge pack being present in the machine. The process is multi-step and a bit tedious.

LOADT allows Model I BASIC programs which have been saved on a 35-track single density diskette to be loaded into the Color Computer memory. The program can then be

See **EXATRON** on page 114

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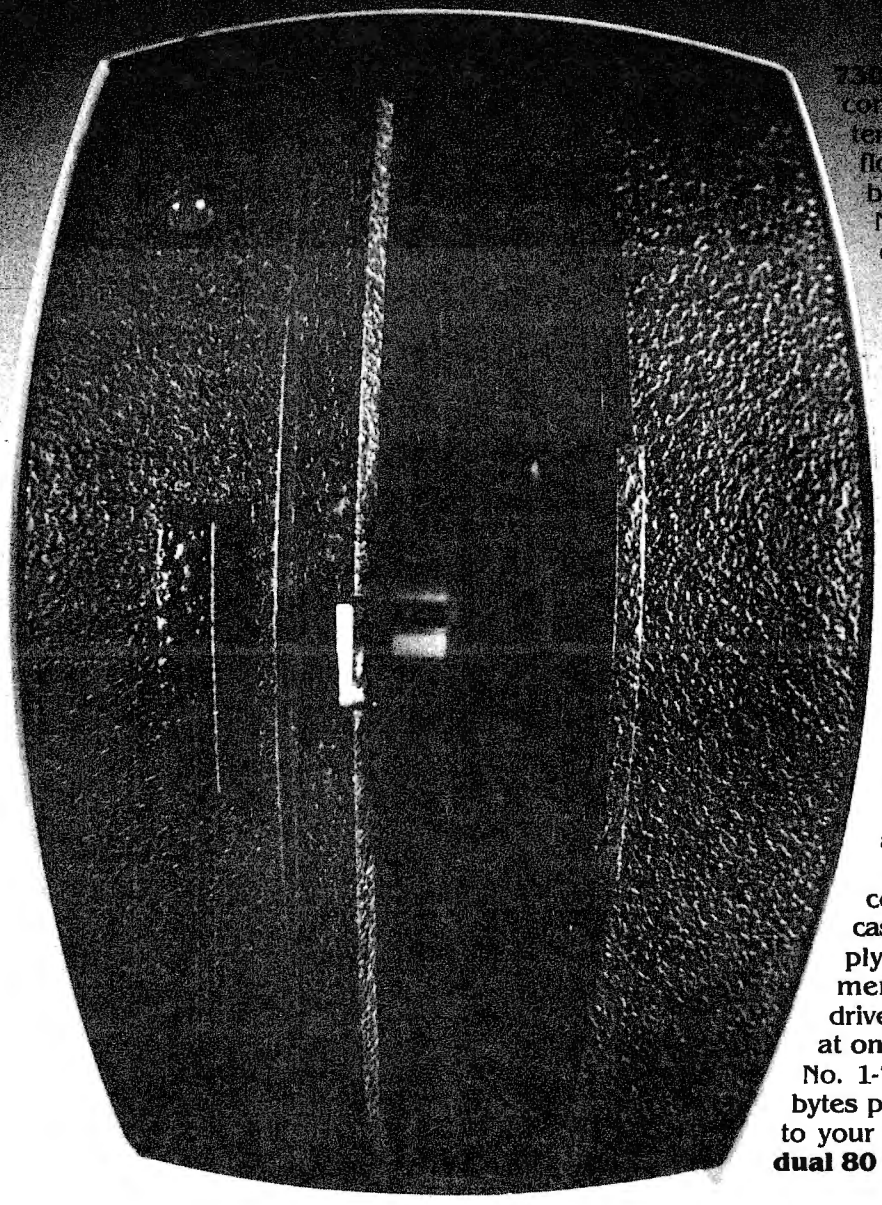

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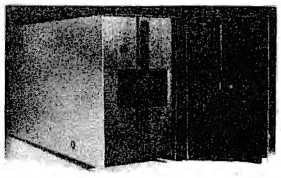

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It happened to me again! I couldn't control myself! I awoke at a quarter to five with the answer to the problem, and I didn't want to go back to sleep for fear of forgetting

So kissing my wife upon the cheek
Up to my feet I flew in a leap.
Down to the hall and onto the stair
That program last night had been a bear

I'm sure many of you have had the same problem. I had the program conceptualized in my mind. But I spent the whole evening trying to put it together in numbered statements with commas and semicolons in all the right places. But alas... It wouldn't work.

Many think of the computer as intelligent.
Well, I'm here to say there're wrong.
I told it what to do - but how irreverent
It would not go along

It was a program that had been bobbling around in my mind. It was for printing mailing labels. Now there are probably hundreds of mailing label programs (I could go out and buy one for $9.95), but this one had a slightly different bent.

I was producing a number of mailing labels for my immediate area. All labels would be in the same state, but they would be in about two dozen different cities. I wanted a program in which I would not have to enter each zip code. I wanted the computer to look up the code for each city.

It sounded simple. Problem- There is some variance in the way that people capitalize names. Is it St. Charles or st. Charles? DuPage or Dupage? Dundee or DunDee? Sometimes one way and sometimes the other.

The answer was simple in afternoon hours as I contemplated a solution while returning from work. But it was not destined to be that simple when I sat at the keyboard. I spent thirty minutes writing the body of the program and three hours *trying* to write the subroutine that would produce the zip code. I had the concept but it wouldn't gel.

So here I sit; its five a.m.
But when I finish it will be a gem.
I'm excited, nearly out of control
Victory over frustration is my goal!

In the wee hours of the morning my brain operates so clearly. It seems so wonderfully simple now. To be perfectly honest, I can't even remember what yesterday's attempt looked like. There is now only one way to solve this problem.

```
10 NN$=""
  Clears "new name"
20 INPUT "ENTER NAME"; N$
  Enters original name
30 LPRINT N$
  LPrints original name
40 FOR X = 1 TO LEN(N$)
  Sets loop to length of name
50 T = ASC(MID$(N$,X,1))
  Develops the ASCII code for
  the Xth letter of the name
60 IF (T>64) AND (T<91) THEN T=T+32
  Decides if code is that of a
  captial... if so, by adding 32 it
  becomes a lower case code.
70 NN$ = NN$ + CHR$(T)
  Changes ASCII code back into
  a letter and assembles the lower
  case name.
80 NEXT X
  Closes the loop
90 LPRINT NN$
  LPrints name in lower case
100 GOTO 10
  Reruns the program
```

This little subroutine would change all the names into strings of lower case letters. By entering my data as all lower case I could successfully find the zip codes. Success was mine!

Amazing as it seems, that did the trick.
The knot in my stomach is gone, I'm no longer sick.
But as you all know
Those like us will go
Head first when it is time for another lick!

■

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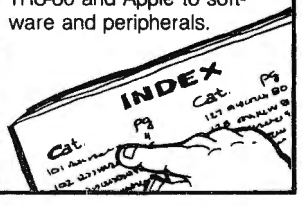

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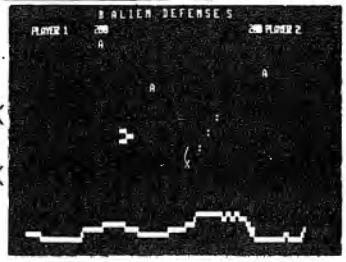

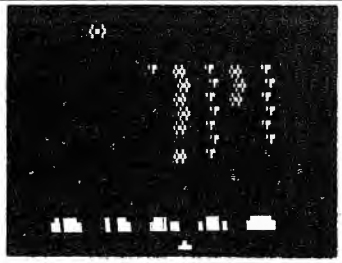

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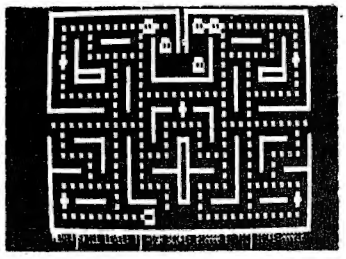

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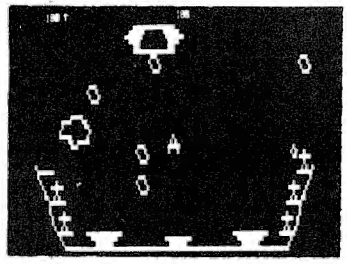

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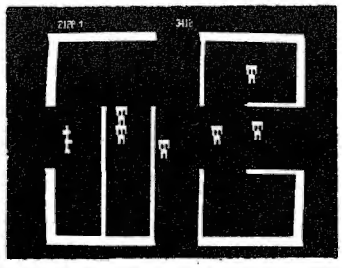

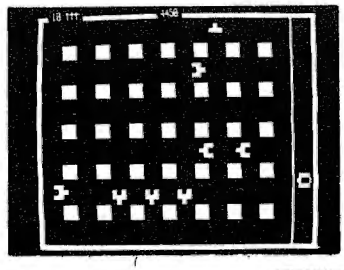

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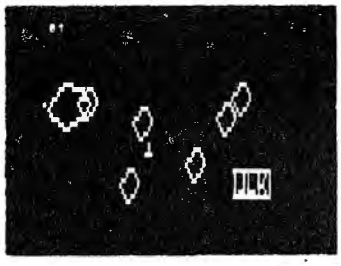

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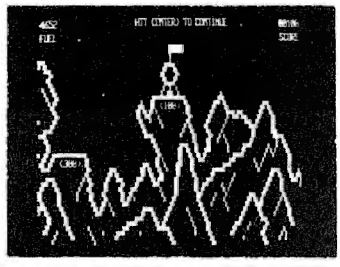

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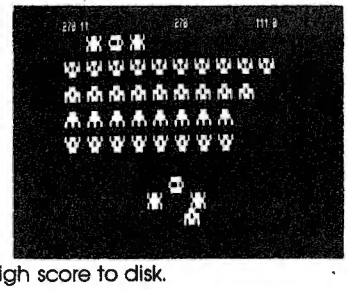

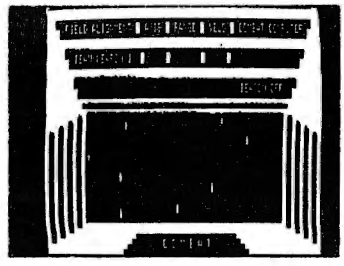

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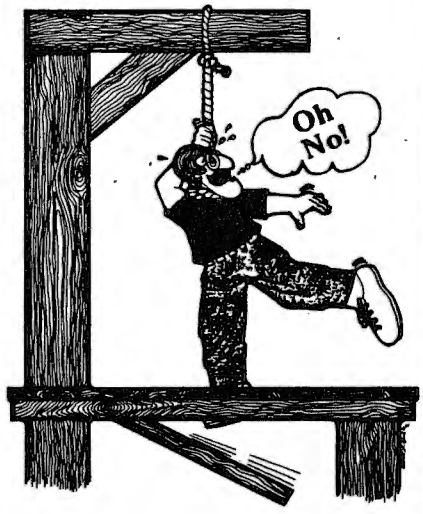

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Captain 80

The adventures of a software secret agent in England

The moon is full. There are wispy clouds floating across its gleaming face and the Yorkshire moors stretch in all directions empty and lonely. I never did see a Werewolf although I cannot express too much disappointment at this.

Here's Captain Eighty disguised as Joe American Software Producer, casually taking in the sights in the Yorkshire country north of London, England. The enthusiasm with which I was received by British customs at Heathrow Airport is just now beginning to wear off and now the true beauty of the English is beginning to settle in my sight.

Lesson one for software producers escorting their wares into Great Britian. Carry English currency with you on the plane. Unless you know (by sight), the person meeting you (be he software producer, pen pal or whatever), do not expect anything but complication from personally importing things into England. The mere act of declaring the approximately $1700 worth of Adventures and Big Five arcade games that occupied the footlocker I was escorting initialized an interesting chain reaction.

Import duties had to be paid. And something called VAT (value added tax), sort of a British version of State Sales Tax, also had to be shelled out. Then I had to know the VAT number of the client for which the software was destined. Now all that was easy enough, I simply had called up the British Embassy in Boston. It was a sweet young lady who'd advised me to have pounds and ounces and pence and stuff like that with me, you know, exchanged in America. No one told me about Agents. I knew Elton John needed one, but me???

The Agent, it turns out, hangs around customs and does all that nasty paperwork for about 33% of the net bill to Her Majesty's Government. It didn't stop there. Even with the help of Graham Heywood, of the *Algray Software Organization,* my British host, I found it nearly impossible to explain, in understandable terms, to a polite, well meaning, but totally uncomprehending customs agent of apparent East Indian decent, just what Software *was* or how the little letters got into the computer or why my software wouldn't work on his computer. It was interesting but next time I'm going to disguise myself as an Arab tourist.

I found the British software market to be fragmented into several noncommunicating factions. Loosely defined they are: Those who pirate software, those who do not need to pirate software because they are licensed to reproduce big selling programs on a royalty basis, but who are suspected of software piracy due to the lack of communication between producers, and those who import software from the United States by purchasing directly from the publishers or from agents or United States vendors and are suspected of skulduggery by all the other above factions purely by virtue of association.

The *Algray Organization* (my host), I found to be much like *Acorn* or *Breeze* or any of the many small Ma and Pa software houses in America. Run on sheer guts and the trust of a very few American companies willing to license them to produce proprietary software on British soil, this little outfit has

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earned the respect of its customers and (at least some), competitors.

Algray is currently licensed to produce *Automated Simulations* in England. The programs are very hot and the English computerist is assured of fresh tapes and disks when he buys his software. They are negotiating with other companies for rights to good programs so they will be worth watching. Additionally, they have developed several respectable programs of their own though none is currently available for export to America.

The Software House of London, is another place I visited during my trip across the pond. Located in a quaint little courtyard off busy Oxford street in Westminster, this computer shoppe had representative software from every major producer in the United States that I could think of. *Adventure International* was well represented, as was *Instant Software,* though not as much. It was a pleasant, thoroughly British establishment and I had a good time there. It is centrally located and, in my opinion, a good place for an American software company to get its feet wet.

The whole time I spent in the land of Royalty was one great learning experience. The British, I discovered, would dearly love to be able to enjoy the same entertainment software we take for granted here in the United States, but by the time an imported tape passes through (see customs description at beginning of column), a $14.95 program is pushing thirty five bucks!!! American software producers who have heard grisly tales of wholesale license ripoffs don't know who to believe and will only sell through export. Catch 22? You got it. Net result, the British microconsumer tightens his belt and waits for the famine to ease.

The two places I visited, *Algray* and *The Software House*, clearly seem to have the ability to function as producing agents, paying royalties to host companies and representing them well. I was not privy to *The Software House's* book but did observe *Algray's*. I'm a believer. They can do the job.

Not every software producer can hop a jet and zoom off to inspect a client in a foreign land. So at the very least there will be continued suspicion between different countries until someone emerges with a track record. New producers, if approached by a foreigner who says he produces for other American companies, find out who and call them. Chances are you will find that foreigner a kindred spirit, an entrepeneur in another country, making his way as you are, to that golden program that will make everyone rich.

The Yorkshire moors are really quite lovely by moonlight. Hmmm, I really must get a haircut and a manicure. There is just a hint of breeze in the night air and I'm having a howling good time here in merry olde England. I do have this urge to run on all fours. Boy ohhh boy. I'm going to have a tough time with British Air looking like this. They'll probably make me ride home in tourist. Robert Morely, I'll get you for this.... ■

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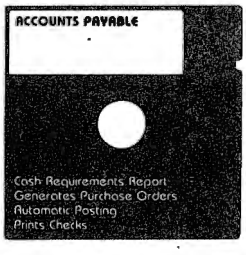

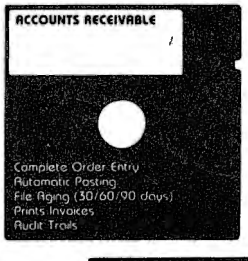

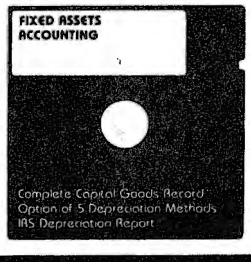

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Linked list subroutines

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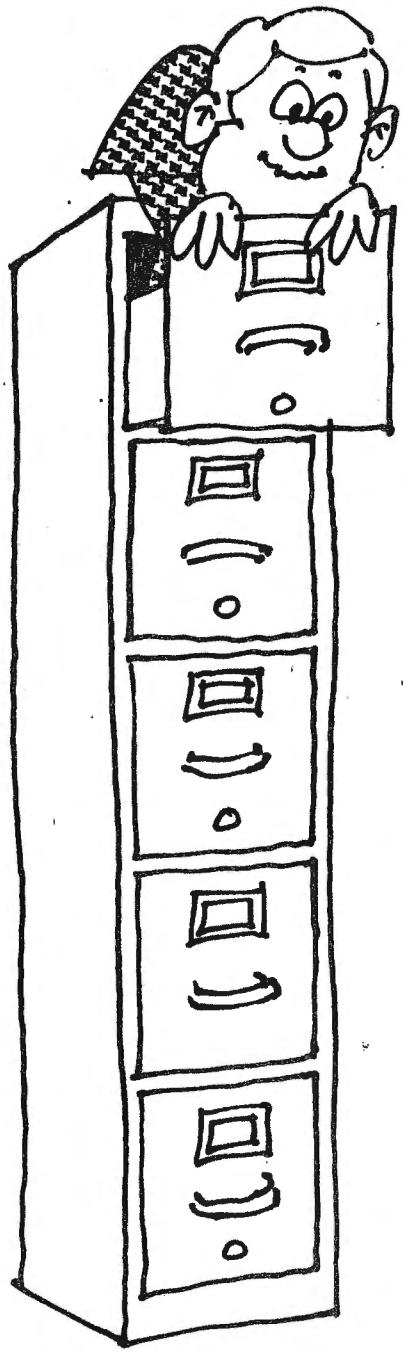

There are many occasions in the life of a computer programmer that call for getting things in order - that is, in some desired sequence. This may be alphabetizing a mailing list, printing mailing labels in zip code order, arranging checks in order by payee or invoice number or some other criterion.

The most common approach is probably to sort the list according to the desired "keys" when it is time to make the list. Several sort procedures have been described in the computer literature both for the pros and for us amateurs. Prominent among them are the bubble sort, the Shell sort and the Quicksort. Each has its advantages and disadvantages. Arguments about the relative speeds of new routines will probably continue for some time.

A realistic alternative is to keep the lists in order in the first place. While it might seem possible to build the list in the correct order, unless you have the information in that order when you start, this approach requires constant moving of data around in the file. It is very uneconomical for most purposes, especially if you must insert an item near the beginning of the list and move all the subsequent items down one to make room. Deleting items causes the same problem.

The best way to keep a list that is entered in random order sorted as you go is to make it into a linked list. These lists have keys or pointers associated with each item that lead you from the smallest (or largest) item to the next in line, from that to the next, and so on to the end. Both sorts and linked lists are nicely described in William Barden's book *Programming Techniques for Level II BASIC*, published by Radio Shack.

Barden's program for linked lists works well, but is not very versatile, it seemed to me, so I have constructed a set of subroutines that can be inserted directly or with little modification into almost any program needing them. These subroutines are presented at two levels. The simplest set of routines sets up that data array and links without trying to recover the space in the file abandoned when items are deleted. This approach is satisfactory when the list is quite stable, especially when items are not frequently removed from it. I use this kind of a list to index my programs, for example, since I rarely throw away one I have put into the index (do you?).

A second pair of subroutines is more complex, but it does allow the space formerly used by deleted items to be recycled to new items as the content of the list changes. This is important for fairly volatile lists, such as might occur in your accounts payable or accounts receivable handling. Here, items are added when received and deleted when paid, so that the list is always current. The key might be the date of the invoice so you can detect ages accounts, for example.

Both sets are demonstrated in the context of driver programs which allow you to enter and delete items and to print the ordered lists. It is common to closely associate the links or pointers with the items of data, but I have found it most useful to separate these into different arrays or lists. For one thing, your links are always integer values and space can be conserved by keeping them in an integer array, whereas your data may typically be floating point numbers or alphanumeric string arrays. In every case, the index number to any item in the data array (e.g., D(5)) is the same as the index to the link array item referring to it (e.g., L(5)). The demo programs use numeric data, but few changes would be needed to make those data into strings. I call my arrays D (for data) and L (for links) in the simpler set, shown in listing 1.

Listing 1 actually has three subroutines. Subroutine A, lines 200 to 280, will link the list in ascending order (smallest to largest) of the data items. Subroutine B, lines 300-380, puts the links in descending order. The third, subroutine C, lines 400-470, deletes items from either list. The demo driver is set to produce a descending list for this example.

It is likely that you will only understand the linked list subroutines by following them out step by step with dummy data. Take the descending routine, for example. The link header in array position L(0) points to the largest element in the array as the entry point. When there is no item in the list at the start, the item counter I, in the driver, is

zero. The item is put into the array in the driver as well, at line 1050. Line 330 is the subroutine sets the initial pointers - the header points at item one, and item one's link is a negative one, indicating it is the smallest (last) in the list. Of course, at this point it is the only one in the list. After the first item, this line is always skipped.

In the subroutines, the variable KL is the previous item pointer and KN is the next item pointer. I is used to indicate the current item. Line 340 decides whether the new item is smaller or larger than each successive item as it goes through the list, and may be run through several times. If D(I) is larger than the next item, line 350 sets the links so that the "previous" link pints to D(I) and D(I)'s link points to that which was previously largest. If this is not so, line 370 will move to the next item in order and repeat line 340. Unless, that is, D(I) is smaller than any item in the list, including the one marked -1, indicating the end. In this case, line 380 puts it at the end, and the former smallest item's link is set to point at this new item. Simple! The ascending routines workes essentially the same way.

The delete subroutine, C, reads through the list until the value you want deleted is found. If it is not found, you are told that the item is not in the list. When found at KI - the pointer to the item to be deleted - processing jumps to line 470, which does nothing more than set the "previous item" pointer, L(KL), to point at the item following the deleted one in order, just skipping over it. The deleted item and its link are zeroed to make the links easier to read, but it is not necessary.

Figure 1 shows a couple of cycles of input and output from this program, and figure 2 shows the link and data arrays as they existed after the last output was produced. The lines represent, respectively, items 0 to the end of the list, and can easily be followed. For example, L(0) tells us that the item at line 4 is largest - the 100 in the D array. The pointer associated with item 4 is 10, since D(10) is 89, the second largest. Its pointer leads us to item 7 (=70), etc., down to the smallest item in line 8, marked with link -1.

The second set of subroutines is built into the program at listing 2. Only the ascending version is given, but following the clues in listing 1 you should be able to make the descending one yourself. In this case we want to recover our free space after an item is deleted from the list, so a second list is constructed in array F to follow it to its end. This means that array F must be initialized so that it starts out with a set of pointers. This is done in lines 150-160 of the driver. Lines 120-130 and 1000 only remind us that if you have stored these arrays on diskette or tape for later use, you do not want to destroy what you have done already by reinitializing them. The appropriate reading routines are not included in the program.

Lines 200-290 are very similar to the previously described subroutine (of course, it goes in the opposite order, but otherwise is similar). It differs mainly in that the index or link to the next free space is taken from the free space array header, F(0). This is reset and the F link at the item is zeroed while the item coming in as X is inserted into the D array here (different from the previous program). Also, the D(0) element is used to count how many slots in the array are currently in use, since we may fill and empty it several times in the course of using it. This can't happen in the previous example. So, in summary, this insertion routine is resetting the links in both the L and F link arrays; L to keep the items in order, and F to point to all the empty slots available.

The deletion array is a little more difficult. The first part is no problem. As in the earlier example, it merely reads through the list until the item is found (or not found, if it isn't there). When it is found, line 470 jumps the L links around the item, decrements the counter in D(0), and zeroes the deleted item from the L and D arrays. The rest of the subroutine looks for and resets the F links so that the just deleted item is at the bottom of the free space list.

The examples in figure 3 show a couple of stages in the processs, just as before. Figure 4 is the display of the L, D, and F arrays at the end of the work shown. The first item in the L list is L(0), pointing to the smallest element in D at D(5). The D(0) value tells us that nine slots are in use, and the F(0) and F(2) entries advise that only one slot is left vacant, at line 2 (zeroes in the L and D arrays).

Three notes are worth adding. In the last example in which the D(0) element is used as a counter, a problem may arise if D is a string array. You will need to refer to it and change it using the string commands VAL and STR$. Secondly, note that I used the DEFINT statement early in each program to make all the links and keys integers. Have you ever noticed how you can identify old FORTRAN warhorses by the values they choose for integers?

Third, it is entirely possible to make the data array a two or more dimensioned array (two is enough for most purposes). You then need to give the L array the same dimensions, of course, but by carefully watching your references you can call the proper subroutine or subroutines in order and have your list linked by more than one key - and even in more than one direction if you wish. Be sure to run through all of them when you delete items, however, or you will have a mess.

A final warning is perhaps also needed. There is no reason you cannot use this system in indexing a disk file too, but there is a good reason not to do so. It will thrash around a great deal causing excess wear when you do. However, it would be easier to make a linked index to the disk records that is read into memory, searched as needed, and used to call up or add or delete the single record needed with one random access to the disk. Sequential files, of course, can't run this way. You can, though, order the items in your memory and read it out to the diskette in proper order. After that it could be accessed sequentially.

All the routines here were built around single-line, fixed-length records. You can have multiple line records by building into your links another column telling how many lines or items are stored if you wish, and indexing to the start of the record as needed. That's fun too.

In any event, I hope these routines can be useful to you as you develop more complex programs. ■

```
ARRAY SIZE DESIRED? 20

START ACTIVITY
FOR INPUT ENTER I, X (WHERE X IS VALUE OF ITEM)
TO DELETE ENTER D, X (SAME CONVENTION)
TO PRINT LIST ENTER P, X (X = ANY NUMBER)
WHAT ACTION? I,50
WHAT ACTION? I,30
WHAT ACTION? I,70
WHAT ACTION? I,100
WHAT ACTION? D,35
ITEM NOT IN LIST
WHAT ACTION? D,70
WHAT ACTION? I,50
WHAT ACTION? P,2
```

Figure 1, continued on next page.

```
ITEM              VALUE
 4                 100
 1                  50
 5                  50
 2                  30

DONE
MORE ACTIVITY? Y
WHAT ACTION? I,35
WHAT ACTION? I,70
WHAT ACTION? I,6.34
WHAT ACTION? I,55
WHAT ACTION? I,89
WHAT ACTION? P,2


ITEM              VALUE
 4                 100
 10                 89
 7                  70
 9                  55
 1                  50
 5                  50
 6                  35
 2                  30
 8                  6.34

DONE
MORE ACTIVITY? N
READY
>
```

Figure 1. Sample input and output for Listing 1. Descending order option.

```
READY
>FOR K=0 TO 10: PRINT L(K),D(K): NEXT
 4                 0
 5                 50
 8                 30
 0                 0
 10                100
 6                 50
 2                 35
 9                 70
-1                 6.34
 1                 55
 7                 89
READY
>
```

Figure 2. Link array L (left) and Data array (right) after runs in Listing 1. Indexes from L(0) to L(10) to after runs in Listing 1. Indexes from L(0) and D(0) to L(10) and D(10). Header L(0) points to the largest item in array (D(4)). See text.

```
ARRAY SIZE DESIRED? 10
IS THIS A NEW LIST? Y
FOR INPUT ENTER I, X (WHERE X IS VALUE OF ITEM)
TO DELETE ENTER D, X (SAME CONVENTION)
TO PRINT LIST ENTER P, X (X = ANY NUMBER)
WHAT ACTION? I,50
WHAT ACTION? I,30
WHAT ACTION? I,90
WHAT ACTION? I,20
WHAT ACTION? I,40
WHAT ACTION? I,20
WHAT ACTION? P,2


ITEM              VALUE
 6                 20
 4                 20
 2                 30
 5                 40
 1                 50
 3                 90

DONE
MORE ACTIVITY? Y
WHAT ACTION? D,40
WHAT ACTION? I,100
WHAT ACTION? D,90
WHAT ACTION? D,10
ITEM NOT ON LIST
WHAT ACTION? P,2

ITEM              VALUE
 6                 20
 4                 20
 2                 30
 1                 50
 7                 100

DONE
MORE ACTIVITY? Y
WHAT ACTION? I,10
WHAT ACTION? I,90
WHAT ACTION? I,20
WHAT ACTION? I,5
WHAT ACTION? I,100
WHAT ACTION? D,30
WHAT ACTION? P,2
```

Figure 3, continued on page 62

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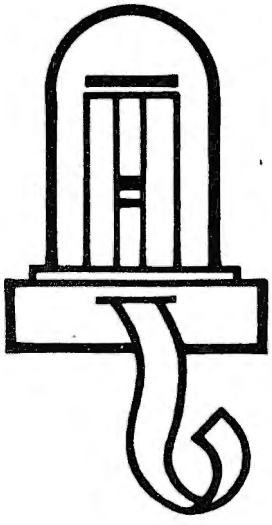

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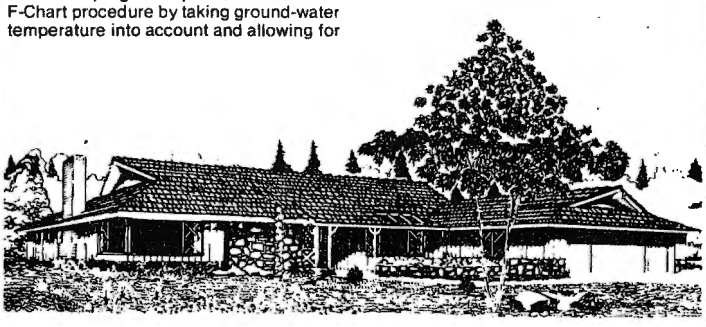

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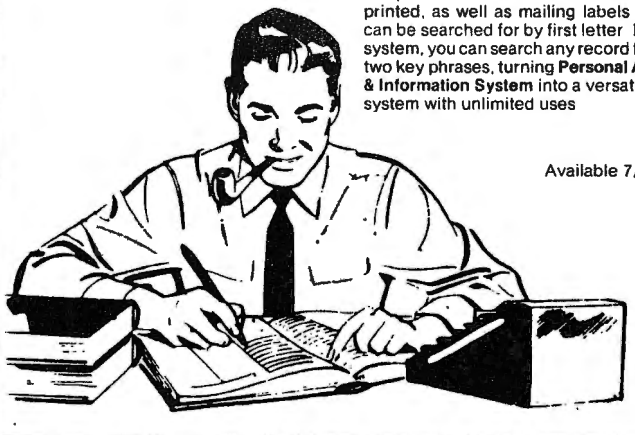

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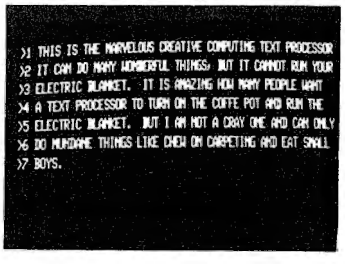

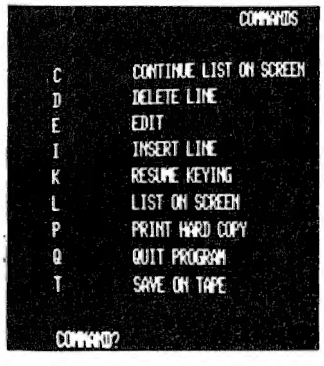

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Circle # 33

```
ITEM              VALUE
 5                 5
 8                 10
 10                20
 6                 20
 4                 20
 1                 50
 9                 90
 3                 100
 7                 100

DONE
MORE ACTIVITY? N
READY
>
```

Figure 3. Sample input and output for Listing 2. Ascending order with space recovery.

```
>FOR K=0 TO 10: PRINTL(K),D(K),F(K):NEXT
 5                 9                 2
 9                 50                0
 0                 0                 -1
 7                 100               0
 1                 20                0
 8                 5                 0
 4                 20                0
-1                 100               0
 10                10                0
 3                 90                0
 6                 20                0
READY
>
```

Figure 4. Left is Link array L, center is Data array D, right is free space links F. First items are: L(0)=5, Location of smallest element; D(0)=9, Number of slots in use; F(0)=2, next free space slot available.

Listing 1
(Color computer users delete line 50)

```
1 REM LINKING SUBROUTINES DEMO
2 REM     R STRAW, 1981
3 REM TRS-80 MOD I LEVEL II CODE
50 DEFINT I - N
100 CLS : INPUT "ARRAY SIZE DESIRED";N
110 DIM D(N), I(N)
120 GOTO 1000
130 '
200 REM LINK ASCENDING : DATA IN ARRAY
  D, LINKS IN L
210 REM LINK HEADER=L(0); INDEX TO
  INCOMING ITEM = I
220 KL = 0 : IF I > 1 THEN 240
230 L(0) = 1 : L(1) = - 1 : RETURN
  'FIRST ITEM
240 KN = L(KL) : IF D(I) > D(KN) THEN
  260
250 L(KL) = I : L(I) = KN : RETURN
  'SMALLER ITEM
260 IF L(KN) < 0 THEN 280
270 KL = KN : GOTO 240 'LARGER ITEM
280 L(KN) = I : L(I) = - 1 : RETURN
  'LARGEST ITEM
290 '
300 REM LINK DESCENDING: DATA IN D,
  LINKS IN L
310 REM LINK HEADER = L(0), INDEX TO
  INCOMING ITEM = I
320 KL = 0 : IF I > 1 THEN 340
330 L(0) = 1 : L(1) = - 1 : RETURN
  'FIRST ITEM
340 KN = L(KL) : IF D(I) <= D(KN) THEN
  360
350 L(I) = KN : L(KL) = I : RETURN
  'LARGER ITEM
360 IF L(KN) < 0 THEN 380
370 KL = KN : GOTO 340 'SMALLER ITEM
380 L(KN) = I : L(I) = - 1 : RETURN
  'SMALLEST ITEM
390 '
400 REM LOCATE AND DELETE ITEM
  (NO SPACE RECOVERY)
410 REM LINKS IN L, DATA IN D,
  ITEM IN X
420 KL = 0 'START SEARCH
430 KI = L(KL) : KN = L(KI) : IF X = D(
  KI) THEN 470 'AT KI
440 IF KN < 0 THEN 460 'END OF LIST
450 KL = KI : GOTO 430
  'CONTINUE SEARCH
460 PRINT "ITEM NOT IN LIST" : RETURN
470 L(KL) = KN : L(KI) = 0 : D(KI) = 0
  : RETURN 'SKIP OVER KI
990 '
1000 PRINT : PRINT "START ACTIVITY" :
  I = 0
1010 PRINT "FOR INPUT ENTER I, X (WHERE
   X IS VALUE OF ITEM)"
1020 PRINT "TO DELETE ENTER D, X (SAME
  CONVENTION)"
1025 PRINT "TO PRINT LIST ENTER P, X (X
   = ANY NUMBER)
1030 INPUT "WHAT ACTION"; A$, X
1035 IF A$ = "P" THEN 1500
1040 IF A$ = "D" THEN 1100
1045 I = I + 1 : IF I > N THEN PRINT "N
  O SPACE LEFT" : GOTO 1030
1050 D(I) = X : GOSUB 300
```

```
1060 GOTO 1030
1100 IF I < 1 THEN PRINT "LIST EMPTY" :
   GOTO 1030
1110 GOSUB 400
1120 GOTO 1030
1500 CLS
2000 REM READ LINKED LIST
2010 KL = 0 : PRINT "ITEM", "VALUE"
2020 KI = L(KL)
2030 PRINT KI, D(KI)
2040 ' AND ANY OTHER PROCESSING DESIRED

2100 IF L(KI) > 0 THEN KL = KI : GOTO 2
  020
2200 PRINT : PRINT "DONE
2210 INPUT "MORE ACTIVITY"; Y$
2220 IF Y$ = "Y" THEN 1030
2230 END
```

Listing 2
(Color computer users delete line 50)

```
1 REM LINKING SUBROUTINES DEMO
2 REM    R STRAW, 1981
3 REM TRS-80 MOD I LEVEL II CODE
4 REM (SPACE RECOVERY VERSION)
50 DEFINT F - N
100 CLS : INPUT "ARRAY SIZE DESIRED";N
110 DIM D(N), I(N), F(N)
120 INPUT "IS THIS A NEW LIST"; Y$
130 IF Y$ <> "Y" THEN 1000
140 REM INITIALIZE F, L ARRAYS AND D(0)
   COUNTER
150 FOR I = 0 TO N - 1 : F(I) = I + 1 :
   L(I) = 0 : NEXT I
160 F(N) = - 1 : L(N) = 0 : D(0) = 0
180 GOTO 1000
190 '
200 REM LINK ASCENDING FROM FREE SPACE
  ARRAY : ITEM IN X
210 KI = F(0) : IF KI < 0 THEN 290 'NO
  SPACE LEFT
220 F(0) = F(KI) : F(KI) = 0 : D(KI) =
  X : KL = 0 'TAKE SPACE, INSERT
225 D(0) = D(0) + 1 : IF D(0) > 1 THEN
  240 'ITEM COUNTER
230 L(0) = KI : L(KI) = - 1 : RETURN
  'FIRST ITEM
240 KN = L(KL) : IF D(KI) > D(KN) THEN
  260
250 L(KL) = KI : L(KI) = KN : RETURN
  'SMALLER ITEM
260 IF L(KN) < 0 THEN 280
270 KL = KN : GOTO 240 'LARGER ITEM
280 L(KN) = KI : L(KI) = - 1 : RETURN
  'LARGEST ITEM
290 PRINT "NO MORE SPACE AVAILABLE" :
  RETURN
300 '
400 REM DELETE FROM LIST, RECOVER SPACE
  : ITEM IS IN X
410 IF D(0) < 1 THEN PRINT "LIST IS EMP
  TY" : RETURN
420 KL = 0
430 KI = L(KL) : KN = L(KI) : IF X = D(
  KI) THEN 470 'FOUND AT KI
440 IF KN < 0 THEN 460
450 KL = KI : GOTO 430 'CONTINUE
460 PRINT "ITEM NOT ON LIST" : RETURN
  'NOT FOUND
465 REM ITEM FOUND, LOCATE AND RESET L
  AND F LINKS
470 L(KL) = KN : L(KI) = 0 : D(0) = D(0
  ) - 1 : D(KI) = 0
480 KF = F(KI) : KR = 0 : FOR KX = 0 TO
   N
490 IF F(KX) = - 1 THEN KR = KX
500 IF F(KX) = KI THEN F(KX) = KF 'LINK
   NOW FREE SP.
510 NEXT KX
520 F(KI) = - 1 : F(KR) = KI : RETURN
  'KI TO END OF FREE SP.
990 '
1000 REM  READ ARRAYS AND LINKS IF NOT
  NEW (OMITTED)
1010 PRINT "FOR INPUT ENTER I, X (WHERE
   X IS VALUE OF ITEM)"
1020 PRINT "TO DELETE ENTER D, X (SAME
  CONVENTION)"
1025 PRINT "TO PRINT LIST ENTER P, X (X
   = ANY NUMBER)"
1030 INPUT "WHAT ACTION"; A$, X
1035 IF A$ = "P" THEN 1500
1040 IF A$ = "D" THEN 1100
1050 GOSUB 200
1060 GOTO 1030
1100 REM
1110 GOSUB 400
1120 GOTO 1030
1500 IF D(0) < 1 THEN PRINT "LIST IS EM
  PTY" : GOTO 1030
2000 REM READ LINKED LIST
2010 KL = 0 : PRINT "ITEM", "VALUE"
2020 KI = L(KL)
2030 PRINT KI, D(KI)
2040 'AND ANY OTHER PROCESSING DESIRED
2100 IF L(KI) > 0 THEN KL = KI : GOTO 2
  020
2200 PRINT : PRINT "DONE"
2210 INPUT "MORE ACTIVITY"; Y$
2220 IF Y$ = "Y" THEN 1030
2500 END
```

Happiness is a printer

Experience with the Epson MX-80 printer

Larry Krengel, Elmhurst, IL

In the fall of 1978 I bought my TRS-80. I spent what seemed to my wife to be thousands of hours talking with "Tom" (the name we have affectionately given to our computer). I enjoyed myself completely.

In some of my more defensive moments, I found myself trying to justify Tom's place in our family. I would find jobs which he could do better than any other member of the family — like counting up to a thousand fast. He was even asked to do more serious jobs like keep a family budget or make up practice math problems.

Tom was always happy to try to prove himself. But it was almost as if he had to do it with one hand tied behind his circuit board ... he had no printer!

For the following two years we (Tom and I) often considered the possibility of adding a printer. That, however, would require an expansion interface, not to mention the printer itself. We could easily have invested (squandered?) more than the original price of Tom!

We watched, shopped, read and sent for information from all the manufacturers. The prices started to come down, but the type quality in the lower priced printers was enough to cause Tom to send out an error message. I got tired of looking at dots which were supposed to look like letters.

Then one exciting morning while I was being my usual computer-store bum, I happened to meet "The Man from Epson". He did not wear a cape, nor did he swing from spiderwebs, but he did carry a printer with him.

That was when I met the MX-80: four widths of print, three densities of type and a beautiful white case with little green lights. What a mate she would make for Tom!

Within a week Tom was sitting on an Expansion Interface and had an MX-80 at his side.

The real story

Now, taking my tongue out of my cheek, I would like to relate the real story of getting to know the MX-80. It is one of frustration which I experienced needlessly.

Before I get to the real story, let me preface this tale with the statement that it was, without a doubt, worth all the work. I wish, however, that someone had written this article for me to read before I bought my MX-80.

The day I bought it, I read the manual on the way home when we stopped to have a hamburger. Therefore, I was ready to start printing as soon as I walked in the door. I had also picked up a cable which would, supposedly, connect the printer to either the keyboard or the interface. It didn't fit the keyboard, so I waited for the Expansion Interface to arrive the next day.

Now I was ready to print, except for the DIP switches which the manual talked about. The manual shows a drawing of a circuit board but nowhere does it say where to find it. After some consideration I removed the top case and almost ripped off the wires which tie the top panel switches to the base.

With the switch wires removed, the top came easily free. I was inside and right there in front of my eyes was the circuit board. Rotating the diagram in the manual, I quickly located the switches. They were numbered, almost imperceptibly, and little plastic covers were there to hold the switches in whatever position the operator placed them. With the switches set and the top back in place, Tom turned out his first hard copy. It was beautiful.

The next step was to learn how to make the new gadget do all those neat little things which sold me on it. As you may have guessed, the manual is far from complete. After almost a week of frustration and many phone calls, I was finally directed to Dr. David A. Lien's "MX-80 User's Manual". It is a 100-page guided journey through the MX-80 and worth every penny. Armed with it, I accomplished in 24 hours what I had failed to accomplish in the entire preceeding week.

In retrospect, I always have great wisdom. Perhaps those of you who are in the position I was in only a few short months ago can benefit from these thoughts.

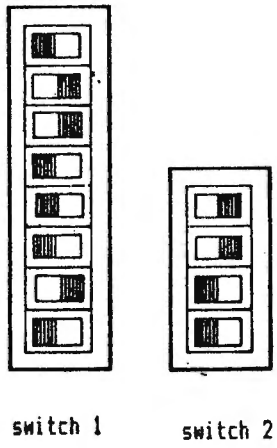


Figure 1
The dip switch settings presently used by the author.

Any change in hardware configuration (adding a printer, a disk drive, or a MODEM, to name a few) of your computer is bound to bring some difficult times. You will not be disillusioned by adding an MX-80. It may be trying, but it is worth it. Before you do anything with the MX-80, obtain a copy of Dr. Lien's book. His advice is sound.

The DIP switches are a source of mystery to me. I have settled on a set of positions which work well for me. They may for you too. Incidently, they are not the same as in Epson's manual or Dr. Lien's book. (See Figure 1)

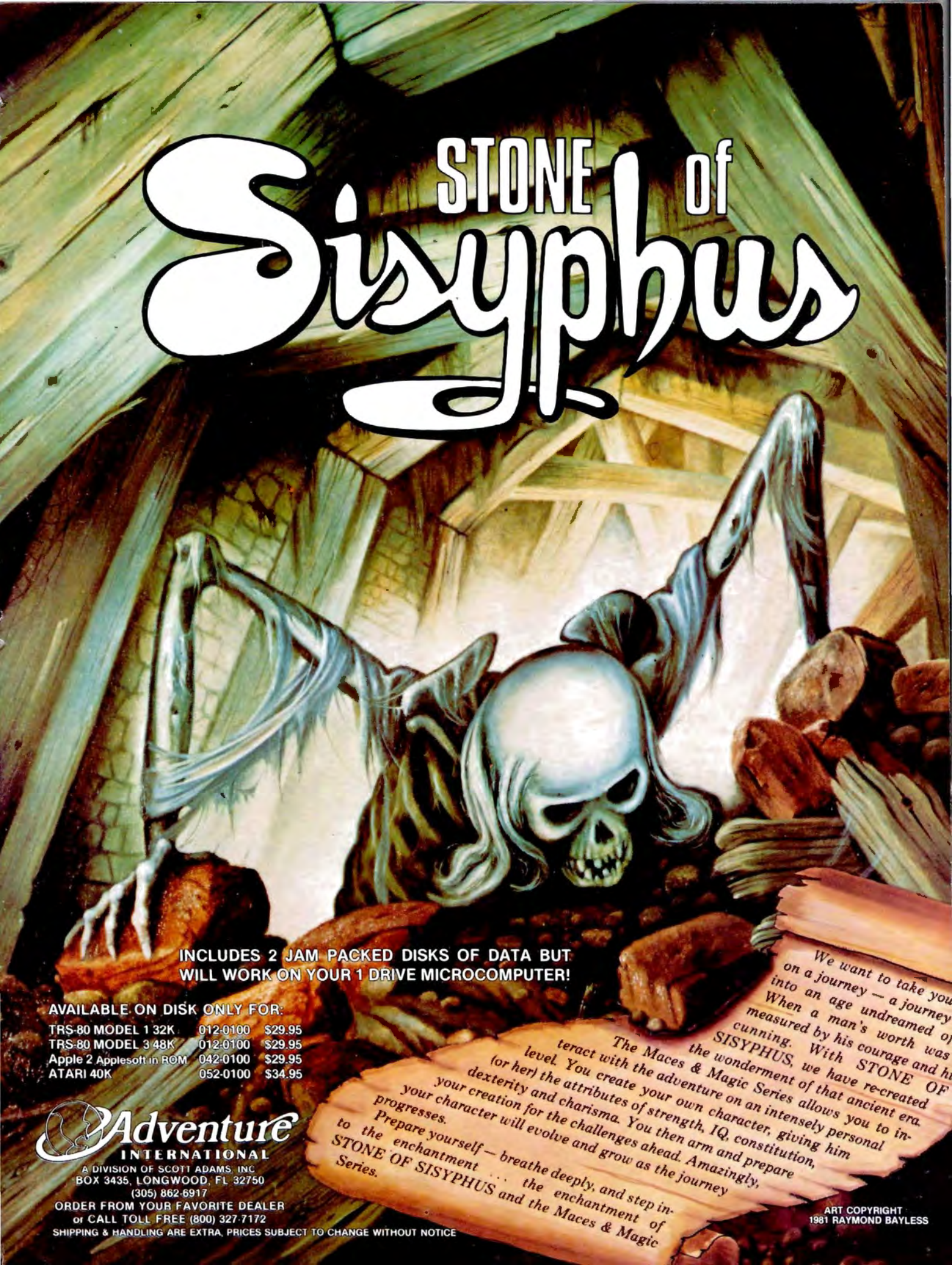
The reason Epson included a "TRS-80 mode" (which Dr. Lien suggests you do *not* use) is the code differences for graphics in the various computers. However, in order to use the TRS-80 mode the computerist must sacrifice a number of the finer options of the MX-80. Fortunately, the user manual provides an alternate plan.

One little quirk which confused me slightly came when the MX-80 would apparently not cancel different formatting codes. This had to do with an internal buffer memory. The characteristic is altered by the DIP switch settings. When in doubt, turn the printer completely off, then back on. It will revert to standard print.

The MX-80 is a great printer, although the lack of documentation was disappointing. If you buy an MX-80, also buy Dr. Lien's book.

Even though a TRS-80 can't smile, I can just feel the happiness radiating from Tom every time I go into my den.

Indeed, happiness is an MX-80 printer mated to a TRS-80. ■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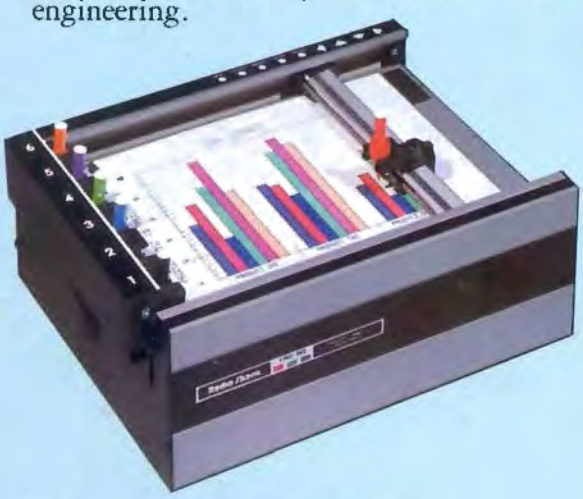

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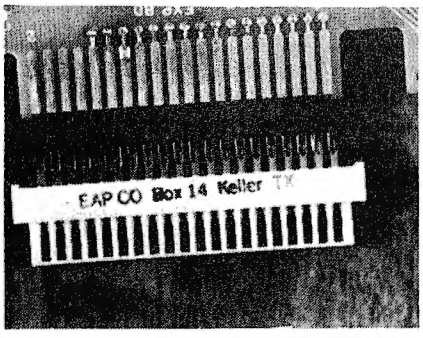
For Model I TRS-80

The TRS-80 Model I microcomputer is probably the world's most popular. It is extremely reliable considering its complexity and its cost effectiveness. However, like Achilles, it has its weak points. The number one annoyance would have to be keybounce. However, there are several solutions to this problem, including frequent cleaning of the key contacts, loading special software drivers, and using Disk BASIC. There is one problem that is not so easy to solve; namely, frequent disk re-boots and other assorted mayhem caused by oxidation of the card edge connectors between the keyboard and the expansion interface.

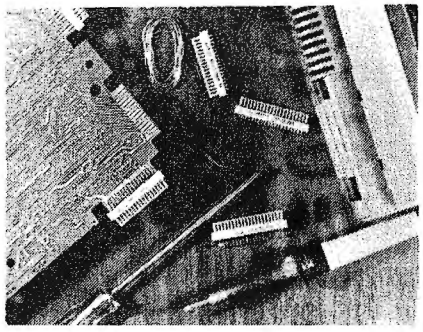
These connectors are simply tin and lead surfaces, subject to oxidation and corrosion. When these surfaces become oxidized to the point that there is a loss of signal quality, disks will re-boot, keyboards will lock up, and glitches will cause all sorts of problems.

What are the alternatives? Well, you could sell your Model I and get a



Model III. (I wonder how your wife would like that idea?) You could pull off the cable and clean the contacts every month or so, but that would eventually wear out the contacts. You could invest in an electroplating outfit and gold plate the contacts as an acquaintance of mine has done on 12 of his machines. Or you could send $18.95 to the E.A.P. Company and solve your re-booting problems forever. In return, you will receive two gold plated connectors that solder on to the edge connectors of the computer.

How about installation? It is a snap if you have some experience with soldering. No, I definitely would not recommend installation by a novice. Have someone with soldering experience install them. A television repair shop would probably do it for a small charge. Before you begin, make sure that you have the following: a low wattage soldering iron (35 watts maximum) with a 1/8th inch tip, high quality resin-core solder, a medium Phillips screwdriver, and a pink pearl or equivalent eraser to clean the contacts. The instructions guide you step by step on disassembly of both the keyboard and expansion interface. Both contacts are thoroughly cleaned

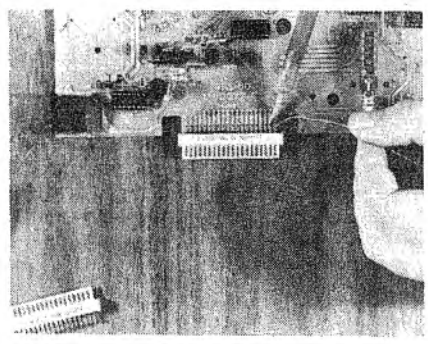


with the eraser, and then the Goldplugs are soldered in place.

Do the Goldplug 80's work? I installed them about a month ago, and have not had a single glitch, which is unusual for my computer. The friend who gold-plated his machines reports 100% reliability with his method also. In fact, he reports that there was a one-volt increase in signal amplitude on the floppy disk signal lines after gold plating. Gold plating the contacts is apparently the way to go!

Since the edge connectors are soldered surfaces, very little solder has to be applied to the connectors. Before you reassemble the computer, check to make sure that there are no shorts between pins of the connectors.

Are the Goldplugs for everyone? It depends. Before deciding to install the Goldplugs, consider this: if you make a mistake and damage your computer, it is probably going to cost a lot to have it repaired. Also consider, if you install these connectors, you have voided the limited warranty. It would probably be safe to say that 95% of all Model I keyboards are out of warranty. However, there is another problem with out of warranty repairs. Radio



Shack does not like unauthorized modifications. If your unmodified machine were to develop a severe problem that a simple diagnostic would not detect, the normal practice is to exchange the entire circuit board for a nominal fee. In the case of a modified board, Radio Shack will exchange the board, but at the full replacement cost. Fortunately, the Goldplugs are removable by simply unsoldering them. For me, they were the answer to a problem that had been plaguing me for some time. The company also sells Goldplugs for the disk port, printer port, screen printer port and RS-232 port for $9.95 each. A complete set of all six plugs is $54.95 ■

Jim Klaproth

Hog jowl mansion

A zany adventure for all TRS-80 models

Jon J. Waples, East Greenwich, RI

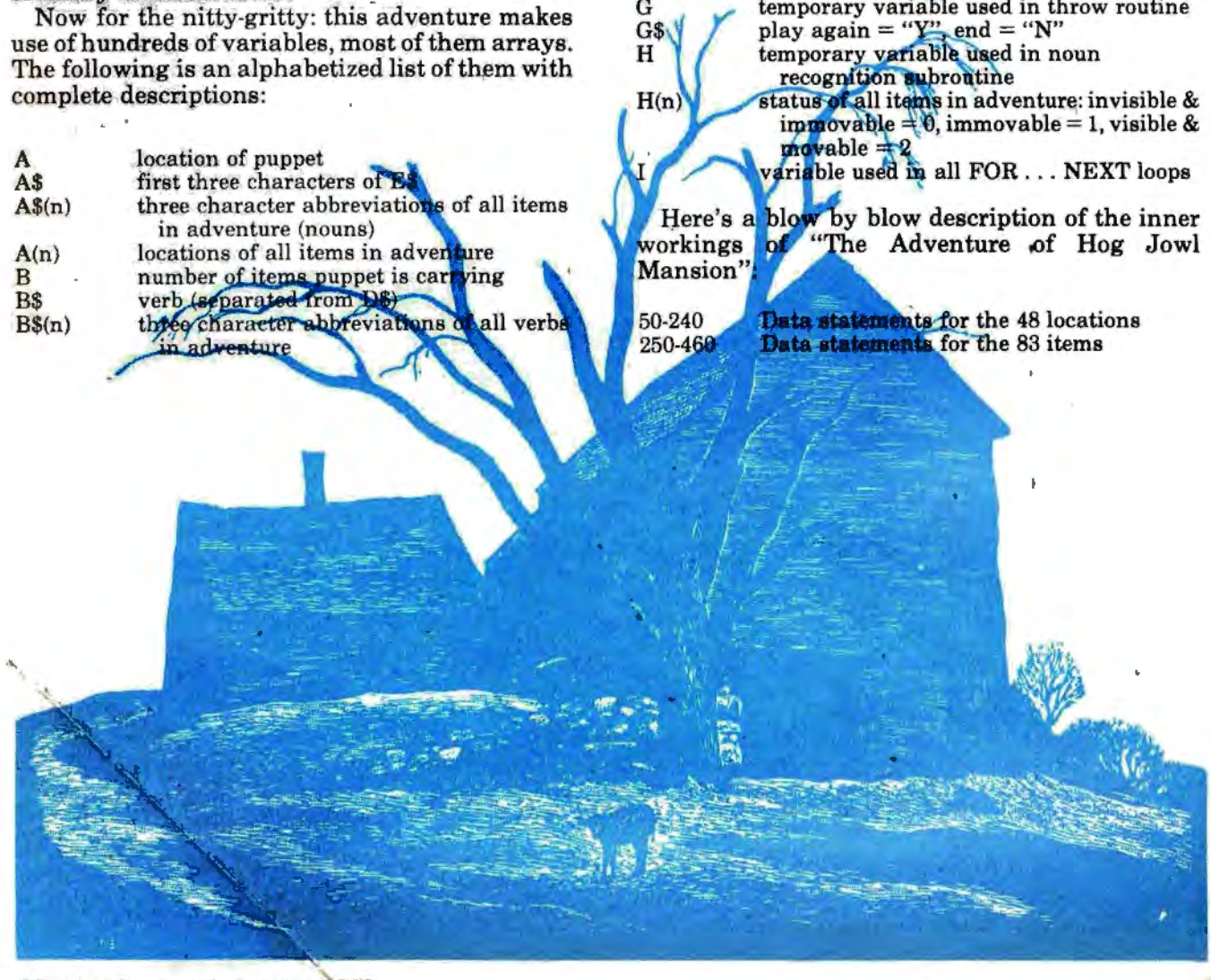
Did you ever have the desire to escape reality for a while and assume the identity of someone else in another place on a fictitious endeavor? Well, this program can do it all for you. You are a nasty repossessor who commands his puppet (or flunky?) to do his dirty work. Since your puppet is relatively unintelligent, and has a vocabulary of only thirty-eight verbs and ninety-two nouns, you can communicate to him in only one and two word sentences. Some words he knows are: take, drop, look, help, score, inventory, and quit. You can help your puppet carry out his mission by using ordinary common sense.

Now for the nitty-gritty: this adventure makes use of hundreds of variables, most of them arrays. The following is an alphabetized list of them with complete descriptions:

A	location of puppet
A$	first three characters of E$
A$(n)	three character abbreviations of all items in adventure (nouns)
A(n)	locations of all items in adventure
B	number of items puppet is carrying
B$	verb (separated from D$)
B$(n)	three character abbreviations of all verbs in adventure
B(n)-G(n)	transition arrays for all locations in adventure
C	temporary variable used in clearing top of screen
C$	line that separates top of screen from bottom
C$(n)	description of all locations in adventure
D	outside = -1, inside = 0
D$	entire command
D$(n)	description of all items in adventure
E	total number of treasures stored
E$	noun (separated from D$)
F	total percentage of treasures stored
F$	obvious exits in present location
G	temporary variable used in throw routine
G$	play again = "Y", end = "N"
H	temporary variable used in noun recognition subroutine
H(n)	status of all items in adventure: invisible & immovable = 0, immovable = 1, visible & movable = 2
I	variable used in all FOR . . . NEXT loops

Here's a blow by blow description of the inner workings of "The Adventure of Hog Jowl Mansion":

50-240	Data statements for the 48 locations
250-460	Data statements for the 83 items



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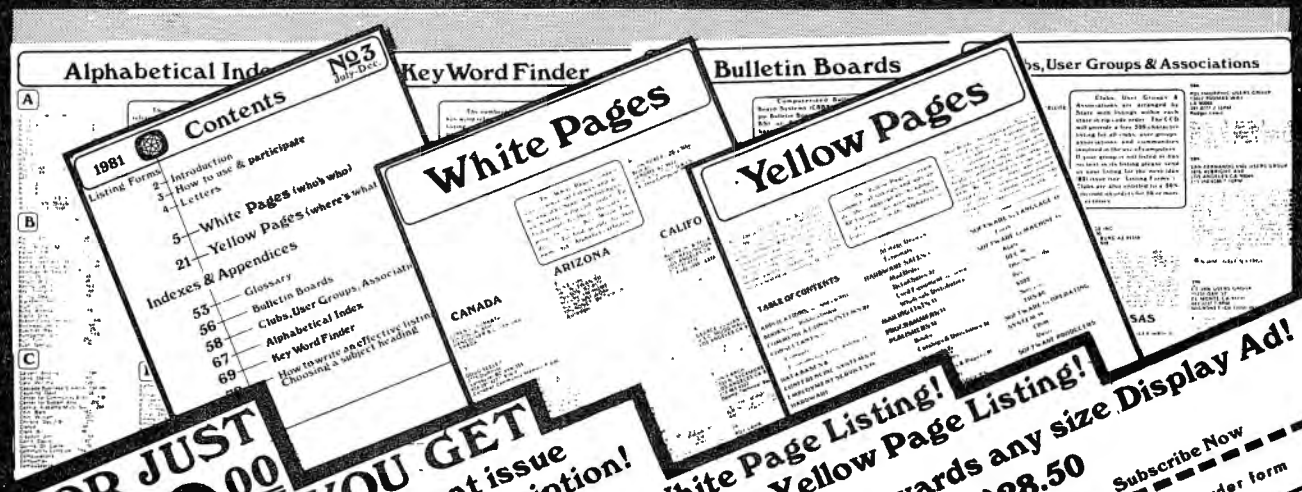

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Circle # 38

460-480	Data statement for 36 verbs
490	Clear all variables, define them as integer
500	Dimension arrays
510-530	Read data into arrays
540	Set up remaining variables
550	Print "Welcome to . . . " message
560-640	Main loop
650-950	Go, walk, run, n, s, e, w, u, d, climb and enter routine
960-1030	Take, get
1040-1100	Take inventory, inventory, I routine
1110-1190	Throw routine
1200-1220	Drop routine
1230-1310	Shoot routine
1320-1340	Turn routine
1350	Jump routine
1360-1400	Move routine
1410-1480	Open routine
1490	Score routine
1500-1530	Push routine
1540-1560	Pick routine
1570-1590	Break routine
1600-1620	Insert routine
1630	Unlock routine
1640-1650	Unbolt routine
1660-1670	Drink routine
1680-1720	Light routine
1730-1740	Pull routine
1750-1860	Look routine
1870-1920	Read routine
1930-1990	Help routine
2000-2190	Erase everything above line, print location, visible items, and obvious exits subroutine
2200-2210	Noun recognition subroutine
2220	Print "I can't do that . . . yet!"
2230	Print "I don't see it here."
2240	Print "I must be stupid, but I don't understand what you mean."
2250-2270	Print score, check for win
2280-2330	Death routine

Happy adventuring! Whether you be a novice or a "grand master". Remember, beware of the dog.

Changes required for Model II operation.

```
45 CLS : PRINT CHR$(2);
540 A = 38 : C$ = "<" + STRING$(78, 45
) + ">"
550 PRINT@ 722, "WELCOME TO THE ADVENT
URE OF HOG JOWL MANSION: VERSION 1.12"
 : PRINT@ 824, "BY JON J. WAPLES"
570 GOSUB 2000 : D$ = "" : E$ = "" : A
$ = "" : PRINT@ 1840, CHR$(1); : INPUT
 " -------> TELL ME WHAT TO DO"; D$ :
 PRINT CHR$(2);
1160 G = I : PRINT@ 1840, CHR$(1); : I
NPUT "  -------> TELL ME WHAT TO DO";
E$
2000 PRINT@ 0, CHR$(2); : FOR I = 1 TO
 8 : PRINT STRING$(80, 32); : NEXT I
2010 PRINT @ 0, "I AM "; : IF LEFT$(C$
(A), 1) = "*" THEN PRINT RIGHT$(C$(A),
 LEN(C$(A)) - 1); : D = - 1 ELSE PRINT
 C$(A); : D = 0
2030 PRINT : PRINT : PRINT "VISIBLE IT
EMS: "
2320 GOSUB 2000 : PRINT@ 1840, CHR$(1)
; : INPUT "DO YOU WANT TO PLAY THIS AD
VENTURE AGAIN"; G$
```

Changes required for Color computer operation.

```
45 CLS
490 CLEAR 200
540 A = 38 : C$ = "<" + STRING$(
30, 45) + ">"
550 CLS : PRINT@ 226, "WELCOME T
O THE ADVENTURE OF" : PRINT " HO
G JOWL MANSION: VERSION 1.12" :
PRINT@ 328, "BY JON J. WAPLES"
570 GOSUB 2000 : D$ = "" : E$ =
"" : A$ = "" : PRINT@ 480,; : IN
PUT ">WHAT NOW"; D$
1130 PRINT "IN ONE WORD TELL ME
WHAT AT."
1160 G = I : PRINT@ 480,; : INPU
T ">WHAT NOW"; E$
2000 PRINT @0,;: FOR I = 1 TO 6
: PRINT STRING$(32, 32); : NEXT
I
2010 PRINT @0, "I AM "; : IF LEF
T$(C$(A), 1) = "*" THEN PRINT RI
GHT$(C$(A), LEN(C$(A)) - 1); : D
 = - 1 ELSE PRINT C$(A); : D = 0
2030 PRINT : PRINT "VISIBLE ITEM
S: ";
2060 IF 31 - POS(0) < LEN(D$(I))
 THEN PRINT
2320 GOSUB 2000 : PRINT@ 480,; :
 INPUT "DO YOU WANT TO PLAY THIS
 ADVENTURE AGAIN"; G$
```

Main listing, for Models I and III

This program has been renumbered and spaced for clarity, Model I/III 16K owners *must* compress the statements heavily. Color computer owners must have 32K, and the program may require some reformatting of print statements to prevent breaking up words.

```
10 REM *       THE ADVENTURE OF       *
20 REM *       HOG JOWL MANSION       *
30 REM *         JON J. WAPLES        *
```

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```
40 REM *        JULY 14, 1981        *
50 DATA "IN A DUMBWAITER.", 0, 0, 2, 0,
   21, 0, "IN A LONG HALLWAY.", 0, 6, 3
   , 0, 0, 0, "IN A WORKSHOP.", 0, 0, 0,
   2, 0, 0
60 DATA "AT THE BOTTOM OF A SECRET PASS
   AGE.", 0, 0, 0, 0, 0, 0, "IN A LABYRI
   NTH OF TUNNELS.", 0, 9, 0, 0, 0, 0
70 DATA "IN A TORTURE CHAMBER.", 2, 0,
   7, 0, 0, 0, "IN A LABYRINTH OF TUNNEL
   S.", 0, 11, 8, 6, 0, 0, "IN A LABYRIN
   TH OF TUNNELS.", 0, 12, 0, 7, 0, 0
80 DATA "IN A LABYRINTH OF TUNNELS.", 5
   , 0, 10, 0, 0, 0, "IN A LABYRINTH OF
   TUNNELS.", 0, 0, 11, 9, 0, 0, "IN A L
   ABYRINTH OF TUNNELS."
90 DATA 7, 0, 0, 10, 0, 0, "IN A LABYRI
   NTH OF TUNNELS.", 8, 16, 0, 0, 0, 0,
   "AT THE LIGHT AT THE END OF THE TUNNE
   L.", 0, 0, 14, 0, 0, 0
100 DATA "IN A LABYRINTH OF TUNNELS.  I
    SEE A LIGHT TO THE WEST.   ", 0, 0,
   15, 13, 0, 0, "IN A LABYRINTH OF TUNN
   ELS.", 0, 0, 16, 14, 0, 0
110 DATA "IN A LABYRINTH OF TUNNELS.",
   12, 20, 0, 15, 0, 0, "IN A LABYRINTH
   OF TUNNELS.", 0, 0, 18, 0, 0, 0, "IN
   A LABYRINTH OF TUNNELS."
120 DATA 0, 0, 19, 17, 0, 0, "IN A LABY
   RINTH OF TUNNELS.", 0, 0, 20, 18, 0,
   0, "IN A LABYRINTH OF TUNNELS.", 16,
   0, 0, 19, 0, 0
130 DATA "IN A DUMBWAITER.", 0, 25, 0,
   0, 43, 1, "IN THE TRANSPORTER ROOM OF
    THE STARSHIP ENTERPRISE.  HEY!
WHERE'S MR. SPOCK?"
140 DATA 0, 26, 0, 0, 0, 0, "IN LORD HO
   G JOWL'S DEN.", 0, 27, 0, 0, 0, 0, "I
   N A SECRET PASSAGE.", 0, 0, 0, 23, 0,
    0
150 DATA "IN A KITCHEN.", 0, 29, 26, 0,
    0, 0, "AT THE WEST END OF A HALLWAY.
   ", 22, 30, 27, 25, 0, 0, "AT THE EAST
    END OF A HALLWAY."
160 DATA 23, 31, 28, 26, 0, 0, "IN A BE
   DROOM.", 0, 0, 0, 27, 0, 0, "IN A PAN
   TRY.", 25, 0, 0, 0, 0, 0
170 DATA "IN THE LOBBY.", 26, 34, 0, 0,
    0, 0, "IN THE LIVING ROOM.", 27, 0,
    0, 0, 0, 0, "IN A WALK IN CLOSET.", 2
   8, 0, 0, 0, 0, 0, "*ON AN UNCUT LAWN.
   "
180 DATA 0, 0, 34, 0, 0, 0, "*AT THE FR
   ONT OF HOG JOWL MANSION.", 0, 36, 0,
   33, 0, 0, "*ON A NARROW LEDGE.", 0, 0
   , 0, 0, 0, 0
190 DATA "*AT THE GATE TO HOG JOWL MANS
   ION.", 0, 0, 0, 0, 0, 0, "ON A BUS NA
   MED 'DESIRE'.", 0, 0, 0, 0, 0, 0, "IN
    A BUS TERMINAL."
200 DATA 0, 0, 39, 0, 0, 0, "IN A RESTR
   OOM.", 0, 0, 0, 38, 0, 0, "IN A WATER
    CLOSET.", 0, 0, 0, 39, 0, 0, "IN HOB
   OKEN, NEW JERSEY.", 38, 42, 38, 42, 3
   8, 42
210 DATA "-- UH OH!  THERE'S A GUY HERE
    WITH A BIG NOSE AND A SPEECH
IMPEDIMENT.  ARRGH!  IT'S CARL SAGAN.",
    0, 0, 0, 0, 0, 0
220 DATA "IN A DUMBWAITER.", 0, 0, 44,
   0, 0, 21, "IN A ROOM BEARING THE SCEN
   T OF ALCOHOL.", 0, 0, 45, 0, 0, 0, "I
   N A STORAGE ROOM.", 0, 46, 0, 44, 0,
   0
230 DATA "IN A DUSTY ATTIC.", 45, 0, 47
   , 0, 0, 0, "IN AN EVIL SMELLING ROOM.
   ", 0, 0, 0, 46, 0, 0
240 DATA "AT THE TOP OF AN ALUMINUM PSE
   UDO CHRISTMAS TREE.          ", 0, 0,
    0, 0, 0, 31
250 DATA "SIGN SAYS: FLOOR 1", "SIG", 1
   , 1, "PLAQUE", "PLA", 1, 1, "DUMBWAIT
   ER", "DUM", 1, 2, "HAMMER", "HAM", 2,
    3, "PLIERS", "PLI", 2, 3, "WRENCH"
260 DATA "WRE", 2, 3, "ELECTRIC BUZZ SA
   W", "SAW", 1, 3, "PUSHBUTTON SWITCH",
    "SWI", 1, 3, "STICK OF DYNAMITE", "D
   YN", 2, 3
270 DATA "LOCKED METAL DOOR", "DOO", 1,
    3, "LOCKED METAL DOOR", "DOO", 1, 4,
    "SPIRAL STAIRCASE LEADING UP", "STA"
   , 1, 4
280 DATA "CORPSE", "COR", 2, 6, "*RICHA
   RD NIXON WRISTWATCH*", "WAT", 2, 6, "
   PUDDLES OF BLOOD AND GORE", "PUD", 1,
    6
290 DATA "DISEMBODIED LIMBS", "LIM", 2,
    6, "*DONALD DUCK NITE LITE*", "LIT",
    2, 13, "SIGN SAYS: FLOOR 2", "SIG",
   1, 21, "PLAQUE", "PLA", 1, 21
300 DATA "*LAVA LAMP*", "LAM", 2, 23, "
   BOOKCASE", "BOO", 1, 23, "SECRET PASS
   AGE", "PAS", 0, 23, "*SECRET DECODER
   RING*", "RIN", 0, 24
310 DATA "DESK", "DES", 1, 24, "DRAWER"
   , "DRA", 1, 24, "SPIRAL STAIRCASE LEA
   DING DOWN", "STA", 0, 24, "REFRIGERAT
   OR", "REF", 1, 25
320 DATA "BUTCHER BLOCK", "BLO", 1, 25,
    "*GINSU KNIFE*", "KNI", 0, 25, "DUMB
   WAITER", "DUM", 1, 25, "PIGGY BANK",
   "BAN", 2, 28, "WINDOW", "WIN", 1, 35
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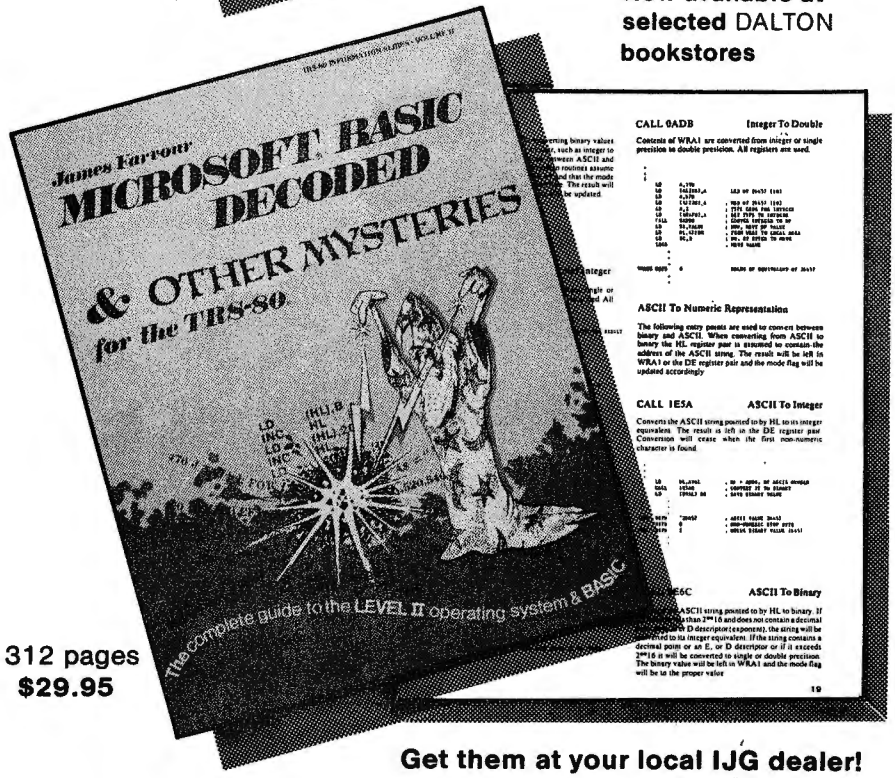

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```
330 DATA "DIME", "DIM", 0, 28, "LARGE B
  ED", "BED", 1, 28, "*CEREMONIAL BED P
  AN*", "PAN", 0, 28, "WALK IN CLOSET",
   "CLO", 1, 28
340 DATA "*BILLY JOWL (SIC)  RECORD AL
  BUM*", "ALB", 2, 29, "UMBRELLA", "UMB
  ", 2, 30, "*ALUMINUM PSEUDO CHRISTMAS
   TREE*", "TRE", 1, 31
350 DATA "BOLTS", "BOL", 0, 31, "WINDOW
  ", "WIN", 1, 31, "*DICE EARRINGS*", "
  EAR", 2, 32, "SPRINKLER SPRAYING WATE
  R", "SPR", 1, 33
360 DATA "*PLASTIC FLAMINGO*", "FLA", 0
  , 33, "SIGN SAYS: LOOK SP...", "SIG",
   1, 33, "WELCOME MAT", "MAT", 2, 34,
  "KEY", "KEY", 0, 34
370 DATA "LARGE DOOR", "DOO", 1, 34, "M
  AILBOX", "MAI", 1, 36, "STICK", "STI"
  , 2, 36, "SIGN SAYS: BEWARE OF DOG",
  "SIG", 1, 36
380 DATA "MANSION", "MAN", 1, 36, "GUAR
  D DOG", "DOG", 1, 36, "POSTCARD", "PO
  S", 0, 36, "NOTE", "NOT", 0, 36, "PAP
  ER CLIP", "CLI", 0, 36
390 DATA "BUS", "BUS", 1, 36, "BUSDRIVE
  R", "DRI", 1, 37, "GATE", "GAT", 1, 3
  7, "BUS TERMINAL", "TER", 1, 37, "BUS
  ", "BUS", 1, 38, "BILLBOARD", "BIL",
  2, 38
400 DATA "LOCKED WATER CLOSET", "CLO",
  1, 39, "SINK", "SIN", 1, 39, "LARGE S
  PIGOT", "SPI", 1, 39, "DAISY SADDLEPA
  L BB GUN", "GUN", 2, 39
410 DATA "TOILET", "TOI", 1, 40, "SIGN
  SAYS: LEAVE *TREASURES* HERE THEN SAY
  : SCORE", "SIG", 1, 40, "SIGN SAYS: F
  LOOR 3", "SIG", 1, 43
420 DATA "PLAQUE", "PLA", 1, 43, "DISTI
  LLERY", "DIS", 2, 44, "*FOGHORN LEGHO
  RN JELLY GLASSES*", "GLA", 2, 44, "DU
  MBWAITER", "DUM", 1, 44
430 DATA "55 GALLON DRUMS FILLED WITH A
  LCOHOL", "ALC", 1, 45, "CLOSED DOOR",
   "DOO", 1, 45, "DEAD IRS AGENT", "AGE
  ", 0, 45
440 DATA "*GOLD FILLINGS*", "FIL", 0, 4
  5, "*WING TIPPED PATENT LEATHER SHOES
  *", "SHO", 0, 45, "CHEST", "CHE", 2,
  46, "MATCH", "MAT", 0, 46
450 DATA "FALSE PANEL IN FLOOR", "FLO",
   1, 46, "ELDERLY COW WITH MORNING BRE
  ATH", "COW", 1, 47, "DOOR", "DOO", 1,
   47
460 DATA "FALSE PANEL IN CEILING", "CEI
  ", 1, 48, "GO", "WAL", "RUN", "N", "S
  ", "E", "W", "U", "D", "TAK", "GET",
  "INV", "I", "THR", "DRO", "CLI"
470 DATA "ENT", "SHO", "TUR", "JUM", "M
  OV", "OPE", "SCO", "PUS", "PIC", "BRE
  ", "INS", "UNL", "UNB", "DRI", "LIG",
   "PUL", "LOO", "EXA"
480 DATA "REA", "HEL", "QUI"
490 CLEAR 200 : DEFINT A - I
500 DIM A(83), A$(83), B(48), B$(36), C
  (48), C$(48), D(48), D$(83), E(48), F
  (48), G(48), H(83)
510 FOR I = 1 TO 48 : READ C$(I), B(I),
   C(I), D(I), E(I), F(I), G(I) : NEXT

520 FOR I = 0 TO 83 : READ D$(I), A$(I)
  , H(I), A(I) : NEXT
530 FOR I = 0 TO 36 : READ B$(I) : NEXT

540 A = 38 : C$ = CHR$(93) + STRING$(62
  , 45) + CHR$(94)
550 CLS : PRINT@ 2, "-" : PRINT@ 579, "
  WELCOME TO THE ADVENTURE OF HOG JOWL
  MANSION: VERSION 1.12" : PRINT@ 664,
  "BY JON J. WAPLES"
560 IF A = 42 THEN PRINT "YOU HAVE LOST
   ALL *TREASURES*." : GOTO 2310
570 GOSUB 2000 : D$ = "" : E$ = "" : A$
   = "" : PRINT@ 960,; : INPUT "  -----
  --> TELL ME WHAT TO DO"; D$
580 FOR I = 1 TO LEN(D$) : IF MID$(D$,
  I, 1) = " " THEN 590 ELSE NEXT : GOTO
   600
590 E$ = RIGHT$(D$, LEN(D$) - I) : A$ =
   LEFT$(E$, 3)
600 B$ = LEFT$(D$, I - 1)
610 FOR I = 0 TO 36 : IF B$(I) = LEFT$(
  B$, 3) THEN 630 ELSE NEXT
620 PRINT "I DON'T KNOW HOW TO " CHR$(3
  4)B$ CHR$(34)" SOMETHING." : GOTO 560


630 ON I + 1 GOTO 650, 650, 650, 650, 6
  60, 670, 680, 690, 700, 960, 960, 104
  0, 1040, 1110, 1200, 690, 710, 1230,
  1320, 1350, 1360, 1410, 1490, 1500, 1
  540, 1570, 1600
640 ON I - 26 GOTO 1630, 1640, 1660, 16
  80, 1730, 1750, 1750, 1870, 1930, 230
  0
650 IF A$ = "NOR" OR B$ = "N" THEN IF B
  (A) > 0 THEN A = B(A) : GOTO 950
660 IF A$ = "SOU" OR B$ = "S" THEN IF C
  (A) > 0 THEN A = C(A) : GOTO 950
670 IF A$ = "EAS" OR B$ = "E" THEN IF D
  (A) > 0 THEN A = D(A) : GOTO 950
680 IF A$ = "WES" OR B$ = "W" THEN IF E
  (A) > 0 THEN A = E(A) : GOTO 950
690 IF A$ = "UP" OR B$ = "U" THEN IF F(
  A) > 0 THEN A = F(A) : GOTO 950
```

```
700 IF A$ = "DOW" OR B$ = "D" THEN IF G
  (A) > 0 THEN A = G(A) : GOTO 950
710 IF A$ = "DUM" AND A = 2 THEN IF B =
   0 THEN A = 1 : GOTO 950 ELSE PRINT "
  SOMETHING WON'T FIT." : GOTO 560
720 IF A$ = "DOO" AND A = 3 THEN IF LEF
  T$(D$(9), 2) = "UN" THEN A = 4 : GOTO
   950 ELSE 2220
730 IF A$ = "DOO" AND A = 4 THEN IF LEF
  T$(D$(10), 2) = "UN" THEN A = 3 : GOT
  O 950 ELSE 2220
740 IF A$ = "STA" AND A = 4 THEN A = 24
   : GOTO 950
750 IF A$ = "PAS" AND A = 23 THEN IF H(
  21) = 1 THEN A = 24 : GOTO 950 ELSE 2
  220
760 IF A$ = "STA" AND A = 24 THEN IF H(
  25) = 1 THEN A = 4 : GOTO 950 ELSE 22
  20
770 IF A$ = "DUM" AND A = 25 THEN IF B
  = 0 THEN A = 21 : GOTO 950 ELSE PRINT
   "SOMETHING WON'T FIT." : GOTO 560
780 IF A$ = "REF" AND A = 25 THEN PRINT
   "GAG, GASP, COUGH, BELCH... I SUFFOC
  ATED!" : GOTO 2280
790 IF A$ = "CLO" AND A = 28 THEN A = 3
  2 : GOTO 950
800 IF A$ = "WIN" AND A = 31 THEN A = 3
  5 : GOTO 950
810 IF A$ = "TRE" AND A = 31 THEN IF H(
  38) = 1 THEN A = 48 : GOTO 950 ELSE P
  RINT "I CAN'T. THE TREE'S TOO UNSTABL
  E." : GOTO 560
820 IF A$ = "DOO" AND A = 34 THEN A = 3
  0 : GOTO 950
830 IF A$ = "WIN" AND A = 35 THEN A = 3
  1 : GOTO 950
840 IF A$ = "BUS" AND (A = 36 OR A = 38
  ) THEN A = 37 : GOTO 950
850 IF A$ = "MAN" AND A = 36 THEN IF LE
  FT$(D$(52), 4) = "DEAD" THEN A = 34 :
   GOTO 950 ELSE PRINT "THE DOG WON'T L
  ET ME." : GOTO 560
860 IF A$ = "GAT" AND A = 37 THEN A = 3
  6 : GOTO 950
870 IF A$ = "TER" AND A = 37 THEN A = 3
  8 : GOTO 950
880 IF A$ = "CLO" AND A = 39 THEN IF LE
  FT$(D$(62), 2) = "UN" THEN A = 40 : G
  OTO 950 ELSE 2220
890 IF A$ = "TOI" AND A = 40 THEN PRINT
   "AH... I FEEL RELIEVED!" : GOTO 560
900 IF A$ = "DUM" AND A = 44 THEN IF B
  = 0 THEN A = 43 : GOTO 950 ELSE PRINT
   "SOMETHING WON'T FIT." : GOTO 560
910 IF A$ = "FLO" AND A = 46 THEN IF H(
  38) = 1 THEN A = 48 : GOTO 950 ELSE P
  RINT "I CAN'T, THERE'S NOTHING ON THE
   OTHER SIDE." : GOTO 560
920 IF A$ = "DOO" AND A = 47 THEN PRINT
   "COW WON'T LET ME." : GOTO 560
930 IF A$ = "CEI" AND A = 48 THEN A = 4
  6 : GOTO 950
940 PRINT "I CAN'T GO IN THAT DIRECTION
  ." : GOTO 560
950 PRINT "OK." : GOTO 560
960 IF A$ = "INV" THEN 1040
970 GOSUB 2200
980 IF I = 38 AND A = A(I) AND H(I) = 1
   THEN PRINT "I CAN'T, IT'S BOLTED TO
  THE FLOOR." : GOTO 560
990 IF I = 76 AND A = A(I) AND H(I) = 1
   THEN PRINT "I CAN'T, THEY'RE FASTENE
  D TO HIS FACE." : GOTO 560
1000 IF B = 6 THEN PRINT "I'M CARRYING
  TOO MUCH.  I'M NOT A FORKLIFT!" : GOT
  O 560
1010 IF A(I) <> A OR H(I) = 0 THEN 2230

1020 IF H(I) = 1 THEN PRINT "I'M TOO WI
  MPY TO DO THAT." : GOTO 560 ELSE IF I
   = 45 AND H(46) = 0 THEN PRINT "I HEA
  R A JINGLE." : H(46) = 2 : A(I) = 0 :
   B = B + 1 : GOTO 560
1030 A(I) = 0 : B = B + 1 : PRINT "OK."
   : GOTO 560
1040 PRINT : PRINT "I AM CARRYING THE F
  OLLOWING:"
1050 IF B = 0 THEN PRINT "NOTHING AT AL
  L." : GOTO 560
1060 FOR I = 0 TO 83
1070 IF A(I) > 0 THEN 1100
1080 IF 60 - POS(0) < LEN(D$(I)) THEN P
  RINT
1090 PRINT D$(I)".  ";
1100 NEXT : PRINT : GOTO 560
1110 GOSUB 2200
1120 IF A(I) > 0 THEN PRINT "I'M NOT CA
  RRYING IT." : GOTO 560
1130 PRINT "IN ONE WORD TELL ME WHAT TO
   THROW IT AT."
1140 GOSUB 2000
1150 GOSUB 2200
1160 G = I : PRINT@ 960,; : INPUT "  --
  -----> TELL ME WHAT TO DO"; E$
1170 GOSUB 2200
1180 IF A(I) <> A OR H(I) = 0 THEN 2230
   ELSE IF LEFT$(E$, 3) = "DOG" AND H(5
  2) = 1 THEN PRINT "DOG CONSUMES IT AN
  D BURPS." : A(G) = A : H(G) = 0 : B =
   B - 1 : GOTO 560
```

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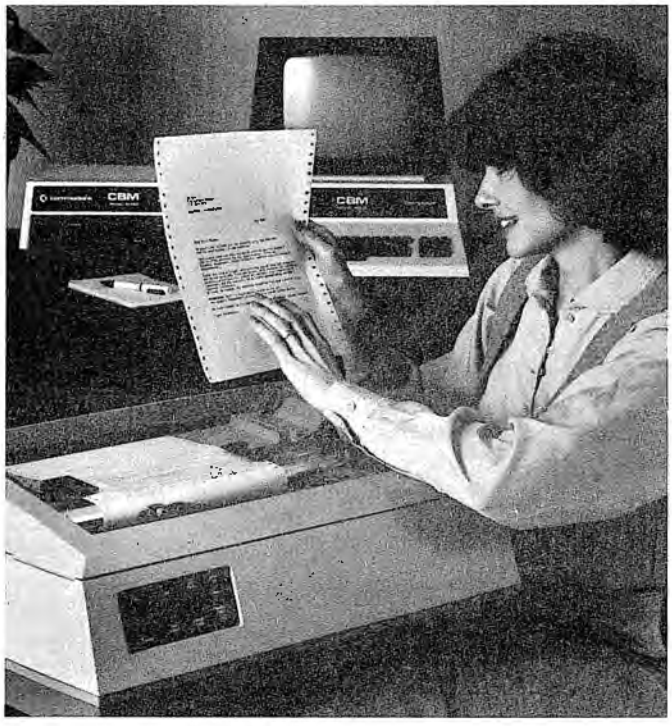

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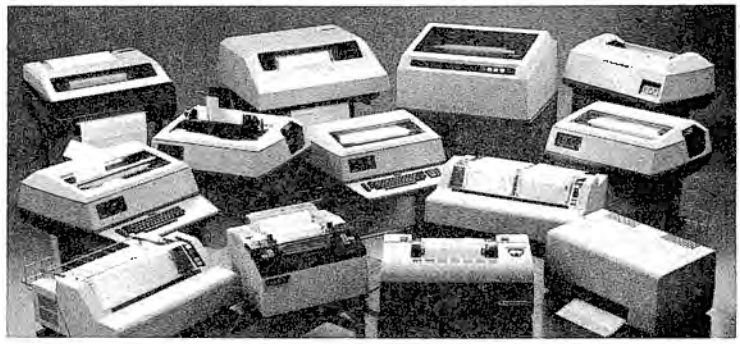


```
1190 A(G) = A : B = B - 1 : PRINT "OK."
   : GOTO 560
1200 GOSUB 2200
1210 IF A(I) > 0 THEN PRINT "I'M NOT CA
  RRYING IT." : GOTO 560
1220 A(I) = A : B = B - 1 : PRINT "OK."
   : GOTO 560
1230 GOSUB 2200
1240 IF A(65) > 0 THEN 2220
1250 IF I = 65 THEN 2240
1260 IF I = 81 THEN PRINT "I CAN'T, COW
  S ARE IMMUNE TO BB'S." : GOTO 560
1270 IF A <> A(I) THEN 2230
1280 PRINT "PLINK!"
1290 IF I = 52 THEN D$(I) = "DEAD GUARD
   DOG" : H(I) = 2
1300 IF I = 57 THEN D$(I) = "DEAD BUSDR
  IVER" : H(I) = 2
1310 GOTO 560
1320 GOSUB 2200 : IF A <> A(I) OR H(I)
  = 0 THEN 2230
1330 IF I = 64 THEN PRINT "SQUEAK!" : D
  $(42) = "SPRINKLER" : H(42) = 2 : H(4
  3) = 2 ELSE PRINT "NOTHING HAPPENS."
1340 GOTO 560
1350 IF A = 35 AND (A$ = "" OR A$ = "DO
  W" OR A$ = "LED") THEN PRINT "SPLAT!"
   : GOTO 2280 ELSE PRINT "I CAN'T GO I
  N THAT DIRECTION." : GOTO 560
1360 GOSUB 2200
1370 IF I = 20 AND H(21) = 0 THEN IF A
  = A(I) THEN PRINT "THERE'S A STRANGE
  NOISE." : H(21) = 1 : GOTO 560
1380 IF I = 23 AND H(25) = 0 THEN IF A
  = A(I) THEN PRINT "THERE'S A STRANGE
  NOISE." : H(25) = 1 : GOTO 560
1390 IF I = 45 AND H(46) = 0 THEN IF A
  = A(I) THEN PRINT "I HEAR A JINGLE."
  : H(46) = 2 : GOTO 560
1400 PRINT "OK." : GOTO 560
1410 GOSUB 2200 : IF A <> A(I) AND A(I)
   <> 0 OR H(I) = 0 THEN 2230
1420 IF I = 24 AND D$(24) = "DRAWER" TH
  EN H(22) = 2 : D$(24) = "OPEN DRAWER"
   : GOTO 1480
1430 IF I = 48 AND D$(48) = "MAILBOX" T
  HEN H(53) = 2 : H(54) = 2 : H(55) = 2
   : D$(48) = "OPEN MAILBOX" : GOTO 148
  0
1440 IF I = 74 AND A = 45 THEN IF D$(74
  ) = "CLOSED DOOR" THEN H(75) = 1 : PR
  INT "I HEAR A DULL THUD." : D$(74) =
  "OPEN DOOR WITH BRICK WALL BEYOND" :
  GOTO 560 ELSE PRINT "IT'S ALREADY OPE
  N!" : GOTO 560
1450 IF I = 78 AND D$(78) = "CHEST" THE
  N H(79) = 2 : D$(78) = "OPEN CHEST" :
   GOTO 1480
1460 IF I = 37 AND NOT(D) THEN PRINT "O
  PENING AN UMBRELLA INSIDE IS BAD LUCK
  !" : PRINT "A SECRET DOOR OPENS BELOW
   ME... I SLIDE DOWN A RAZOR BLADE" :
  PRINT "INTO A POOL OF ALCOHOL." : GOT
  O 2280
1470 PRINT "NOTHING HAPPENS." : GOTO 56
  0
1480 PRINT "SOMETHING FALLS OUT." : GOT
  O 560
1490 GOSUB 2250 : GOTO 560
1500 GOSUB 2200
1510 IF I <> 7 THEN 2240
1520 FOR I = 0 TO 83 : IF A(I) = 0 AND
  LEFT$(D$(I), 1) = "*" THEN A(I) = A :
   H(I) = 0 : B = B - 1 : PRINT "WHIRRR
  !  BUZZ SAW RIPS THE "D$(I) : PRINT "
  RIGHT OUT MY HANDS AND DESTROYS IT!"
  : GOTO 560
1530 NEXT : PRINT "BUZZ SAW TURNS ON FO
  R A MOMENT... THEN STOPS." : GOTO 560

1540 IF A$ <> "LOC" THEN 2240
1550 IF A(55) <> 0 OR A <> 4 THEN 2220
1560 PRINT "OK." : D$(9) = "UNLOCKED ME
  TAL DOOR" : D$(10) = "UNLOCKED METAL
  DOOR" : GOTO 560
1570 GOSUB 2200 : IF A(I) <> A AND A(I)
   <> 0 OR H(I) = 0 THEN 2230 ELSE IF I
   <> 30 THEN PRINT "I CAN'T, IT'S UNBR
  EAKABLE." : GOTO 560
1580 IF A(3) = 0 AND (A(30) = 0 OR A(30
  ) = A) AND D$(30) = "PIGGY BANK" THEN
   PRINT "SMASH!  I HEAR A JINGLE." : H
  (32) = 2 : A(32) = A : D$(30) = "PIEC
  ES OF BROKEN PIGGY BANK" : A$(30) = "
  PIE" ELSE 2220
1590 GOTO 560
1600 GOSUB 2200 : IF I <> 32 THEN 2240
1610 IF A = 39 AND A(32) = 0 THEN PRINT
   "DOOR FLIES OPEN!" : D$(62) = "UNLOC
  KED WATER CLOSET" : A(32) = 39 : H(32
  ) = 0 : B = B - 1 ELSE 2220
1620 GOTO 560
1630 GOSUB 2200 : GOTO 2240
1640 GOSUB 2200 : IF I <> 38 THEN PRINT
   "IT ISN'T BOLTED." : GOTO 560
1650 IF A = 31 AND A(5) = 0 THEN PRINT
  "OK." : H(38) = 2 : H(39) = 2 : GOTO
  560 ELSE 2220
1660 GOSUB 2200 : IF A(I) <> A AND A(I)
   <> 0 OR H(I) = 0 THEN 2230
```

```
1670 IF I = 73 THEN PRINT "BURP... BOY
  AM I PLASTERED!" : GOTO 560 ELSE PRIN
  T "YUCK!" : GOTO 560
1680 GOSUB 2200 : IF A(I) <> A AND A(I)
   <> 0 OR H(I) = 0 THEN 2230
1690 IF A(79) <> 0 THEN PRINT "I DON'T
  HAVE A MATCH." : GOTO 560
1700 IF I = 8 OR I = 73 THEN PRINT "KAB
  OOM!  MY BODY IS BLOWN INTO SMALL UNR
  ECOGNIZABLE PIECES." : B = B - 2 : A(
  I) = A : H(I) = 0 : A(79) = A : H(79)
   = 0 : GOTO 2280
1710 IF I = 79 THEN PRINT "MATCH FLARES
   UP BRIEFLY... THEN DISINTEGRATES." :
   B = B - 1 : A(79) = A : H(79) = 0 :
  GOTO 560
1720 PRINT "IT WON'T BURN." : GOTO 560
1730 GOSUB 2200 : IF A(I) <> A OR H(I)
  = 0 THEN 2230
1740 IF I = 76 THEN PRINT "OK." : H(I)
  = 2 : A(I) = 0 : B = B + 1 : GOTO 560
   ELSE PRINT "NOTHING HAPPENS." : GOTO
   560
1750 GOSUB 2200 : IF A(I) <> A AND A(I)
   <> 0 OR H(I) = 0 THEN 2230
1760 IF I = 1 OR I = 18 OR I = 69 OR I
  = 53 OR I = 54 OR I = 61 THEN PRINT "
  MAYBE I SHOULD READ IT?" : GOTO 560
1770 IF I = 2 OR I = 29 OR I = 72 OR I
  = 9 OR I = 10 OR I = 47 OR I = 82 OR
  I = 11 OR I = 25 OR I = 21 OR I = 26
  OR I = 35 OR I = 62 OR I = 31 THEN PR
  INT "THERE'S SOMETHING THERE... MAYBE
   I SHOULD GO THERE?" : GOTO 560
1780 IF I = 40 OR I = 51 OR I = 58 OR I
   = 56 OR I = 60 OR I = 59 OR I = 38 O
  R I = 80 OR I = 83 OR I = 66 THEN PRI
  NT "THERE'S SOMETHING THERE... MAYBE
  I SHOULD GO THERE?" : GOTO 560
1790 IF I = 75 AND H(77) = 0 THEN H(76)
   = 1 : H(77) = 2 : GOTO 1860
1800 IF I = 33 AND H(34) = 0 THEN H(34)
   = 2 : GOTO 1860
1810 IF I = 27 AND H(28) = 0 THEN H(28)
   = 2 : GOTO 1860
1820 IF I = 30 THEN PRINT "IT LOOKS BRE
  AKABLE." : GOTO 560
1830 IF I = 46 THEN PRINT "IT'S A KEY T
  O AN EDSEL." : GOTO 560
1840 IF I = 42 AND H(43) = 0 THEN 1860
1850 PRINT "I SEE NOTHING SPECIAL." : G
  OTO 560
1860 PRINT "THERE'S SOMETHING THERE." :
   GOTO 560
1870 GOSUB 2200 : IF A(I) <> A AND A(I)
   <> 0 OR H(I) = 0 THEN 2230
1880 IF I = 1 OR I = 18 OR I = 69 THEN
  PRINT "MAXIMUM CAPACITY: 1 PERSON OR
  175 POUNDS." : GOTO 560
1890 IF I = 53 THEN PRINT "DEAR LORD,"
  : PRINT "HAVING A GREAT TIME, WISH YO
  U WERE HERE." : GOTO 560
1900 IF I = 54 THEN PRINT "NOTE FROM TH
  E POST OFFICE:" : PRINT "POSTAGE DUE:
   42 CENTS." : GOTO 560
1910 IF I = 61 THEN PRINT "YOUR MISSION
   IS TO REPOSSESS THE 13 *TREASURES* O
  F LORD HOG" : PRINT "JOWL AND STORE T
  HEM IN A PREDETERMINED PLACE... GOOD
  LUCK!" : GOTO 560
1920 PRINT "I CAN'T, IT'S ILLEGIBLE." :
   GOTO 560
1930 ON A GOTO 1950, 1950, 1960, 1960,
  1950, 1950, 1950, 1950, 1950, 1950, 1
  950, 1950, 1950, 1950, 1950, 1950, 19
  50, 1950, 1950, 1950, 1950, 1950, 197
  0, 1970
1940 ON A - 24 GOTO 1950, 1950, 1950, 1
  950, 1950, 1950, 1950, 1950, 1950, 19
  50, 1950, 1980, 1950, 1980, 1990, 195
  0, 1950, 1950, 1950, 1950, 1950, 1950
  , 1980, 1950
1950 PRINT "TRY EXAMINING THINGS." : GO
  TO 560
1960 PRINT "I'M PRETTY GOOD AT PICKING
  LOCKS." : GOTO 560
1970 PRINT "I USED TO BE A -MOVING- MAN
  ." : GOTO 560
1980 PRINT "I'M A PRETTY GOOD MARKSMAN.
  " : GOTO 560
1990 PRINT "IT'S A PAY TOILET." : GOTO
  560
2000 FOR I = 2 TO 962 STEP 64 : C = PEE
  K(I + 15360) : PRINT@ I - 2, CHR$(30)
  ; : IF C = 45 THEN 2010 ELSE NEXT
2010 PRINT CHR$(28)"I AM "; : IF LEFT$(
  C$(A), 1) = "*" THEN PRINT RIGHT$(C$(
  A), LEN(C$(A)) - 1); : D = - 1 ELSE P
  RINT C$(A); : D = 0
2020 FOR I = 0 TO 83 : IF A(I) = A AND
  H(I) > 0 THEN 2030 ELSE NEXT : GOTO 2
  090
2030 PRINT "  VISIBLE ITEMS:" : PRINT
2040 FOR I = 0 TO 83
2050 IF A(I) <> A OR H(I) = 0 THEN 2080


2060 IF 60 - POS(0) < LEN(D$(I)) THEN P
  RINT
2070 PRINT D$(I)".  ";
2080 NEXT
2090 PRINT
```

```
2100 F$ = ""
2110 IF B(A) > 0 THEN F$ = "NORTH "
2120 IF C(A) > 0 THEN F$ = F$ + "SOUTH
  "
2130 IF D(A) > 0 THEN F$ = F$ + "EAST "

2140 IF E(A) > 0 THEN F$ = F$ + "WEST "

2150 IF F(A) > 0 THEN F$ = F$ + "UP "
2160 IF G(A) > 0 THEN F$ = F$ + "DOWN "

2170 IF F$ = "" THEN 2190
2180 PRINT : PRINT "SOME OBVIOUS EXITS
  ARE: "F$
2190 PRINT C$; : RETURN
2200 FOR I = 0 TO 83 : IF A$(I) = LEFT$
  (E$, 3) THEN H = I : IF A(I) = A OR A
  (I) = 0 THEN RETURN
2210 NEXT : I = H : IF A$(I) = LEFT$(E$
  , 3) THEN RETURN ELSE PRINT "I DON'T
  KNOW WHAT " CHR$(34)E$ CHR$(34)" IS."
   : GOTO 560
2220 PRINT "I CAN'T DO THAT... YET!" :
  GOTO 560
2230 PRINT "I DON'T SEE IT HERE." : GOT
  0 560
2240 PRINT "I MUST BE STUPID, BUT I DON
  'T UNDERSTAND WHAT YOU MEAN." : GOTO
  560
2250 E = 0 : FOR I = 0 TO 83 : IF A(I)
  = 40 AND LEFT$(D$(I), 1) = "*" THEN E
   = E + 1
2260 NEXT : F = E * 100/13 : PRINT "YOU
   STORED"E"TREASURES.  ON A SCALE OF 0
   TO 100 THAT RATES"*STR$(F)".";
2270 IF E = 13 THEN PRINT "EXCELLENT!
  YOU HAVE COMPLETED THIS ADVENTURE." :
   GOTO 2310 ELSE PRINT : RETURN
2280 PRINT "I'M DEAD." : PRINT "MY BODY
   TELEPORTS ELSEWHERE."
2290 PRINT "I SINCERELY HOPE I CAN FIND
   MY WAY OUT OF HERE.  I DON'T" : PRIN
  T "THINK I CAN STAND IT MUCH LONGER!"
   : A = 41 : GOTO 560
2300 GOSUB 2250
2310 PRINT "THIS ADVENTURE IS OVER."
2320 GOSUB 2000 : PRINT@ 960,; : INPUT
  "DO YOU WANT TO PLAY THIS ADVENTURE A
  GAIN"; G$
2330 IF LEFT$(G$, 1) = "Y" THEN GOSUB 2
  000 : RUN ELSE IF LEFT$(G$, 1) = "N"
  THEN CLS : END ELSE 2320
```

■

Z-subs revisited

Now it's Z-language for all TRS-80 models

Spencer Hall

Z-Language

You may have seen and even (I hope) used my nine Z-Subroutines which appeared in *80-U.S.* a year ago. If you did they you probably realized that there were bound to be more. You were absolutely right. Lazy programmer that I am, I had to have an easy way to do several common but elegant things in my BASIC programs without reinventing the wheel each time. The repertoire has grown to where it has to be called Z-Language because, at this stage of the game, it's like a full scale enhancement of Level II BASIC. Take a quick look at the Z-Language Summary and then come back here to read how they operate.

O.K. Some pretty elegant functions...yes? In case you missed the first article, here's how they work. You load them from tape, Stringy Floppy wafer, etc. when you start to program and statement 0 simply jumps over them to line 200 where your program actually starts. When you need one of the neat things that are described in the "Function" column of the summary, you simply call it with a GOSUB. If the function description mentions one of the Z-variables, you preface your call with a definition of that variable.

To see how this works, just type in the first two lines, number 0 and 1. Now write the following:

```
200 CLS: ZT$="GOOD MORNING, FOLKS":GOSUB 1
```

Run that and watch subroutine #1 center your message on the top line. If you want to see your centered message hang on the screen until you touch a key, type in statement #9. Now add a line to your program like this:

```
210 GOSUB 9
```

When you run that program your message...which might be something different from what we suggested, of course...will simply hang there on the blank screen until you touch a key. That's just the beginning. After you've run this two liner and come back to BASIC and before you LIST or EDIT anything, enter (in COMMAND mode) ?Z$. Hey, that's the key you hit...if it was a character and not a control key. If it was a digit from 0 thru 9, try asking ?ZZ. That's a true number, not a string character. See the possibilities? Get fast action on IF Z=type statements. The Z-80 microprocessor will test ten or fifteen of these in a fraction of a second and you can get a different branch with every one...without having to ENTER a response.

We've discussed just one subroutine to give you the general idea. Type yourself a few and try them with mini-programs or even in the command mode. The results will amaze you. When you test the screen boxes, #31, and #32, be sure to end your mini-program with a GOSUB9 so you won't ruin the shape you have produced. Several other subroutines return useful information, like ZO which is the address where the centered line was written by #11. Some of the printer subroutines may not work because printers are notoriously non-standardized. Your assignment, if you care to accept it, is to "translate" those that don't work into your printer's "native" language.

Note that some of the Z-variables are mnemonic and get used over and over: ZT$, ZL, ZT. etc. Make your own subroutines. We've left plenty of room below 200. Define the variables differently in each of them and then call some Z-Language. This multiplies the versatility of your "package" manyfold.

For a good look at Z-Language in action study the program listing for the Exatron Label Writer which is also in this issue. In particular, look at line 910 of that program to see two GOSUB 9 returning a line number toched by the user for instantaneouslabeling of the text input box without the use of the ENTER key.

You may want to copy some, but not all, of the subroutines we have

listed. The first nine are basic (no pun!) and the second nine include several which are needed in order not to mess up the boxes created by #31 and #32...which you really ought to have. The flicker routines, numbers 43 and 44 are useful in teaching programs to signal "RIGHT" or "WRONG" after the student has answered a question. The number conversions, #50 and #51 are great if you are writing various kinds of monitors with PEEK statements. Type a few at a time and record them. Keep your numbers the same as ours or confusion can easily develop.

The elegant way to do this is to have them on a five-foot Stringy Floppy wafer. When you get the urge to program, ZAP! You're in Z-Language in just a few seconds. By the time this appears in print, you should be able to get these from the Exatron Stringy Floppy Owners Association for the cost of one wafer. This will save you the trouble of copying them. ESFOA will be on the lookout for other subroutines to fit in all those missing numbers and we'll all be elegant program stylists with no effort at all. Disgusting isn't it? ■

Z-Language Summary

GOSUB 29 does not apply to the Model II or Color Computer.

#	Lines	Function
1	—	Centers text ZT$ on current line
2	—	Centers text ZB$ on bottom line
3	142	Prints line of 64 of character ZC$ on current line
4	3, 141, 142	Prints line of 64 of graphics block ZG on current line
5	—	Places cursor at start of line ZL
6	—	Erases screen below line ZP and returns cursor to start of line ZP+
7	—	"Freezes" screen for ZS seconds
8	9	Prints message "HIT ANY KEY TO PROCEED" on current line and "freezes" screen until user responds
9	—	"Freezes" screen with no message until user hits a key. Defines Z$=(key hit). Also, if key is a single digit (0-9), defines ZZ as this number.
11	—	Centers text ZT$ on line ZL and defines ZO as the PRINT @ address for the start position of ZT$
12	2, 5	Same as #2 above but returns cursor immediately to start of line ZL.
13	3, 5	Same as #3 above but writes the 64-character string on line ZL.
14	4, 5	Same as #4 above but writes the 64 graphics string on line ZL
15	—	Places cursor at tab position ZT on line ZL
16	—	Erases the screen from the top thru line ZE and returns cursor to top of the screen
18	9	Same as #8 above except that the message appears on the bottom line
17	—	"Freezes" screen for ZS seconds and counts time with the message, "(n) SECONDS" at tab position, ZT on line ZL
19	—	Prints text ZT$ at tab position, ZT on line ZL and defines ZO as the PRINT @ address for the start of text ZT$

NOTE: The following printer subroutines use the TRS-80 mode control codes native to the Okidata Microline 80.

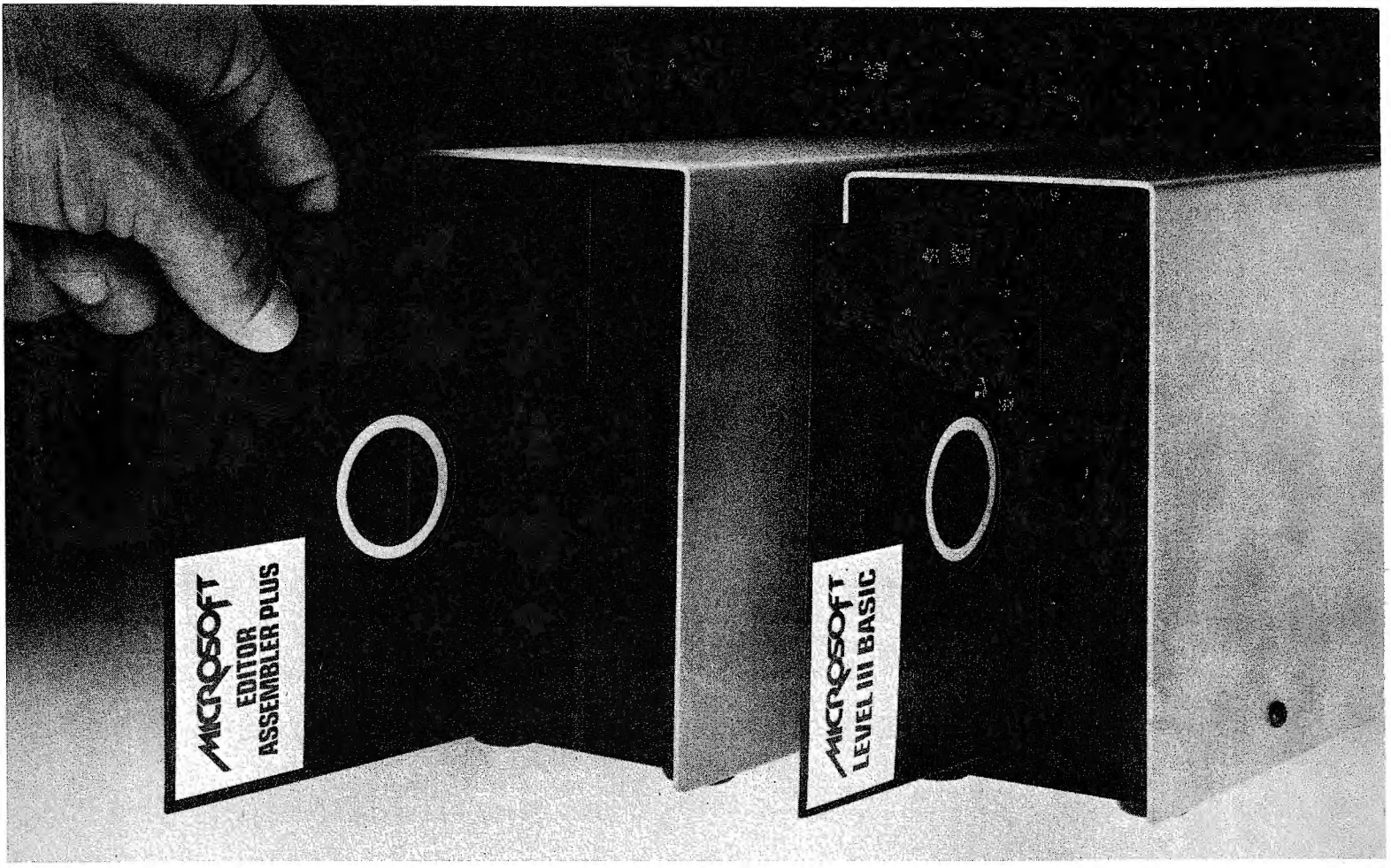
21	26	Centers text ZT$ on a 64-character line using normal (10 per inch) characters
22	26	Centers text ZT$ on a 32-character line using large (5 per inch) characters and returns printer to normal (10 per inch) characters
23	26, 142	Centers a string of ZN characters ZC$ on the line
24	23, 26, 141, 142	Centers a string of ZN graphics blocks ZG on the line
25	—	Feeds paper for ZN lines
26	—	Sets printers for 64-character line (8 space margins).

NOTE: The following specialty subroutines, although called by the line number shown, actually depend on subroutines which are listed beginning with line 101.

29	101-105	Causes printer to reproduce the entire image on the screen.
31	111-114	Draws a single line box around the extreme outer edge of the screen.
32	106-110 and 114	Draws a double line box around the extreme edge of the screen
41	115-119	Prints text ZT$ at tab position, ZT on line ZL surrounded by a single line box
42	—	Erases the contents of the box drawn by #41 but leaves the box
43	120-122	Causes text ZT$ to flicker on and off at the center of the screen. Number of "on" flickers is set by value assigned to ZF and the time of each appearance is set by the value assigned to ZD. Default values are: ZF= and ZD =20.
44	120-122	Same as #43 except that the text flickers at tab position ZT on line ZL
51	124-134	Accepts a decimal value D and returns its hexadecimal equivalent as H$
52	136-140	Accepts a hexadecimal number H$ and returns its decimal equivalent as D

Z-Language listing for Model I and III

```
0 CLEAR 500:CLS:GOTO 200
1 PRINTTAB((64-LEN(ZT$))/2)ZT$:RETURN
2 Z=960+(64-LEN(ZB$))/2:PRINT@Z,ZB$;:RE
  TURN
3 GOSUB 142:PRINTTAB((64-ZN)/2)STRING$(
  ZN,ZC$);:RETURN
4 GOSUB 141:GOTO 3
5 PRINT@ 64*ZL,;:RETURN
```



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```
6 PRINT@ 64*(ZP+1),;:FOR Z=1 TO 14-ZP:P
  RINTSTRING$(64," ");:NEXT:PRINT@ 64*(
  ZP+1),;:RETURN
7 FOR ZZ=1 TO 345*ZS:NEXT ZZ:RETURN
8 PRINTTAB(21)"TO PROCEED HIT ANY KEY"
9 Z$=INKEY$:IFZ$=""THEN 9 ELSE ZZ=VAL(Z
  $):RETURN
10 '------THE NINE (NEARLY) SIMILAR Z-S
  UBROUTINES-----'
11 ZO=64+64*ZL-LEN(ZT$)/2-32:PRINT@ ZO,
  ZT$;:RETURN
12 GOSUB 2:GOTO 5
13 GOSUB 5:GOTO 3
14 GOSUB 5:GOTO 4
15 Z=64*(ZL-1)+ZT:PRINT@Z,;:RETURN
16 PRINT@ 0,;:FOR Z=0 TO ZE:PRINTSTRING
  $(64," ");:NEXT Z:PRINT@ 0,;:RETURN
17 N=1:FOR Z=1 TO ZS:FOR ZZ=1 TO 300:NE
  XT ZZ:PRINT@ZL*64+ZT,N "SECONDS";:N=N
  +1:NEXT Z:RETURN
18 PRINT@981,"TO PROCEED HIT ANY KEY";:
  GOTO 9
19 ZO=ZL*64+ZT:PRINT@ ZO,ZT$;:RETURN
20 '------PRINTER Z-SUBROUTINES------'
21 GOSUB 26:Z=(64-LEN(ZT$))/2:LPRINTTAB
  (Z)ZT$:RETURN
22 GOSUB 26:Z=(32-LEN(ZT$))/2:LPRINTCHR
  $(31):LPRINTTAB(Z)ZT$:LPRINTCHR$(30):
  RETURN
23 GOSUB 26:GOSUB 142:LPRINTTAB((64-ZN)
  /2)STRING$(ZN,ZC$):RETURN
24 GOSUB 141:GOTO 23
25 FOR Z=1 TO ZN:LPRINT" ":NEXT Z:RETUR
  N
26 LPRINTCHR$(27)CHR$(66):RETURN
29 GOTO 101
30 '------BOX BORDER Z-SUBROUTINES-----
  -'
31 GOTO 111      '------SINGLE LINE BORD
  ER------'
32 GOTO 106      '------DOUBLE LINE BORD
  ER------'
40 '------"SPECIAL MESSAGE" Z-SUBROUTIN
  ES------'
41 GOTO 115
        '----TEXT BOX----'
42 PRINT@PZ-1,STRING$(Z+2," ");:RETURN
        '----ERASE BOX---'
43 Z=480-LEN(ZT$)/2:GOTO 120     '----CE
  NTER-SCREEN FLICKER----'
44 Z=64*(ZL-1)+ZT-1:GOTO 120       '---
  -FLICKER @ ZT ON ZL----'
50 '------MATHEMATICAL Z-SUBROUTINES---
  ---'
51 GOTO 124      '------CONVERT DECIMAL
  TO HEX.------'
52 GOTO 136      '------CONVERT HEX. TO
  DECIMAL------'
100 '------REFERRED ROUTINES BEGIN HERE
  -------'
101 GOSUB 26
102 FOR Z=15360 TO 16383
103 IF PEEK(Z)<27 C=PEEK(Z)+64:GOTO 105

104 C=PEEK(Z)
105 LPRINTCHR$(C);:NEXT Z:RETURN
106 TZ$=CHR$(191)+CHR$(131)+STRING$(60,
  179)+CHR$(131)+CHR$(191)
107 MZ$=CHR$(191)+CHR$(128)+CHR$(191)+S
  TRING$(58,128)+CHR$(191)+CHR$(128)+CH
  R$(191)
108 BZ$=CHR$(191)+CHR$(176)+STRING$(60,
  179)+CHR$(176)
109 PRINT TZ$;
110 FOR N=1 TO 14:PRINT MZ$;:NEXT:PRINT
   BZ$;:GOTO 114
111 PRINTCHR$(191);:PRINTSTRING$(62,CHR
  $(131));:PRINTCHR$(191);
112 FOR N=1 TO 14:PRINTCHR$(192);:PRINT
  CHR$(191);:PRINTCHR$(254);:PRINTCHR$(
  191);:NEXT
113 PRINTCHR$(191);:PRINTSTRING$(62,CHR
  $(176));
114 POKE16383,191:RETURN
115 Z=LEN(ZT$):IF ZT=0 THEN PZ=64*ZL-Z/
  2-32 ELSE PZ=64*(ZL-1)+ZT-1
116 TZ$=CHR$(188)+STRING$(Z+2,140)+CHR$
  (188)
117 BZ$=STRING$(Z+4,131)
118 PRINT@ PZ,ZT$;
119 PRINT@ PZ-66,TZ$;:PRINT@ PZ-2,CHR$(
  191);:PRINT@ PZ+Z+1,CHR$(191);:PRINT@
   PZ+62,BZ$;:RETURN
120 ZJ=LEN(ZT$):IF ZD=0 ZD=20
121 IF ZF=0 ZF=3
122 FOR D=1 TO ZD:PRINT@Z,ZT$;:FOR F=1
  TO ZF:NEXT F:PRINT@Z,STRING$(ZJ," ");
  :FOR F=1 TO ZF:NEXT F:NEXT D:RETURN
124 DEFINT H
125 H1=D/4096:I=D-H1*4096:H2=I/256:I=I-
  H2*256:H3=I/16:H4=I-H3*16
126 IF H1>9 H1=H1+55 ELSE H1=H1+48
127 IF H2>9 H2=H2+55 ELSE H2=H2+48
128 IF H3>9 H3=H3+55 ELSE H3=H3+48
129 IF H4>9 H4=H4+55 ELSE H4=H4+48
132 H$=CHR$(H1)+CHR$(H2)+CHR$(H3)+CHR$(
  H4):IF LEFT$(H$,2)="00" H$=RIGHT$(H$,
  2)
133 IF LEFT$(H$,1)="0" H$=RIGHT$(H$,3)
134 RETURN
136 N=LEN(H$):M=N+1:FOR J=1 TO N:D$(J)=
  MID$(H$,(M-J),1):NEXT
```

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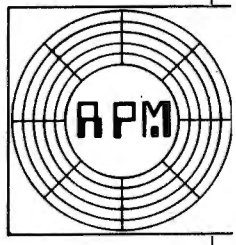

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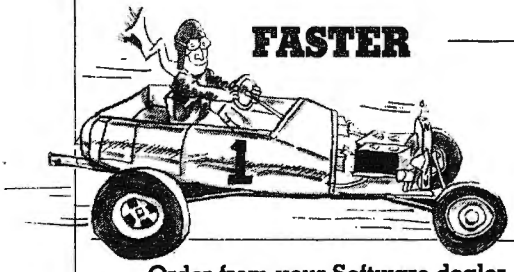

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```
137 FOR J=1 TO N:IF ASC(D$(J))>57 THEN
  D(J)=ASC(D$(J))-55:GOTO 139
138 D(J)=VAL(D$(J))
139 NEXT J
140 D=0:F=1:FOR J=1 TO N:D=D+D(J)*F:F=F
  *16:NEXT:RETURN
141 ZC$=CHR$(ZG)
142 IF ZN RETURN ELSE ZN=64:RETURN
```

Z-Language listing for Model II

```
0 CLEAR 500:CLS:GOTO 200
1 PRINTTAB((80-LEN(ZT$))/2)ZT$:RETURN
2 Z=1840+(80-LEN(ZB$))/2:PRINT@Z,ZB$;:
RETURN
3 GOSUB 142:PRINTTAB((80-ZN)/2)STRING$
(ZN,ZC$);:RETURN
4 GOSUB 141:GOTO 3
5 PRINT@ 80*ZL,;:RETURN
6 PRINT@ 80*(ZP+1),;:FORZ=1 TO 23-ZP:P
RINTSTRING$(80," ");:NEXT:PRINT@80*(ZP
+1),;:RETURN
7 FOR ZZ=1 TO 654*ZS:NEXT ZZ:RETURN
8 PRINTTAB(29)"TO PROCEED HIT ANY KEY"
9 Z$=INKEY$:IFZ$=""THEN 9 ELSE ZZ=VAL(
Z$):RETURN
10 '------THE NINE (NEARLY) SIMILAR Z-
SUBROUTINES-----'
11 Z0=80+80*ZL-LEN(ZT$)/2-40:PRINT@ Z0
,ZT$;:RETURN
12 GOSUB 2:GOTO 5
13 GOSUB 5:GOTO 3
14 GOSUB 5:GOTO 4
15 Z=80*(ZL-1)+ZT:PRINT@Z,;:RETURN
16 PRINT@ 0,;:FOR Z=0 TO ZE:PRINTSTRIN
G$(80," ");:NEXT Z:PRINT@ 0,;:RETURN
17 N=1:FOR Z=1 TO ZS:FOR ZZ=1 TO 650:N
EXT ZZ:PRINT@ZL*80+ZT,N "SECONDS";:N=N
+1:NEXT Z:RETURN
18 PRINT@981,"TO PROCEED HIT ANY KEY";
:GOTO 9
19 Z0=ZL*80+ZT:PRINT@ Z0,ZT$;:RETURN
20 '------PRINTER Z-SUBROUTINES------'
21 GOSUB 26:Z=(80-LEN(ZT$))/2:LPRINTTA
B(Z)ZT$:RETURN
22 GOSUB 26:Z=(40-LEN(ZT$))/2:LPRINTCH
R$(31):LPRINTTAB(Z)ZT$:LPRINTCHR$(30):
RETURN
23 GOSUB 26:GOSUB 142:LPRINTTAB((80-ZN
)/2)STRING$(ZN,ZC$):RETURN
24 GOSUB 141:GOTO 23
25 FOR Z=1 TO ZN:LPRINT" ":NEXT Z:RETU
RN
26 LPRINTCHR$(27)CHR$(66):RETURN
30 '------BOX BORDER Z-SUBROUTINES----
--'
31 GOTO 111      '------SINGLE LINE BOR
DER------'
32 GOTO 106      '------DOUBLE LINE BOR
DER------'
40 '------"SPECIAL MESSAGE" Z-SUBROUTI
NES------'
41 GOTO 115
       '----TEXT BOX----'
42 PRINT@PZ-1,STRING$(Z+2," ");:RETURN
       '----ERASE BOX---'
43 Z=920-LEN(ZT$)/2:GOTO 120     '----C
ENTER-SCREEN FLICKER----'
44 Z=80*(ZL-1)+ZT-1:GOTO 120       '--
--FLICKER @ ZT ON ZL----'
50 '------MATHEMATICAL Z-SUBROUTINES--
-----'
51 GOTO 124      '------CONVERT DECIMAL
 TO HEX.------'
52 GOTO 136      '------CONVERT HEX. TO
 DECIMAL------'
100 '------REFERRED ROUTINES BEGIN HER
E-------'
106 PRINT@81,CHR$(128)STRING$(76,CHR$(
150))CHR$(129);
107 PRINT@(22,1),CHR$(131)STRING$(76,1
50)CHR$(130);
110 FOR N=2 TO 21:PRINT@(N,1),CHR$(148
);:PRINT@(N,78),CHR$(148);:NEXTN
111 PRINT@0,CHR$(128)STRING$(78,CHR$(1
50))CHR$(129);
112 FOR N=1 TO 22:PRINTCHR$(148);:PRIN
T@(ROW(Z),79),CHR$(148);:NEXT
113 PRINTCHR$(131)STRING$(78,CHR$(150)
)CHR$(130);
114 RETURN
115 Z=LEN(ZT$):IF ZT=0 THEN PZ=80*ZL-Z
/2-40 ELSE PZ=80*(ZL-1)+ZT-1
116 TZ$=CHR$(128)+STRING$(Z+2,150)+CHR
$(129)
117 BZ$=CHR$(131)+STRING$(Z+2,150)+CHR
$(130)
118 PRINT@ PZ,ZT$;
119 PRINT@ PZ-82,TZ$;:PRINT@ PZ-2,CHR$
(148);:PRINT@ PZ+Z+1,CHR$(148);:PRINT@
 PZ+78,BZ$;:RETURN
120 ZJ=LEN(ZT$):IF ZD=0 THEN ZD=20
121 IF ZF=0 THEN ZF=3
122 FOR D=1 TO ZD:PRINT@Z,ZT$;:FOR F=1
 TO ZF:NEXT F:PRINT@Z,STRING$(ZJ," ");
:FOR F=1 TO ZF:NEXT F:NEXT D:RETURN
124 DEFINT H
125 H1=D/4096:I=D-H1*4096:H2=I/256:I=I
-H2*256:H3=I/16:H4=I-H3*16
```

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```
126 IF H1>9 H1=H1+55 ELSE H1=H1+48
127 IF H2>9 H2=H2+55 ELSE H2=H2+48
128 IF H3>9 H3=H3+55 ELSE H3=H3+48
129 IF H4>9 H4=H4+55 ELSE H4=H4+48
132 H$=CHR$(H1)+CHR$(H2)+CHR$(H3)+CHR$
(H4):IF LEFT$(H$,2)="00" H$=RIGHT$(H$,
2)
133 IF LEFT$(H$,1)="0" H$=RIGHT$(H$,3)
134 RETURN
136 N=LEN(H$):M=N+1:FOR J=1 TO N:D$(J)
=MID$(H$,(M-J),1):NEXT
137 FOR J=1 TO N:IF ASC(D$(J))>57 THEN
 D(J)=ASC(D$(J))-55:GOTO 139
138 D(J)=VAL(D$(J))
139 NEXT J
140 D=0:F=1:FOR J=1 TO N:D=D+D(J)*F:F=
F*16:NEXT:RETURN
141 ZC$=CHR$(ZG)
142 IF ZN THEN RETURN ELSE ZN=80:RETUR
N
```

Z-Language listing for Color computer

```
0 CLEAR 500:CLS:GOTO 200
1 PRINTTAB((32-LEN(ZT$))/2)ZT$:R
ETURN
2 Z=480+(32-LEN(ZB$))/2:PRINT@Z,
ZB$;:RETURN
3 GOSUB 142:PRINTTAB((32-ZN)/2)S
TRING$(ZN,ZC$);:RETURN
4 GOSUB 141:GOTO 3
5 PRINT@ 32*ZL,;:RETURN
6 PRINT@32*(ZP+1),;:FORZ=1 TO 15
-ZP:PRINTSTRING$(32," ");:NEXT:P
RINT@32*(ZP+1),;:RETURN
7 FOR ZZ=1 TO 439*ZS:NEXT ZZ:RET
URN
8 PRINTTAB(5)"TO PROCEED HIT ANY
 KEY"
9 Z$=INKEY$:IFZ$=""THEN 9 ELSE Z
Z=VAL(Z$):RETURN
10 '------THE NINE (NEARLY) SIMI
LAR Z-SUBROUTINES-----'
11 ZO=INT(32+32*ZL-LEN(ZT$)/2-16
):PRINT@ ZO,ZT$;:RETURN
12 GOSUB 2:GOTO 5
13 GOSUB 5:GOTO 3
14 GOSUB 5:GOTO 4
15 Z=32*(ZL-1)+ZT:PRINT@Z,;:RETU
RN
16 PRINT@ 0,;:FOR Z=0 TO ZE:PRIN
TSTRING$(32," ");:NEXT Z:PRINT@
0,;:RETURN
17 N=1:FOR Z=1 TO ZS:FOR ZZ=1 TO
 420:NEXT ZZ:PRINT@ZL*32+ZT,N "S
ECONDS";:N=N+1:NEXT Z:RETURN
18 PRINT@485,"TO PROCEED HIT ANY
 KEY";:GOTO 9
19 ZO=ZL*32+ZT:PRINT@ ZO,ZT$;:RE
TURN
20 '------PRINTER Z-SUBROUTINES-
-----'
21 GOSUB 26:Z=(64-LEN(ZT$))/2:LP
RINTTAB(Z)ZT$:RETURN
22 GOSUB 26:Z=(32-LEN(ZT$))/2:LP
RINTCHR$(31):LPRINTTAB(Z)ZT$:LPR
INTCHR$(30):RETURN
23 GOSUB 26:GOSUB 142:LPRINTTAB(
(64-ZN)/2)STRING$(ZN,ZC$):RETURN
24 GOSUB 141:GOTO 23
25 FOR Z=1 TO ZN:LPRINT" ":NEXT
Z:RETURN
26 LPRINTCHR$(27)CHR$(66):RETURN
30 '------BOX BORDER Z-SUBROUTIN
ES------'
31 GOTO 111      '------SINGLE LI
NE BORDER------'
32 GOSUB 31 : GOTO 106      '----
--DOUBLE LINE BORDER------'
40 '------"SPECIAL MESSAGE" Z-SU
BROUTINES------'
41 GOTO 115
                '----TEXT BOX----'
42 PRINT@PZ-1,STRING$(Z+2," ");:
RETURN       '----ERASE BOX---'
43 Z=240-LEN(ZT$)/2:GOTO 120
'----CENTER-SCREEN FLICKER----'
44 Z=32*(ZL-1)+ZT-1:GOTO 120
   '----FLICKER @ ZT ON ZL----'
50 '------MATHEMATICAL Z-SUBROUT
INES------'
51 GOTO 124      '------CONVERT D
ECIMAL TO HEX.------'
52 GOTO 136      '------CONVERT H
EX. TO DECIMAL------'
100 '------REFERRED ROUTINES BEG
IN HERE-------'
106 TZ$=CHR$(145)+STRING$(28,147
)+CHR$(146)
107 MZ$=CHR$(149)+STRING$(28,32)
+CHR$(154)
108 BZ$=CHR$(148)+STRING$(28,156
)+CHR$(152)
109 PRINT@33, TZ$;
110 FOR ZL=3 TO 14:ZT=1:ZT$=MZ$:
GOSUB15:PRINT MZ$;:NEXT:ZL=15:GO
SUB15:PRINT BZ$;:RETURN
```

```
111 PRINT@0,CHR$(145);STRING$(30
,147);CHR$(146);
112 FOR N=1 TO 14:PRINTCHR$(149)
;TAB(31);CHR$(154);:NEXT
113 PRINTCHR$(148);STRING$(30,15
6);
114 POKE1535,152:RETURN
115 Z=LEN(ZT$):IF ZT=0 THEN PZ=3
2*ZL-Z/2-16 ELSE PZ=32*(ZL-1)+ZT
-1
116 TZ$=CHR$(128)+STRING$(Z+2,12
8)+CHR$(128)
117 BZ$=STRING$(Z+4,128)
118 PRINT@ PZ,ZT$;
119 PRINT@ PZ-34,TZ$;:PRINT@ PZ-
2,CHR$(128);:PRINT@ PZ+Z+1,CHR$(
128);:PRINT@ PZ+30,BZ$;:RETURN
120 ZJ=LEN(ZT$):IF ZD=0 THEN ZD=
20
121 IF ZF=0 THEN ZF=3
122 FOR D=1 TO ZD:PRINT@Z,ZT$;:F
OR F=1 TO ZF:NEXT F:PRINT@Z,STRI
NG$(ZJ," ");:FOR F=1 TO ZF:NEXT
F:NEXT D:RETURN
124 '
125 H1=INT(D/4096):I=D-H1*4096:H
2=INT(I/256):I=I-H2*256:H3=INT(I
/16):H4=I-H3*16
126 PRINT H1,H2,H3,H4:IF H1>9 TH
EN H1=H1+55 ELSE H1=H1+48
127 IF H2>9 THEN H2=H2+55 ELSE H
2=H2+48
128 IF H3>9 THEN H3=H3+55 ELSE H
3=H3+48
129 IF H4>9 THEN H4=H4+55 ELSE H
4=H4+48
132 H$=CHR$(H1)+CHR$(H2)+CHR$(H3
)+CHR$(H4):IF LEFT$(H$,2)="00" T
HEN H$=RIGHT$(H$,2)
133 IF LEFT$(H$,1)="0" THEN H$=R
IGHT$(H$,3)
134 RETURN
136 N=LEN(H$):M=N+1:FOR J=1 TO N
:D$(J)=MID$(H$,(M-J),1):NEXT
137 FOR J=1 TO N:IF ASC(D$(J))>5
7 THEN D(J)=ASC(D$(J))-55:GOTO 1
39
138 D(J)=VAL(D$(J))
139 NEXT J
140 D=0:F=1:FOR J=1 TO N:D=D+D(J
)*F:F=F*16:NEXT:RETURN
141 ZC$=CHR$(ZG)
142 IF ZN THEN RETURN ELSE ZN=32
:RETURN ■
```

How to find execution points

For Model I and III with tape and TBUG or DEBUG

Glenn W. Collura, Streetsboro, OH

Have you ever wondered how your TRS-80 knows where to go when you type /ENTER after loading a system format tape? Have you ever needed the execution point of a machine language program to make a backup copy but did not have a monitor available that would give you this information? If so, then read on and I'll tell you about two very easy methods of obtaining this information.

Method one

Let's start by loading TBUG into the computer from tape. I chose TBUG because most TRS-80 users own a copy of it even if they have purchased other monitor programs. All references will be made assuming TBUG is in memory. If you don't have a copy, another comparable monitor program will do, although some commands and addresses will differ slightly. If you don't have a monitor program at all, read on because a little later I'll describe a method which can be used without a monitor program at all. When TBUG has finished loading, type /ENTER. How did your TRS-80 know where to start executing TBUG? Here's how.

Using TBUG's M command (display memory), look at locations 40DF and 40E0. Location 40DF will contain A0. Location 40E0 will contain 43. These two locations store the entry point for system format tapes. Remember that the TRS-80 stores addresses with the least significant bit (LSB) first and the most significant bit (MSB) last. By reading out these two locations we can see that the entry point or execution point for TBUG is 43A0. To prove that this is correct, do the following. Using TBUG's J (jump) command, type J 1A19. This is a jump back to BASIC. You should see the READY prompt. From BASIC type SYSTEM (ENTER). At the "*?" prompt type /17312. How about that!, right back to TBUG. This verifies the address we read at locations 40DF and 40E0. Remember that when we are in BASIC we must use decimal addresses. Address 43A0 hex converts to 17312 in decimal. If you are using a monitor other than TBUG you will have to convert the address you read at 40DF from hex to decimal. The result should be the same.

Why we need entry points

Why do we need to know the execution point? As you can see, we just returned to BASIC and then went back to our monitor without having to reload it. This can be very useful when using a renumbering utility or other machine language routine. If you wanted to renumber several BASIC programs you would only have to load the renumber program once. After each successive BASIC program was loaded you could simply jump (/ entry point) back to the renumber utility as often as needed. Another advantage is the capability of having two or more machine language programs in memory at the same time, providing they do not overlay each other. I do this quite often when I'm examining somebody's code. Usually I load a monitor, a disassembler and the program I wish to examine into memory together. Without knowing the entry points of the three programs, it would not be possible to jump from one program to the other. Yet another advantage is the ability to make backup copies of machine language programs. Most monitors require start address, end address, execution point and filename to write a section of memory or a program to tape. The list of advantages goes on and on.

Now let's get back to our keyboards and find the execution point for a machine language program.

Method one continued

If you still have TBUG in your machine, do a jump back to BASIC again. If not, load TBUG and return to BASIC. Choose a machine language program for which you need to find the entry point. I will be using Super Nova from Big 5 Software for this demonstration. Any machine language program you happen to have handy will do. Just make sure that your program will load above TBUG. From BASIC type SYSTEM (ENTER). At the *? prompt type NOVA (ENTER), or the filename of the program that you are using. When the tape has finished loading *do not* type /ENTER. Instead, type /17312 and ENTER. This is our entry point

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back into TBUG. If you are not using TBUG use the appropriate decimal address for your monitor. Once you are back into TBUG, use the M command to examine locations 40DF and 40E0. For Super Nova you should read a 93 at location 40DF and a 63 at location 40E0. Our execution point would be 6393 hex. Again, if you are using a different program the address will be different.

The easy way

As promised, here is a method that can be used without loading a monitor program. It is also an easy way to convert the entry point from hex to decimal. I will use the Super Nova program again for this demonstration.

Load your system tape into memory as you normally would. After the tape has loaded hit the reset button *Do not* type /ENTER. Hitting the reset button will bring us back to BASIC. From the command mode, type PRINT PEEK (16607+ PEEK(16608)) * 256 and ENTER. With my program the result was 25491. This converts to 6393 hex, which is the entry point for the program I used. To verify that this is correct, type SYSTEM (ENTER). At the *? prompt type "/" followed by the decimal number that was returned by the PEEK statements. Your program should start executing just as though you typed "/ ENTER" after it loaded.

Conclusion

The two methods described here should be a help in locating entry points for your machine language programs. As most of you know, there are several monitors available that will read a system tape and give you the execution point. However, if you don't already own one of these programs and you don't want to invest in another monitor, the methods described here should work just as well. They will also give you some insight into how your TRS-80 works.

This method of finding execution points is not entirely foolproof. There are some programs on the market which execute automatically. This means you don't type "/ENTER" after they load. They simply start running as soon as they are finished loading. Needless to say, this method will not work on these tapes. However, most of the monitor programs which read system tapes also will not return the correct entry point for those programs. Aside from these few exceptions, you should now be able to find the execution point for most of your machine language programs.

TBUG has been replaced with a new utility from Radio Shack called DEBUG; stock #26-2000. The TBUG commands and memory addresses are different in DEBUG.

*The "D" command is used in place of the "M" command. Location 40DF will contain 09; 40E0 will contain 49. The entry point for DEBUG is then 4909 hex or 18697 in decimal. Therefore, use /18697 in answer to the *? prompt to return to DEBUG as described in the above text.*

DEBUG is for both the Model I and III and the above memory locations and figures apply to both machines. ■

BUILD it yourself —in BASIC!

For Model I disk with TRSDOS

Dan Connors, Harvey, LA

This article describes a BASIC utility which will allow you to operate your TRS-80 disk system as a turn-key system. The concept is similar to the Model III disk command BUILD which creates a program which takes over the computer at DOS READY and loads utilities, BASIC, sets file and memory size and your first BASIC program.

The BUILD/BAS program creates a machine language file identical to one which could have been made by a disk-based editor/assembler. After the program writes the file on diskette, you can call it with the AUTO command. No knowledge of machine of machine language is needed.

Unlike the Model III BUILD command, the file which this program creates will reside in unprotected memory. Since the program will be switched out of control of your keyboard eventually, this space is made free for use by your BASIC programs.

Lines 100 to 320 assemble a string of characters which are, in fact, a machine language program. The assembler listing is shown in the remarks. The program simply intercepts the keyboard scan, returns one character each time the scan is called until the end of file is found, then restores the original keyboard scan. At this point, the program is done and the space it used is free.

Lines 330-410 take your input and add it to the file. Lines 420 to 450 complete the assembly of the routine which will be written on the diskette. Lines 460 to 500 write the disk file. The remainder of the program is just instructions.

Like all programs, this one has limits. The file it creates will be loaded into memory from 6F00H to a maximum of 6FFFH (28416 to 28671 in decimal). This space is not protected. This area was chosen because it is a very unusual place to put a machine language routine, so it probably won't conflict with any other utilities you might have. It does occupy space normally used by BASIC programs, however, it is disabled before the BASIC program is loaded.

You might experience a lockup or reboot should this module load a utility which overwrites this area. Long routines are suspect. For example, BACKUP or COPY may use all of memory.

You also cannot use it to run another utility which interrupts the keyboard scan. Programs such as KBFIX and most macros interrupt this scan. If you want to load one of these programs, you may, but you cannot activate it until the BUILD module has been deactivated.

To do this, you need to load the utility using:

LOAD"*filename*/CMD"

then write a short BASIC program which changes the return to DOS to a simple return. You can find this instruction by using DISKDUMP/BAS and looking for the sequence that goes: C3 2D 40 (JP 402DH). Your BASIC program simply needs to poke C9H (201D) into the location the C3H is in, then use a DEFUSR statement to mark the beginning of the utility, and a USR call (A=USR0(B)) to activate it. Follow this with a CLEAR statement, which might be needed to eliminate an erroneous error message, and RUN"*whatever*" to execute the BASIC program you really wanted to have executed in the first place.

You may need the following information to determine where the utility resides in memory: The third and fourth bytes are the starting address, in hexadecimal, of where the program will be loaded into memory. The order is reversed. The BUILD module, for example, loads at 6F00H, and the third and fourth bytes of the disk file are 00 6F. The first byte of the program goes here, the next in the following byte, etc. Your computer will convert this to decimal very quickly with the following: PRINT&Hnnnn, where nnnn are the four hexadecimal digits. The end of the program will be flagged with two bytes: 0202. The two bytes following are the start location for this utility. Reverse the order and you have the correct address for your DEFUSR statement. The BUILD module, for example, could be pointed to with: DEFUSR0=&H6F00. A=USR0(B) will activate the utility. ■

```
5 ' DO NOT TYPE IN ANY LINE NUMBERS ENDING IN '5' (REMARKS)
15 ' PROGRAM BUILD/BAS, CREATES MACHINE LANGUAGE DISK FILE
25 ' WHICH CAN BE USED TO EXTEND THE AUTO COMMAND BY
35 ' ALLOWING THE LOADING OF SEVERAL PROGRAMS.
45 ' THIS PROGRAM USES MEMORY LOCATIONS 6F00H TO 6FFFH
55 ' (28416 TO 28671 DECIMAL) TEMPORARILY.  IT IS DUMPED
65 ' BEFORE ANY BASIC PROGRAM IS RUN.
75 ' COPYRIGHTED MAY 15, 1981 BY DAN CONNORS, 2320 HAMPTON DR
85 ' HARVEY, LA 70058
100 CLEAR500:DEFINTB-P:DEFSTRQ-Z:REM BUILD
105 ' INITIALIZE
110 CLS:INPUT"WHAT DO YOU WANT TO CALL THE COMPLETED PROGRAM";X
115 ' INPUT FILENAME OF COMMAND FILE
```

```
120 IFRIGHT$(X,4)<>"/CMD"THENX=X+"/CMD"
125 ' MAKE SURE IT ENDS IN /CMD
130 CLS:Y=CHR$(1)+CHR$(0)
135 ' FIRST BYTE INDICATES MACHINE CODE, 2ND IS BYTE COUNT.
140 Y=Y+CHR$(00)+CHR$(&H6F)
145 '                ORG   6F00H
150 Y=Y+CHR$(&H2A)+CHR$(&H16)+CHR$(&H40)
155 ' 6F00 2A1640    LD    HL,(4016H)   ;KEYBOARD VECTOR
160 Y=Y+CHR$(&H22)+CHR$(&H10)+CHR$(&H6F)
165 ' 6F03 22106F    LD    (6F10H),HL   ;POKE INTO CALL $-$
170 Y=Y+CHR$(&H21)+CHR$(&H0F)+CHR$(&H6F)
175 ' 6F06 210F6F    LD    HL, 6F0FH    ;BEGINNING OF NEW SCAN
180 Y=Y+CHR$(&H22)+CHR$(&H16)+CHR$(&H40)
185 ' 6F09 221640    LD    (4016H),HL   ;POKE INTO KEYBD VECTOR
190 Y=Y+CHR$(&HC3)+CHR$(&H2D)+CHR$(&H40)
195 ' 650C C32D40    JP    402DH        ;GO TO DOS READY
200 Y=Y+CHR$(&HCD)+CHR$(0)+CHR$(0)
205 '6F0F CD0000     CALL  $-$          ;CALL OLD SCAN
210 Y=Y+CHR$(&H2A)+CHR$(&H26)+CHR$(&H6F)
215 '6512 2A266F     LD    HL,(6F26H)   ;GET POINTER
220 Y=Y+CHR$(&H7E)
225 '6F15 7E         LD    A,(HL)       ;PUT CHAR IN A
230 Y=Y+CHR$(&H23)
235 '6F16 23         INC   HL           ;ADD 1 TO POINTER
240 Y=Y+CHR$(&H22)+CHR$(&H26)+CHR$(&H6F)
245 '6F17 22266F     LD    (6F26H),HL   ;STORE POINTER
250 Y=Y+CHR$(&HFE)+CHR$(&HFF)
255 '6F1A FEFF       CP    0FFH         ;DOES A= FFH?
260 Y=Y+CHR$(&HC0)
265 '6F1C C0         RET   NZ           ;IF NOT, RET CHAR
270 Y=Y+CHR$(&H2A)+CHR$(&H10)+CHR$(&H6F)
275 '6F1D 2A106F     LD    HL,(6F10H)   ;IF SO GET OLD SCAN
280 Y=Y+CHR$(&H22)+CHR$(&H16)+CHR$(&H40)
285 '6F20 221640     LD    (4016H),HL   ;& PUT IT BACK
290 Y=Y+CHR$(&H3E)+CHR$(&H0D)
295 '6F23 3E0D       LD    A,13         ;PUT A CR IN A
300 Y=Y+CHR$(&HC9)
305 '6F25 C9         RET                ;RETURN (PROG DISABLED)
310 Y=Y+CHR$(&H28)+CHR$(&H6F)
315 '6F26 286F       DEFW  6F28h        ;POINTING TO NEXT BYTE
320 IFLEN(Y)<>44THENPRINT"PROGRAM NOT TYPED IN CORRECTLY":END
325 'MACHINE LANGUAGE PROGRAMS ARE NOT EASY TO GET ALONG WITH
330 J=1
335 'J IS NUMBER OF COMMAND LINES
340 PRINT"TYPE IN WHAT YOU NORMALLY DO TO BRING SYSTEM UP"
345 ' INSTRUCTIONS
350 PRINT"TYPE IN <END> TO END"
355 ' INSTRUCTIONS
360 PRINT"COMMAND :";J
365 ' INPUT LOOP STARTS
370 LINEINPUTZ:IFZ="END"THEN410
375 ' INPUT COMMAND, CHECK FOR END
380 K=INSTR(Z,"RUN"):IFK<>0THEN400
385 'PROGRAM MAY NOT BE RUNNING WITH A BASIC PROGRAM RUNNING
390 Y=Y+Z+CHR$(13)+CHR$(0):J=J+1:GOTO360
395 'APPENDS COMMAND TO Y STRING WHICH IS THE MACH. LANG. PROG
400 Y=Y+Z:GOTO420
```

```
405 'PROGRAM WILL TERM BUILD, NOTE CR & 0 NOT ADDED
410 Y=LEFT$(Y,LEN(Y)-2)
415 'REMOVE CR AND 0 FROM LAST LINE
420 Y=Y+CHR$(&HFF)
425 'XXXX FF        DEFB   0FFH       ;FF SIGNALS END
430 Y=Y+CHR$(2)+CHR$(2)
435 'XXXX 0202                        ;MARKS END FOR DOS
440 Y=Y+CHR$(0)+CHR$(&H6F)
445 'XXXX 006F                        ;TELLS DOS TO JUMP TO 6F00
450 J=LEN(Y)-6:MID$(Y,2,1)=CHR$(J)
455 ' J IS PROGRAM LENGTH, MAKE SECOND CHARACTER = J
460 OPEN"R",1,X
465 'OPEN FILE WHICH YOU NAMED
470 FIELD1,255ASW
475 'WHOLE THING IS ONE PIECE
480 LSETW=Y
485 'PUT PROGRAM IN BUFFER
490 PUT1,1
495 'WRITE IT ON DISK
500 CLOSE
505 'PROGRAM IS NOW ON DISK
510 CLS:PRINT"RETURNING YOU TO DOS READY."
515 ' SET UP AUTO COMMAND
520 PRINT:PRINT"TYPE IN THE FOLLOWING EXACTLY:"
525 ' INSTRUCTIONS
530 PRINT:PRINT"AUTO ";LEFT$(X,LEN(X)-4)
535 ' INSTRUCTIONS
540 PRINT:PRINT"THEN REBOOT.  PROGRAM TERMINATED":CMD"S"
545 ' RETURN TO DOS READY ■
```

Spacer

The keywords used in the data statements are those used by the Model I/III only. To fully utilize Spacer on your machine, add the keywords unique to your BASIC at the end of the data list. Please note that the "XXXX" *must* be the last item in the list.

Make your BASIC programs readable

For Models I, II, III and Color computer with disk

Lou Pa, Sacramento, CA

Writing a program in a compressed form (without unnecessary spaces) so it will run in limited memory often makes it impossible to share a readable listing. While it does not "stylize" according to Nevison (*The Little Book of BASIC Style*, Addison-Wesley Publishing Co., 1978), Spacer does create a legible program file from a compressed program.

This program works in a 16K computer with a minimum of one disk drive and any DOS (Disk Operating System). When entering the program, do not enter the remark statements as they will use more than a 16K disk system can handle. If you have 32K of memory or larger, there will be no problem.

Programs saved in the ASCII format (SAVE"*filespec*",A) are stored as sequential files. The file input/output commands can be used to manipulate program lines as if they were filed data. The concept is extendable to renumbering, comparing two or more programs, global editing, and a true compactor which concatenates program lines and changes all line references.

Spacer sifts each character of a program line through a series of questions asking, "How does this character fit Spacer's grammar of BASIC?" It recognizes eight elements: numbers and letters, which also combine into variables; symbols; command words; remarks (REM statements); DATA statements; and strings between quote marks. Blanks are neither added to or deleted from remarks and strings between quotes, and are pretty much ignored in DATA elements, too. Command words are compared to a "token" list just as they are in the BASIC interpreter. Because of its slowness and the fact that I am so used to reading closely typed programs, I use Spacer rarely. Essentially, it is an exercise in using sequential files. ■

```
1 REM  ********************************
2 REM
3 REM    Listing of SPACER/BAS for
4 REM    Models I, II, and III
5 REM          by LOU PA
6 REM             BOX 19358
7 REM             SACRAMENTO CA 95819
8 REM          JANUARY 1980 (C)
9 REM  ********************************

10 CLS:CLEAR1000:DEFSTRA-G:DEFINTH-Q:N=
  34:F=CHR$(N):GOTO250
11 '   SKIP OVER SUBROUTINES TO INITIAL
  IZATION
15 REM STRINGS BETWEEN QUOTES SUBROUTIN
  E SEARCHES FOR THE SECOND OF A PAIR O
  F QUOTE MARKS (CHR$(34)), AND RETURNS
   THE STRING PLUS THE QUOTE MARKS
16 '   NEW, SPACED PROGRAM LINE. REFERR
  ED FROM REGULAR SEQUENCE LINE #360 AN
  D FROM WITHIN THE DATA STATEMENT ROUT
  INE LINE #470.
20 J=INSTR(K+1,C,F):IFJ=0THENJ=L
30 D=MID$(C,K,J-K+1):RETURN
35 REM PRELIMINARY SPACING AROUND SYMBO
  LS. SPACER BEGINS BY ADDING SPACES AN
  D THE DELETING THEM.
40 IFH=33ORH=35ORH=36ORH=37ORH=44ORH=59
  ORH=63ORH=64THEND=D+" ":GOTO50
45 IFH=45ORH=42ORH=43ORH=58ORH=60ORH=61
  ORH=62THEND=" "+D+" "
46 REM NEXT TWO LINES SET THE SYMBOL SP
  ACING VARIABLES. H1 & H2 REPRESENT TH
  E CHARACTERS AT THE RIGHT OF THE NEWL
  Y SPACED LINE VARIABLE "E."
47 '   H3 & H4 ARE THE LEFT CHARACTERS
  OF PROCESSING CHARACTERS TO BE ADDED.
   D2 & D3 ARE USED TO CHECK SPACING AR
  OUND CERTAIN TWO AND THREE LETTER COM
  MAND WORDS (LIST IN LINE #70).
50 H1=ASC(RIGHT$(E,1)):H2=ASC(MID$(E,LE
  N(E)-1,1)):D2="":D3=""
55 IFLEN(E)>2THEND2=MID$(E,LEN(E)-2,2):
  IFLEN(E)>3THEND3=MID$(E,LEN(E)-3,3)
60 H3=ASC(LEFT$(D,1)):IFLEN(D)>1THENH4=
  ASC(MID$(D,2,1))ELSEH4=130
65 REM NEXT LINE PREVENTS REMOVING SPAC
  E FROM BETWEEN THE PROGRAM WORDS "AND
```

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```
  ," "OR," "IF," OR THE PUNCTUATION MAR
  KS COMMAS, COLONS, AND SEMI-COLONS AN
  D A RIGHT PARENS ")". THIS ALLOWS A S
  TATEMENT LIKE:
66 '   IF(X=1AND(A=2ORB=3))THEN ####, T
  O BE SPACED LIKE: IF (X = 1 AND (A =
  2 OR B = 3)) THEN ####, RATHER THAN:
  IF(X = 1 AND(A = 2 OR B = 3)) THEN ##
  ##. THUS IT ALLOWS THE RIGHT PARENS T
  O STAY CLOSE TO
67 '   OTHER WORDS LIKE LEFT$(, MID$(,
  ETC.
70 IFH1=32ANDH3=40AND(D3="AND"ORD2="OR"
  ORD2="IF"ORH2=44ORH2=58ORH2=59)THEN57
  0
75 REM REMOVES BLANK AFTER LINE FEED, R
  IGHT PARENS, "/," AND BETWEEN THE EQU
  ALS/NOT EQUALS SIGNS (<=>).
80 IFH3=32AND((H1=10ORH1=47ORH1=40)OR((
  H1=60ORH1=61ORH1=62)AND(H4=60ORH4=61O
  RH4=62)))THEND=MID$(D,2):GOTO60
85 REM REMOVES BLANK BETWEEN ANYTHING A
  ND THE ASCII CHARS LISTED AS DECIMAL
  NUMBERS IN THE LINE. THE PRINTCHR$(8)
   IS A SCREEN FORMAT COMMAND THAT ALLO
  WS THE NEWLY SPACED LINE TO PRINT COR
  RECTLY.
90 IFH1=32AND(H3=47ORH3=10ORH2=40ORH3=4
  1ORH3=32ORH3=44)THEN95
91 IFH1=32AND(H3=43ORH3=40ORH3=58ORH3=5
  9ORH3=33ORH3=35ORH3=36ORH3=37ORH3=91)
  THEN 95
92 GOTO 100
95 E=LEFT$(E,LEN(E)-1):PRINTCHR$(8);:GO
  TO50
100 GOTO570
105 REM THIS ROUTINE COMPARES THE PROGR
  AM LINE POSITION WITH A LIST OF THE C
  OMMAND WORDS. THE SEARCH IS IN THE OR
  DER OF THE WORDS'S OCCURANCE IN MY PR
  OGRAMS. CHANGE THE SEQUENCE TO SUIT Y
  OURSELF.
106 '   NOTE, HOWEVER, THAT A SHORT WOR
  D THAT IS CONTAINED IN A LONG WORD--P
  RINT IN PRINT@, FOR EXAMPLE, MUST FOL
  LOW THE LONG WORD IN THE SEARCH OR IT
   WILL SPLIT THE WORD--PRINT @, OR PRI
  NT USING, ETC.
110 READDO
111 IFDO="XXXX"THEN570
112 IFMID$(C,I,LEN(DO))=DOTHEND=" "+DO+
  " ":I=I+LEN(DO)-1:GOTO50ELSE110
120 DATA OR,AND,GOTO,IF,THEN,FOR,NEXT,O
  N,TO,GOSUB
130 DATA LEFT$,MID$,INSTR,CHR$,ELSE,CLS
  ,LPRINT
140 DATA PRINT@,PRINT#-1,PRINT#-2,PRINT
  USING,PRINT#,PRINT
150 DATA INPUT#-1,INPUT#-2,INPUT#,INPUT
  ,INT,LEN,STR$
160 DATA RIGHT$,PEEK,POKE,LINEINPUT#,LI
  NEINPUT,GET,PUT,LSET,READ
170 DATA ASC,AS,FIELD,RETURN,STRING$,VA
  RPTR,CDBL,CINT
180 DATA CSNG,CVD,CVI,CVS,MKD$,MKI$,MKS
  $,INKEY$,CLOSE
190 DATA OPEN,LET,STEP,TAB,USR,VAL,USIN
  G,LINE,LOAD
200 DATA DIM,LOF,EOF,RUN,MEM,END,CSAVE,
  RESTORE,RANDOM
210 DATA DEFINT,DEFSTR,DEFDBL,DEFUSR,RE
  SUME,POINT,SET
220 DATA RSET,RESET,ABS,ATN,COS,EXP,FIX
  ,NOT,RND,SGN,LOC,LOG
230 DATA SIN,SQR,TAN,STOP,FREE,FRE,KILL
  ,ERROR,ERR,NAME,SAVE
240 DATA CLEAR,TROFF,DEFSNG,TIME$,OUT,M
  ERGE,DELETE,TRON,XXXX
250 ONERRORGOTO5000
255 REM THE MENU IS SHORT AND ERROR TRA
  PPED
260 INPUT"PROCESSES:
SELECT:
   1 DESPACE FOR COMPACTNESS
   2 RESPACE FOR CLARITY
   ";M:IFM<1ORM>2THEN260
270 INPUT"REMOVE REMARKS Y/N";GA:IFGA<>
  "Y"THENGA="N"
280 LINEINPUT"
PROGRAM FILESPEC ==> ";A:IFA=""THEN280
290 LINEINPUT"
PROCESSED PROGRAM FILESPEC ==> ";B
295 REM THE LINE PREVENTS YOUR TRYING T
  O OPEN ONE FILESPEC FOR BOTH INPUT AN
  D OUTPUT AT THE SAME TIME.
300 IFB=ATHEN280ELSEIFB=""THEN290
310 OPEN"I",1,A:OPEN"O",2,B
315 REM CLEARS SCREEN AND PRINTS THE FI
  LESPECS
320 CLS:PRINT@0,"RESPACING ";A;" INTO "
  ;B
325 REM THE PROGRAM BEGINS BY LINEINPUT
  ING A PROGRAM LINE FROM DISK. IF IT I
  S A NULL LINE, THE FILE IS CHECKED FO
  R THE END OF FILE MARKER AS A PRECAUT
  ION.
330 E="":LINEINPUT#1,C:L=LEN(C):A#=A#+L
  :IFC=""THEN610
335 REM THE LINE NUMBER IS STRIPPED AND
   PUT INTO THE NEW-LINE VARIABLE "E".
  THE SCREEN IS CLEARED FROM POSITION #
  128 TO DISPLAY THE NEW LINE AS IT IS
  SPACED.
336 PRINTC
```

```
340 I=INSTR(C," "):E=LEFT$(C,I):PRINTE;
  :I=I+1
345 REM NOW, THE LINE IS PROCESSED CHAR
  ACTER BY CHARACTER. MOSTLY, BY THE AS
  C NUMBER OF THE CHARACTER VARIABLE "H
  ".
350 FORI=ITOL:D=MID$(C,I,1):H=ASC(D)
355 REM WE NEITHER WANT TO ADD OR DELET
  E SPACES FROM STRINGS BETWEEN QUOTES.
   IF THE CURRENT CHARACTER IS A QUOTE
  MARK, THIS LINE JUMPS TO THE QUOTE SU
  BROUTINE IN LINE 20-30. THE LOOP COUN
  TER INCREMENTS TO THE
356 '   LENGTH OF THE STRING. IF THERE
  IS NO SECOND QUOTE, AS SOME PROGRAMME
  RS OMIT THE QUOTE MARK AT THE END OF
  A LINE, SPACER ASSUMES THE END OF THE
   LINE IS THE SECOND
357 '   QUOTE MARK. THE STRING IS IMMED
  IATELY CONCATENATED INTO THE NEW LINE
   VARIABLE.
360 IFH=NTHENK=I:GOSUB20:I=J:GOTO580
365 REM NUMBERS REQUIRE NO PROCESSING E
  XCEPT CONCATENATING. TO KEEP PROCESSI
  NG TIME DOWN WHILE ALLOWING A DESPACI
  NG OPTION, SPACER CONCATENATES SPACES
   IMMEDIATELY AND THEN REMOVES ANY EXT
  RAS.
370 IF(H>47ANDH<58)OR(M=2ANDH=32)THEN57
  0
375 REM WHEN DESPACING BLANKS ARE REMOV
  ED BY JUMPING TO THE LOOPS END. STRIN
  GS WERE PROCESSED IN LINE 360, SO THI
  S LINE JUMPS ON TO CHECK THE SPECIAL
  COMMAND WORDS.
380 IFM=1THENIFH=32THEN590ELSE420
385 REM THIS LINE JUMPS TO SYMBOLS PROC
  ESS ROUTINE.
390 IF(H=33OR(H>35ANDH<65)ORH=91)ANDH<>
  39THEN40
395 REM IT TAKES THE LONGEST TIME TO SE
  ARCH FOR A LETTER COMBINATION THAT IS
   NOT A COMMAND WORD. SINCE ALL COMMAN
  D WORDS HAVE AT LEAST TWO DIFFERENT L
  ETTERS THIS ROUTINE SKIPS THE WORD SE
  ARCH FOR LETTERS
396 '   FOLLOWED BY THE SAME LETTER OR
  ANY SYMBOL OR NUMBER. IT ALSO PASSES
  THROUGH THE LAST CHARACTER IN A LINE.

400 IFI<LTHENHB=ASC(MID$(C,I+1,1))ELSE5
  70
410 IF(H=HB)OR((H>64ANDH<91)ANDHB<65)TH
  EN580
415 REM THE DATA ROUTINE IS SPACER IN M
  INIATURE. FIRST, "DATA" IS SPLIT OFF
  AND THE COUNTER INCREMENTS.
```

```
420 IFMID$(C,I,4)<>"DATA"THEN520ELSEI=I
  +4:DD=" DATA "
425 REM SECOND, ANY BLANKS BETWEEN "DAT
  A" AND ITS FIRST ELEMENT ARE STRIPPED
   BY INCREMENTING THE COUNTER.
430 IFMID$(C,I,1)=" "THENI=I+1:GOTO430
435 REM THIRD, A CHARACTER BY CHARACTER
   LOOP IS INITIATED WITH VARIABLES AS
  IN THE MAIN LOOP.
440 FORK=ITOL:D=MID$(C,K,1):H=ASC(D)
445 REM STRIP BLANKS AFTER A COMMA AND
  BEFORE AN ELEMENT.
450 IFH=44THENIFMID$(C,K+1,1)=" "THENK=
  K+1:GOTO450
455 REM CHECKS FOR COLON--TERMINATOR. I
  F PRESENT, JUMPS OUT OF LOOP.
460 IFH=58THENDD=DD+D:GOTO510
465 REM STRINGS BETWEEN QUOTES ROUTINE.
   DATA ELEMENTS CAN ALSO BE QUOTED STR
  INGS.
470 IFH=NTHENGOSUB20:K=J:GOTO490
475 REM INSERT SPACE AFTER COMMA WHEN R
  ESPACING
480 IFH=44ANDM=2THEND=D+" "
485 REM CONCATENATE DATA ELEMENT CHARAC
  TERS
490 DD=DD+D

500 NEXTK
505 REM CHANGE DATA STATEMENT VARIABLE
  INTO MAIL LOOP CONCATENATING VARIABLE
  . INCREMENT MAIN LOOP COUNTER. JUMP T
  O CONCATENATE LINE.
510 D=DD:DD="":I=K:GOTO570
515 REM PROCESS REM STATEMENTS
520 IFMID$(C,I,3)<>"REM"ANDH<>39THEN560

525 REM IF REMS ARE NOT TO BE REMOVED,
  THEN THE ENTIRE REMARK IS PUT INTO TH
  E CONCATENATING VARIABLE, THE LOOP CO
  UNTER IS INCREMENTED, AND THE REM IS
  CONCATENATED.
530 IFGA="N"THEND=MID$(C,I):I=L:GOTO570

535 REM IF REMS ARE TO BE REMOVED, THE
  NEWLY SPACED LINE (E) IS BACK SEARCHE
  D FOR A COLON AND ALL FROM THE COLON
  TO THE RIGHT IS STRIPPED. IF THE BACK
  SEARCH GOES ALL THE WAY TO THE BEGINN
  ING OF THE LINE, THE
536 '   ENTIRE LINE IS A REMARK AND THE
   LINE IS PASSED OVER.
539 IF H=39 THEN600
540 FORII=LEN(E)TO1STEP-1:H=ASC(MID$(E,
  II,1))
550 IFH<>58THENNEXTII:GOTO610:ELSEE=LEF
  T$(E,II-1):GOTO600
555 REM NOW, SEARCH THROUGH THE COMMAND
   WORD LIST.
560 IFM=2THENPOKE16553,255:RESTORE:GOTO
  110
565 REM REMOVE EXCESS SPACES.
570 IFRIGHT$(E,1)=" "ANDLEFT$(D,1)=" "T
  HEND=MID$(D,2)
575 REM CONCATENATE INTO THE NEWLY SPAC
  ED LINE.
580 E=E+D:PRINTD;
585 REM END OF MAIN LOOP.
590 NEXTI
595 REM PRINT NEW LINE TO DISK.
600 PRINT#2,E
605 REM CHECK FOR END OF FILE MARKER AN
  D GO BACK FOR ANOTHER LINE OR CLOSE T
  HE FILES.
610 IF EOF(1) THEN CLOSE ELSE 320
620 END
4995 REM ERROR TRAPPING ROUTINE FOR STR
  ING TOO LONG. IF SO, PRINT MESSAGE ON
   LINE PRINTER AND RECORD AS MUCH AS P
  OSSIBLE.
5000 IF ERR=28 AND ERL=580 THEN LPRINT
  LEFT$(E, 10) : RESUME600
5010 ONERRORGOTO0
5020 STOP
```

Model II changes

Note: Add keywords to the token list as needed.

```
560 IFM=2THENRESTORE:GOTO110
620 IF GA="N" THEN END
670 OPEN"I",1,B
680 OPEN"O",2,A
690 IF EOF(1) THEN CLOSE : END
700 LINEINPUT#1,C
710 A%=INSTR(C," ")
720 B%=LEN(C)
730 IF A%=B% THEN 690
740 PRINT C
750 PRINT#2,C
760 GOTO690
```

Color computer version

Note: Add keywords to the token list as needed.

```
1 REM  ************************
2 REM
3 REM    SPACER....
4 REM
5 REM    by LOU PA
6 REM       BOX 19358
7 REM       SACRAMENTO CA 95819
8 REM
9 REM  ************************
10 CLS:CLEAR1000:N=34:F$=CHR$(N)
:GOTO260
```

```
11 REM SKIP OVER SUBROUTINES TO
   INITIALIZATION.
15 REM STRINGS BETWEEN QUOTES
   SUBROUTINE SEARCHES FOR THE
   SECOND OF A PAIR OF QUOTE
   MARKS (CHR$(34)), AND RETURNS
   THE STRING PLUS THE QUOTE
   MARKS.
16 ' NEW, SPACED PROGRAM LINE.
   REFERRED FROM REGULAR
   SEQUENCE LINE #360 AND FROM
   WITHIN THE DATA STATEMENT
   ROUTINE LINE #470
20 J=INSTR(K+1,C$,F$):IFJ=0 THEN
J=L
30 D$=MID$(C$,K,J-K+1):RETURN
35 REM PRELIMINARY SPACING
   AROUND SYMBOLS. SPACER BEGINS
   BY ADDING SPACES AND THEN
   DELETING THEM.
40 IFH=330RH=350RH=360RH=370RH=4
40RH=590RH=630RH=64 THEND$=D$+"
":GOTO50
45 IFH=450RH=420RH=430RH=580RH=6
00RH=610RH=62 THEND$=" "+D$+" "
46 REM NEXT TWO LINES SET THE
   SYMBOL SPACING VARIABLES. H1
   & H2 REPRESENT THE CHARACTERS
   AT THE RIGHT OF THE NEWLY
   SPACED LINE VARIABLE "E."
47 ' H3 & H4 ARE THE LEFT
   CHARACTERS OF PROCESSING
   CHARACTERS TO BE ADDED. D2 &
   D3 ARE USED TO CHECK SPACING
   AROUND CERTAIN TWO AND THREE
   LETTER COMMAND WORDS (LIST
   IN LINE #70).
50 H1=ASC(RIGHT$(E$,1)):H2=ASC(M
ID$(E$,LEN(E$)-1,1)):D2$="":D3$=
""
55 IFLEN(E$)>2 THEND2$=MID$(E$,L
EN(E$)-2,2):IFLEN(E$)>3 THEND3$=
MID$(E$,LEN(E$)-3,3)
60 H3=ASC(LEFT$(D$,1)):IFLEN(D$)
>1 THENH4=ASC(MID$(D$,2,1)) ELSE
H4=130
65 REM NEXT LINE PREVENTS
   REMOVING SPACE FROM BETWEEN
   THE PROGRAM WORDS "AND",
   "OR", "IF" OR THE PUNCTUATION
   MARKS: COMMAS, COLONS, AND
   SEMI-COLONS AND RIGHT PARENS:
   "(". THIS ALLOWS A STATEMENT
   LIKE:
66 ' IF(X=1AND(A=20RB=3))THEN...
   TO BE SPACED LIKE:
   IF (X = 1 AND (A = 2 OR B =
```

```
   3)) THEN..., RATHER THAN:
   IF(X = 1 AND(A = 2 OR B = 3))
   THEN... THUS IT ALLOWS THE
   RIGHT PARENS TO STAY CLOSE TO
67 ' OTHER WORDS LIKE LEFT$(,
   MID$(, ETC.
70 IFH1=32ANDH3=40AND(D3$="AND"O
RD2$="OR"ORD2$="IF"ORH2=44ORH2=5
8ORH2=59) THEN570
75 REM REMOVES BLANK AFTER LINE
   FEED, RIGHT PARENS, "/" AND
   BETWEEN THE EQUALS/NOT EQUALS
   SIGNS (<=>).
80 IFH3=32AND((H1=10ORH1=47ORH1=
40)OR((H1=60ORH1=61ORH1=62)AND(H
4=60ORH4=61ORH4=62))) THEND$=MID
$(D$,2):GOTO60
85 REM REMOVES BLANK BETWEEN
   ANYTHING AND THE ASCII CHARS
   LISTED AS DECIMAL NUMBERS IN
   THE LINE. THE PRINTCHR$(8)
   IS A SCREEN FORMAT COMMAND
   THAT ALLOWS THE NEWLY
   SPACED LINE TO PRINT
   CORRECTLY.
90 IFH1=32AND(H3=47ORH3=10ORH2=4
0ORH3=41ORH3=32ORH3=44) THEN95
91 IFH1=32AND(H3=43ORH3=40ORH3=5
8ORH3=59ORH3=33ORH3=35ORH3=36ORH
3=37ORH3=91) THEN95
92 GOTO100
95 E$=LEFT$(E$,LEN(E$)-1):PRINTC
HR$(8);:GOTO50
100 GOTO570
105 REM THIS ROUTINE COMPARES
    THE PROGRAM LINE POSITION
    WITH A LIST OF THE COMMAND
    WORDS. THE SEARCH IS IN THE
    ORDER OF THE WORDS'S
    OCCURANCE IN MY PROGRAMS.
    CHANGE THE SEQUENCE TO SUIT
    YOURSELF.
106 'NOTE, HOWEVER, THAT A SHORT
    WORD THAT IS CONTAINED IN A
    LONG WORD--PRINT IN PRINT@,
    FOR EXAMPLE, MUST FOLLOW THE
    LONG WORD IN THE SEARCH OR
    IT WILL SPLIT THE WORD--
    PRINT @, OR PRINT USING.
110 READDO$
111 IFDO$="XXXX" THEN570
112 IFMID$(C$,I,LEN(DO$))=DO$ TH
EN114 ELSE110
114 D$=" "+DO$+" ":I=I+LEN(DO$)-
1:GOTO50
120 DATA OR,AND,GOTO,IF,THEN,FOR
,NEXT,ON,TO,GOSUB
130 DATA LEFT$,MID$,INSTR,CHR$,E
LSE,CLS,LPRINT
140 DATA PRINT@,PRINT#-1,PRIT#-2
,PRINTUSING,PRINT#,PRINT
150 DATA INPUT#-1,INPUT#-2,INPUT
#,INPUT,INT,LEN,STR$
160 DATA RIGHT$,PEEK,POKE,LINEIN
PUT#,LINEINPUT,GET,PUT,LSET,READ
170 DATA ASC,AS,FIELD,RETURN,STR
ING$,VARPTR,CDBL,CINT
180 DATA CSNG,CVD,CVI,CVS,MKD$,M
KI$,MKS$,INKEY$,CLOSE
190 DATA OPEN,LET,STEP,TAB,USR,V
AL,USING,LINE,LOAD
200 DATA DIM,LOF,EOF,RUN,MEM,END
,CSAVE,RESTORE,RANDOM
210 DATA DEFINT,DEFSTR,DEFDBL,DE
FUSR,RESUME,POINT,SET
220 DATA RSET,RESET,ABS,ATN,COS,
EXP,FIX,NOT,RND,SGN,LOC,LOG
230 DATA SIN,SQR,TAN,STOP,FREE,F
RE,KILL,ERROR,ERR,NAME,SAVE
240 DATA CLEAR,TROFF,DEFSNG,TIME
$,OUT,MERGE,DELETE,TRON,XXXX
255 REM THE MENU IS SHORT AND
    ERROR TRAPPED
260 CLS:PRINTTAB(11)"PROCESSES":
PRINT:PRINT"SELECT:":PRINT:PRINT
TAB(5)"1  DESPACE FOR COMPACTNES
S":PRINTTAB(5)"2  RESPACE FOR CL
ARITY ";:INPUTM:IFM<1ORM>2 THEN2
60
270 INPUT"REMOVE REMARKS Y/N";GA
$:IFGA$<>"Y" THENGA$="N"
280 LINEINPUT"INPUT FILESPEC ";A
$:IFA$="" THEN280
290 LINEINPUT"OUTPUT FILESPEC ";
B$
295 REM THE LINE PREVENTS YOUR
    TRYING TO OPEN ONE FILESPEC
    FOR BOTH INPUT AND OUTPUT AT
    THE SAME TIME.
300 IFB$=A$ THEN280 ELSEIFB$=""
THEN290
310 OPEN"I",1,A$:OPEN"O",2,B$
315 REM CLEARS SCREEN AND PRINTS
    THE FILESPECS
320 CLS:PRINT"RESPACING ";A$:PRI
NT" INTO ";B$
325 REM THE PROGRAM BEGINS BY
    LINEINPUTING A PROGRAM LINE
    FROM DISK. IF IT IS A NULL L
    LINE, THE FILE IS CHECKED
    FOR THE END OF FILE MARKER
    AS A PRECAUTION.
330 E$="":LINEINPUT#1,C$:L=LEN(C
$):A=A+L:IFC$="" THEN610
```

```
335 REM THE LINE NUMBER IS
    STRIPPED AND PUT INTO THE
    NEW-LINE VARIABLE "E". THE
    SCREEN DISPLAYS THE NEW LINE
    AS IT IS SPACED.
336 PRINTC$
340 I=INSTR(C$," "):E$=LEFT$(C$,
I):PRINTE$;:I=I+1
345 REM NOW, THE LINE IS
    PROCESSED CHARACTER BY
    CHARACTER. MOSTLY, BY THE
    ASCII NUMBER OF THE
    CHARACTER VARIABLE "H".
350 FORI=I TOL:D$=MID$(C$,I,1):H
=ASC(D$)
355 REM WE NEITHER WANT TO ADD
    OR DELETE SPACES FROM
    STRINGS BETWEEN QUOTES. IF
    THE CURRENT CHARACTER IS A
    QUOTE MARK, THIS LINE JUMPS
    TO THE QUOTE SUBROUTINE IN
    LINES 20-30. THE LOOP
    COUNTER INCREMENTS TO
356 ' LENGTH OF THE STRING. IF
    THERE IS NO SECOND QUOTE, AS
    SOME PROGRAMMERS OMIT THE
    QUOTE MARK AT THE END OF A
    LINE, SPACER ASSUMES THE END
    OF THE LINE IS THE SECOND
357 ' QUOTE MARK. THE STRING IS
    IMMEDIATELY CONCATENATED
    INTO THE NEW LINE VARIABLE.
360 IFH=N THENK=I:GOSUB20:I=J:GO
TO580
365 REM NUMBERS REQUIRE NO
    PROCESSING EXCEPT
    CONCATENATING. TO KEEP
    PROCESSING TIME DOWN WHILE
    ALLOWING A DESPACING OPTION,
    SPACER CONCATENATES SPACES
    IMMEDIATELY AND THEN REMOVES
    ANY EXTRAS.
370 IF(H>47ANDH<58)OR(M=2ANDH=32
) THEN570
375 REM WHEN DESPACING BLANKS
    ARE REMOVED BY JUMPING TO
    THE LOOPS END. STRINGS WERE
    PROCESSED IN LINE 360, SO
    THIS LINE JUMPS ON TO CHECK
    THE SPECIAL COMMAND WORDS.
380 IFM=1 THENIFH=32 THEN590 ELS
E420
385 REM THIS LINE JUMPS TO
    SYMBOLS PROCESS ROUTINE.
390 IF(H=33OR(H>35ANDH<65)ORH=91
)ANDH<>39 THEN40
395 REM IT TAKES THE LONGEST
    TIME TO SEARCH FOR A LETTER
    COMBINATION THAT IS NOT A
    COMMAND WORD. SINCE ALL
    COMMAND WORDS HAVE AT LEAST
    TWO DIFFERENT LETTERS THIS
    ROUTINE SKIPS THE WORD
    SEARCH FOR LETTERS
396 'FOLLOWED BY THE SAME LETTER
    OR ANY SYMBOL OR NUMBER. IT
    ALSO PASSES THROUGH THE LAST
    CHARACTER IN A LINE.
400 IFI<L THENHB=ASC(MID$(C$,I+1
,1)) ELSE570
410 IF(H=HB)OR((H>64ANDH<91)ANDH
B<65) THEN580
415 REM THE DATA ROUTINE IS
    SPACER IN MINIATURE. FIRST,
    "DATA" IS SPLIT OFF AND THE
    COUNTER INCREMENTS.
420 IFMID$(C$,I,4)<>"DATA" THEN5
20 ELSEI=I+4:DD$=" DATA "
425 REM SECOND, ANY BLANKS
    BETWEEN "DATA" AND ITS FIRST
    ELEMENT ARE STRIPPED BY
    INCREMENTING THE COUNTER.
430 IFMID$(C$,I,1)=" " THENI=I+1
:GOTO430
435 REM THIRD, A CHARACTER BY
    CHARACTER LOOP IS INITIATED
    WITH VARIABLES AS IN THE
    MAIN LOOP.
440 FORK=I TOL:D$=MID$(C$,K,1):H
=ASC(D$)
445 REM STRIP BLANKS AFTER A
    COMMA AND BEFORE AN ELEMENT
450 IFH=44 THENIFMID$(C$,K+1,1)=
" " THENK=K+1:GOTO450
455 REM CHECKS FOR COLON--
    TERMINATOR. IF PRESENT,
    JUMPS OUT OF LOOP.
460 IFH=58 THENDD$=DD$+D$:GOTO51
0
465 REM STRINGS BETWEEN QUOTES
    ROUTINE. DATA ELEMENTS CAN
    ALSO BE QUOTED STRINGS.
470 IFH=N THENGOSUB20:K=J:GOTO49
0
475 REM INSERT SPACE AFTER
    COMMA WHEN RESPACING
480 IFH=44ANDM=2 THEND$=D$+" "
485 REM CONCATENATE DATA
    ELEMENT CHARACTERS
490 DD$=DD$+D$
500 NEXTK
505 REM CHANGE DATA STATEMENT
    VARIABLE INTO MAIL LOOP
    CONCATENATING VARIABLE.
```

BASIC application

```
    INCREMENT MAIN LOOP COUNTER.
    JUMP TO CONCATENATE LINE.
510 D$=DD$:DD$="":I=K:GOTO570
515 REM PROCESS REM STATEMENTS
520 IFMID$(C$,I,3)<>"REM"ANDH<>3
9 THEN560
525 REM IF REMS ARE NOT TO BE
    REMOVED, THEN THE ENTIRE
    REMARK IS PUT INTO THE
    CONCATENATING VARIABLE, THE
    LOOP COUNTER IS INCREMENTED,
    AND THE REM IS CONCATENATED.

530 IFGA$="N" THEND$=MID$(C$,I):
I=L:GOTO570
535 REM IF REMS ARE TO BE
    REMOVED, THE NEWLY SPACED
    LINE (E$) IS BACK SEARCHED
    FOR A COLON AND ALL FROM THE
    COLON TO THE RIGHT IS
    STRIPPED. IF THE BACKSEARCH
    GOES ALL THE WAY TO THE
    BEGINNING OF THE LINE
536 'ENTIRE LINE IS A REMARK AND
    THE LINE IS PASSED OVER.
539 IFH=39 THEN600
540 FORII=LEN(E$) TO1STEP-1:H=AS
C(MID$(E$,II,1))
550 IFH<>58 THENNEXTII:GOTO610:
ELSEE$=LEFT$(E$,II-1):GOTO600
555 REM NOW, SEARCH THROUGH THE
    COMMAND WORD LIST.
560 IFM=2 THENRESTORE:GOTO110
561 IFMID$(C$,I,4)="THEN" THEND$
=" THEN":I=I+3:GOTO50
562 IFMID$(C$,I,4)="ELSE" THEND$
=" ELSE":I=I+3:GOTO50
563 IFMID$(C$,I,2)="TO"AND(MID$(
C$,I-2,5)<>"MOTOR"ANDMID$(C$,I-3
,7)<>"RESTORE"ANDMID$(C$,I-1,4)<
>"STOP"ANDRIGHT$(E$,2)<>"GO") TH
END$=" TO":I=I+1:GOTO50
565 REM REMOVE EXCESS SPACES.
570 IFRIGHT$(E$,1)=" "ANDLEFT$(D
$,1)=" " THEND$=MID$(D$,2)
575 REM CONCATENATE INTO THE
    NEWLY SPACED LINE.
580 E$=E$+D$:PRINTD$;
585 REM  END OF MAIN LOOP.
590 NEXTI
595 REM PRINT NEW LINE TO DISK.
600 PRINT#2,E$
605 REM CHECK FOR END OF FILE
    MARKER AND GO BACK FOR
    ANOTHER LINE OR CLOSE THE
    FILES.
610 IFEOF(1) THENCLOSE ELSE320
```

■

System/command

Insertion/deletion in large arrays for Models I and III

James F. Williams

Sometimes it may become necessary to insert or delete elements from large arrays. A prime candidate would be a BASIC word processor. In fact, most BASIC in-memory file systems need it at one time or another. Of course, many file designs include linked-pointers and the like, but using the BASIC arrays directly is usually much simpler.

The BASIC code needed to accomplish insertion/deletion is quite simple, but uncomfortably slow in numeric arrays, and downright painful in string arrays. The insert/delete from the beginning of very large numeric arrays (say in a 48K machine) can take several seconds, and the same operation in a very large string array with memory approaching capacity could take hours or even days to complete. The bugaboo in the string array is, of course, the famous "silent death" or string space re-allocation routine. Inserting or deleting an element requires re-definition of all elements above the insert/delete element (to make room for the newly inserted element, or to get rid of the null element which was deleted.)

The machine language routine included here simply does block moves of the pointers (in the case of string arrays) or values (in the case of numeric arrays), thus avoiding the re-definition hassles. This routine can easily accomplish insertion/deletion in the largest arrays possible in a 48K machine in less than a second (most of that time is BASIC overhead setting up and calling the routine).

Also included here is a BASIC program which demonstrates the use of the routine. Do not be frightened by the complexity of the example. I wanted to construct a quasi-realistic example that used all type of arrays. The actual use of the program is far simpler.

First, type the machine language module in EDTASM and create a system tape. Then load the system tape into memory. Execute this with a /ENTER. It initially occupies memory starting at 7000H, but automatically relocates itself to the top of reserved memory and protects itself. It also automatically sets the USR branch location to its entry point. This means that you do not have to have the "POKE 16526, (low order byte): POKE 16527, (high order byte)" statement in your BASIC program.

To address this routine from BASIC, you need to pass more than the one integer value that BASIC allows. Therefore, you set up a short integer array (4 elements long) and load it with the information that the machine language routine needs. It expects this format:

M(0)=VARPTR of the insert/delete element
M(1)=VARPTR of the last used element
M(2)=0 (for insert) or 1 (for delete)
M(3)=variable type flag:
- 2 - integer
- 3 - string
- 4 - single precision
- 8 - double precision

Now, after you load the array with this information, call the machine language routine by passing the VARPTR of the first element in the communication array. This BASIC statement accomplishes that:

```
X=USR(VARPTR(M(0)))
```

The machine language routine first checks to see if the insert/delete VARPTR is less than the last element. If so, the move takes place and a 0 is assigned to the variable X. If not, the VARPTR's are invalid and a -1 is returned. You can check this from BASIC so that you know if you did something wrong.

If you performed a delete, then the element whose VARPTR you stored in M(0) will have been written over by the element above it (and all other elements above that moved down one). You should then subtract one from your counter that keeps up with the total number of elements in your array.

If you performed an insert, then the element whose VARPTR you stored in M(0) will be copied into the element above it. That element will also be moved up one and so on. You could then use your BASIC input statement to insert your new element into the array. You should also add one to your total element count variable.

The discussion of the insert routine brings up one very important precaution: The machine language routine does not check to see if any more

elements in a given array are dimensioned. This means if you force an insertion when no more elements are available, the last element will overlay some unknown part of memory. The results could be fatal. Fortunately, there is an easy way to check this from BASIC: simply try to address the current highest element + 1 just before an insertion. If BASIC responds with a "Bad Subscript" error, then you know not to try to perform the insertion. This is the function of the rather obscure P(M+1)=0 in line 70 of the BASIC program.

Now a note about deleting in string arrays: the delete routine does not automatically free string space after a deletion has been made. A series of several deletions in a row will leave copies of the last element in the array elements above the last used element. Therefore, to keep from tying up unaddressed string space, it is wise to set the previously highest element to a null string after a deletion. This is the function of the D(M)="" statement in line 80 of the BASIC program.

The use of the VARPTR command deserves one comment. Take care that after the machine language array is loaded with the VARPTR of insert/delete element (line 500, 510, 520, and 530 in the BASIC example), a new variable is not introduced until after USR command is executed. The creation of a new variable can render the old VARPTR's incorrect.

Now that you understand the principles of using this routine, let us look for a moment at the particulars of the BASIC example.

This is an inventory program of rather limited scope. It can handle a part number of up to 16 digits, a quantity of up to 32767 (65535 with a little modification if you need it), a cost of 6 significant figures, and a description. Because you probably would not want to build a large file by hand to test out the insertion and delete routines, it includes a random file generator that fills the arrays. The descriptions are especially implausible (6 repeating letters), but it saves a lot of typing.

You can do three things with the file: 1) List it starting at any line number and exit a list by hitting any key, 2) Insert a record into the file at any point, and 3) Delete any record from the file.

Line 10 DIMensions the arrays and does other housekeeping chores. This program is set to run in 16K (without comments in the BASIC program).

Line 20 builds the random file.

Line 30-90 are the command loop

Lines 50-60 are the (L)ist command.

Line 70 is the (I)nsert command.

Line 80 is the (D)elete command.

Lines 500-900 are the Insert-Delete subroutine. The file is made of 4 parallel arrays, one for each field. So that the records remain parallel, insertion or deletion must be done on all four arrays at the same element.

Line 500 sets up the machine language communication array for the double precision PART NUMBER.

Line 510, 520, and 530 do the same thing for the integer QUANTITY, the single precision COST, and the string DESCRIPTION.

Line 900 is where the actual interface with the machine language routine takes place. Note that if a -1 is returned from the routine, "ERROR" is displayed to indicate that bad parameters were passed to it.

Now for the machine language routine. The routine is completely relocatable (no JP's, CALL's, or absolute addresses to itself). The only address that must be calculated is the entry point, and is assigned to the USR branch address in line 420.

The code from 400-440 is useful if you hate to set memory size. The rest of the code is fairly straight forward. This routine easily could be combined with other machine language routines you need for BASIC. You could also do the "conversion to DATA statement trick" if you do not like to load separate machine language and BASIC programs. You would set the original USR branch to 7000H, and it would reset it to the entry point of the routine after executing. However, it would take much longer to load.

To fully appreciate how much computer time this routine can save, add BASIC code to the demonstration program to perform an insertion or deletion near the beginning of the array. My tests showed that a BASIC string array insertion took about 10 minutes in this limited 16K application. Using the machine language routine, all 4 insertions took less than one second. As indicated in the beginning of this article, if the CLEAR and DIM statements are set for a 48K application, your computer may become obsolete before it finishes. ■

BASIC program example

```
1 '"INVENTORY" PROGRAM FOR
    INSERT/DELETE DEMO
2 'BY JAMES F. WILLIAMS
3 'VARIABLES:
   M     LAST ELEMENT NUMBER
   X     UTILITY VARIABLE
   Z     CURRENT LINE NUMBER
   P()   DOUBLE PRECISION:  PART NUMBER
   Q()   INTEGER:  QUANTITY
4 'C()   SINGLE PRECISION:  COST
   D()   STRING: DESCRIPTION
   D     STRING INPUT FOR COMMANDS
5 '*** CLEAR STRING SPACE, SET UP
   ARRAYS, ETC. ***
10 CLEAR4000:DEFINTM,Q-Z:DEFDBLP:DEFSTR
  D:M=600:DIMM(3),P(M+10),Q(M+10),C(M+1
  0),D(M+10)
```

```
15 '*** BUILD RANDOM FILE ***
20 FORX=0TOM:P(X)=RND(10000)*123:Q(X)=R
  ND(10000):
C(X)=RND(1000)/100:D(X)=STRING$(6,CHR$(
  RND(26)+64)):NEXT
25 '*** COMMAND LOOP ***
30 D="":INPUT"(L)IST, (I)NSERT, (D)ELET
  E";D
40 INPUT"LINE #";Z
45 '*** LIST ROUTINE ***
50 IFD="L"THENPRINT"LINE    PART #","QUA
  NTITY","COST","DESCRIPTION"ELSE70
60 IFINKEY$<>""THEN30ELSEPRINTZ;P(Z),Q(
  Z),C(Z),D(Z):Z=Z+1:IFZ>MTHEN30ELSE60
65 '*** INSERT ROUTINE ***
70 IFD="I"THENM(2)=0:P(M+1)=0:GOSUB500:
  IFX<>-1THENINPUT"PART #";P(Z):
INPUT"QUANTITY";Q(Z):INPUT"COST";C(Z):I
  NPUT"DESCRIPTION";D(Z):M=M+1
75 '*** DELETE ROUTINE ***
80 IFD="D"THENM(2)=1:GOSUB500:IFX<>-1TH
  END(M)="":M=M-1
90 GOTO30
495 '*** INSERT-DELETE PART NUMBER ***
500 M(0)=VARPTR(P(Z)):M(1)=VARPTR(P(M))
  :M(3)=8:GOSUB900
505 '*** INSERT-DELETE QUANTITY ***
510 M(0)=VARPTR(Q(Z)):M(1)=VARPTR(Q(M))
  :M(3)=2:GOSUB900
515 '*** INSERT-DELETE COST ***
520 M(0)=VARPTR(C(Z)):M(1)=VARPTR(C(M))
  :M(3)=4:GOSUB900
525 '*** INSERT-DELETE DESCRIPTION ***
530 M(0)=VARPTR(D(Z)):M(1)=VARPTR(D(M))
  :M(3)=3
895 '*** INTERFACE WITH MACHINE
      LANGUAGE ROUTINE ***
900 X=USR(VARPTR(M(0))):IFX=-1THENPRINT
  "ERROR":RETURNELSERETURN
```

Side by side listing of
Insert-delete routine for Models I and III

```
                00100 ;INSERT-DELETE ROUTINE FOR MODEL I AND MODEL III
                00110 ;(C) 1981 BY JAMES F. WILLIAMS
                00120 ;
                00130 ;THIS MACHINE LANGUAGE ROUTINE IS TO BE USED WITH
                00140 ;BASIC PROGRAMS THAT REQUIRE INSERTION OR DELETION
                00150 ;IN LARGE ONE DIMENSIONAL ARRAYS. IT IS ESPECIALLY
                00160 ;TIME SAVING FOR STRING ARRAYS.
                00170 ;
                00180 ;THIS ROUTINE RELOCATES AND PROTECTS ITSELF AT THE
                00190 ;TOP OF PROTECTED MEMORY.
                00200 ;
                00210 ;CONTROL ARRAY (INTEGER)
                00220 ;       M(0) =  VARPTR OF INSERT-DELETE ELEMENT
                00230 ;       M(1) =  VARPTR OF LAST ELEMENT
                00240 ;                       (NOT COUNTING BUFFER ELEMENTS
                00250 ;                             AT END OF ARRAY)
                00260 ;       M(2) =  0 INSERT FLAG
                00270 ;               1 DELETE FLAG
                00280 ;       M(3) =  2 INTEGER FLAG
                00290 ;               3 STRING FLAG
                00300 ;               4 SINGLE PRECISION FLAG
                00310 ;               8 DOUBLE PRECISION FLAG
                00320 ;
7000            00330         ORG     7000H
7000 ED5BB140   00340 RELO    LD      DE,(40B1H)      ;TOP OF MEM TO DE
7004 1B         00350         DEC     DE              ;LESS ONE
7005 014F00     00360         LD      BC,LSTB-ENTRY   ;LENGTH OF ROUTINE TO BC
7008 216F70     00370         LD      HL,LSTB-1       ;REAL LAST BYTE TO HL.
700B EDB8       00380         LDDR                    ;MOVE 'EM UP
700D EB         00390         EX      DE,HL           ;ENTRY -1 TO HL
700E 22B140     00400         LD      (40B1H),HL      ;SET NEW TOP OF MEM
```

```
7011 23       00410          INC     HL              ;ENTRY POINT TO HL
7012 228E40   00420          LD      (16526),HL      ;SET USR BRANCH
7015 113200   00430          LD      DE,50           ;CLEAR 50
7018 CD831E   00440          CALL    1E83H           ;BASIC CLEAR ROUTINE
701B 01181A   00450          LD      BC,1A18H        ;THIS BASIC RE-ENTRY
701E C3AE19   00460          JP      19AEH           ; WORKS FOR MOD I AND III
7021 CD7F0A   00470 ENTRY    CALL    0A7FH           ;USR VAR IN HL
7024 E5       00480          PUSH    HL              ;BEGINNING OF MACH. ARRAY
7025 DDE1     00490          POP     IX              ; TO IX
7027 DD5E00   00500          LD      E,(IX+0)        ;INSERT-DELETE ELEMENT
702A DD5601   00510          LD      D,(IX+1)        ; TO DE
702D DD6E02   00520          LD      L,(IX+2)        ;LAST ELEMENT
7030 DD6603   00530          LD      H,(IX+3)        ; TO HL
7033 DF       00540          RST     18H             ;COMPARE (HL-DE)
7034 3006     00550          JR      NC,OK           ;OK IF HL>=DE
7036 21FFFF   00560          LD      HL,-1           ;FOR BAD PARAMETERS
7039 C39A0A   00570 RETURN   JP      0A9AH           ;HL TO USR VAR. IN BASIC
703C E5       00580 OK       PUSH    HL
703D ED52     00590          SBC     HL,DE           ;LENGTH OF MOVE
703F E5       00600          PUSH    HL
7040 C1       00610          POP     BC              ; TO BC
7041 E1       00620          POP     HL              ;LAST ELEMENT TO HL
7042 AF       00630          XOR     A               ;0 A REG
7043 DDBE04   00640          CP      (IX+4)          ;INSERT-DELETE FLAG
7046 DD7E06   00650          LD      A,(IX+6)        ;VARIABLE TYPE FLAG
7049 2811     00660          JR      Z,INSERT        ;INSERT?
704B D5       00670 DELETE   PUSH    DE              ;NO, DELETE
704C E1       00680          POP     HL              ;1ST ELEMENT TO HL
704D 23       00690 VTYPE    INC     HL              ;SET HL TO NEXT ELEMENT
704E 3D       00700          DEC     A               ;LOOP FOR # BYTES IN
704F 20FC     00710          JR      NZ,VTYPE        ; VARIABLE TYPE
7051 78       00720          LD      A,B             ;IF BC = 0 THEN
7052 B1       00730          OR      C               ; ALLOW DELETION OF
7053 2802     00740          JR      Z,GOODRT        ; LAST ELEMENT ONLY
7055 EDB0     00750          LDIR                    ;MOVE 'EM BACK ONE SET
7057 210000   00760 GOODRT   LD      HL,0            ;GOOD FLAG RETURN
705A 18DD     00770          JR      RETURN          ;TO BASIC JP
705C 3D       00780 INSERT   DEC     A               ;SET HL TO LAST BYTE
705D 2803     00790          JR      Z,RESET         ; OF LAST ELEMENT
705F 23       00800          INC     HL
7060 18FA     00810          JR      INSERT
7062 DD7E06   00820 RESET    LD      A,(IX+6)        ;RESET VAR. TYPE
7065 E5       00830          PUSH    HL              ;LAST BYTE
7066 D1       00840          POP     DE              ; TO DE
7067 13       00850 VTYPE2   INC     DE              ;SET DE TO NEWLY
              00860                                  ; CREATED ELEMENT
7068 03       00870          INC     BC              ;ADD ONE ELEMENT LENGTH
7069 3D       00880          DEC     A
706A 20FB     00890          JR      NZ,VTYPE2       ;LOOP FOR # BYTES IN
              00900                                  ; ELEMENT
706C EDB8     00910          LDDR                    ;MOVE 'EM UP 1 SET
706E 18E7     00920          JR      GOODRT          ;TO GOOD RETURN
7070 00       00930 LSTB     DEFB    0               ;FOR LENGTH CALC.
7000          00940          END     RELO
00000 TOTAL ERRORS
```

■

The Corvus hard disk system

The first of a two-part look at a TRS-80 compatible hard drive...

T. R. Dettmann, Associate Editor

Would you like to have *all* your disks available immediately; every one on-line and ready to go simply by giving a command to the computer?

It doesn't require a special robot, all it takes is a lot of storage. You won't find 10-megabyte floppy disks around, but you will find hard disks.

Corvus Systems (2029 O'Toole Ave., San Jose, California, 95131, (408) 946-7700) has put together a series of hard disk units that put mass storage within the reach of almost anyone.

Radio Shack's Model III with four disk drives is a very good buy when considering cost per byte of storage. It comes in at about 0.342 cents per byte.

Corvus lists a five-megabyte drive which gives a cost per byte of 0.088 cents. That's almost four times better in terms of cost per byte than doing it with a floppy.

The idea of cost savings as well as an expanding need for disk storage space had us looking at hard disk systems. We contacted several companies for information and Corvus was kind enough to put one on loan for some testing.

This issue I'll be taking you through a tour of the Corvus disk system. Next issue, I'll follow up with a report on software available to run on the Corvus. That includes two special versions of TRSDOS, OASIS, and CP/M on the Model II and one special version of TRSDOS and one on NEWDOS80 for the Model I and III.

The Corvus drive used for this evaluation was a 20-megabyte drive. It was equipped with the Corvus Systems Mirror (Video Tape Backup Hardware) and Constellation Multiplexer (Multiple System Hardware).

The Corvus manual lists the specs for the drive as follows:

Number of platters	3
Number of data surfaces	5
Tracks per surface	448
Data tracks per surface	380
Bytes per track (Unformatted)	10240
Bytes per cylinder (Unformatted)	51400
Data cylinders	380
Bytes per surface (Unformatted)	3.89 MB
Bytes per drive (Unformatted)	19.6 MB
Track density	300 TPI
Bit density	5868 BPI
Rotational speed	3600 rpm
Average latency	8.33 MS
Single track access time	10 MS
Average access time	50 MS
Maximum access time	100 MS
Heads per surface	1
Start/stop times	15 sec

The drives are fixed and in an environmentally sealed container. It includes low load, low mass Winchester type read/write heads with a linear voice coil actuator system for head positioning. This is currently considered the best available system, outdating the step motor drives used in older disks and floppy disks.

A recirculating, filtered air system in a sealed enclosure prevents contamination. The drive motor is a brushless DC type with built-in disk spindle, motor electronics and speed control.

Due to the unit's small size (6.375 x 14.50 x 23.00 inches), it can fit easily on a Model II system desk next to the computer. Because it is sealed, there is no scheduled maintenance. Despite that, Corvus lists a Mean Time Between Failure (MTBF) as 10,000 hours of operation and Mean Time to Repair (MTR) as 1/2 hour.

The system is set up so that up to four drives can be connected to one computer, giving up to 80-megabytes of storage capacity.

Upon removing the drive from the shipping box, we looked over the instructions for setting the system up. They are readable and remarkably simple. After setting a few switches, plugging the adapter board for the computer, and plugging in the power cord, we were ready to start operation.

That 3600 rpm disk really makes a whine as it starts up. After a few seconds, the noise drops down and the ready light comes on.

We started with the CORDOS system for the Model II by Andy Frederickson. As it turns out, this is the least capable of the systems we will be looking at in the follow-up article next month, but it was the simplest place to start.

First, we carried out system level tests. Setting up the disk as if it were a bunch of floppy disk drives or one big drive was fun. During system level testing the only difficulties were all software related. The hardware worked magnificently.

After transferring some programs from floppy disks to hard disks, we went into BASIC and tried some more tests. I was most interested in some timing comparisons where a program was loaded from a floppy first, and then the same program was loaded from the hard disk. For a 22K program, the hard disk was six times faster than the floppy. This

was not totally unexpected, but nice anyway.

Then I tried some random access involving large files and small ones. For large files, the difference in time to get a record became noticeable, though I couldn't measure it for small files.

Up to this point in my testing, I haven't run more than one computer at a time through the multiplexer, nor have I run the mirror backup system. We will by next month though, when we also look at the software.

By now your biggest question is probably: Why bother? A hard disk system costs too much to justify. Doesn't it?

The answer to that is both yes and no. For the average home user, a hard disk sysstem is really about as necessary as a third sock per pair. It's nice to have, but doesn't get much use.

The home user (unless money is unlimited or some other need presents itself) can get by very well with floppy disks. The needs in that kind of environment do not require extremely fast access or large capacity.

A business user is another story altogether. If you are running a business which is beginning to outgrow its present computer, you can add new life to your system for much less than you can buy a minicomputer.

A TRS-80 system with a hard disk is a mid-way machine. It's between a micro and a mini. It isn't as fast as a mini, but 20-megabytes is more than some mini's have for storage, and 80-megabytes (4 Corvus units) will let you store just about anything within reason.

A hard disk isn't a solution to all problems. You need to consider the fact that you may be limited by something other than disk access time and storage space. When large amounts of data must be printed frequently the printer would print a line and wait for the floppy disk to access. Printing from the hard disk was faster, but not much. Now the hard disk was faster than the printer so it is the printer which goes continuously and the disk drive waits.

In the final analysis, the Corvus hard disk system is for the intermediate size business. It provides better, more efficient service for someone who is too small for a minicomputer but too big for a microcomputer floppy based system. The Corvus is an efficient, cost-effective solution to that problem. ■

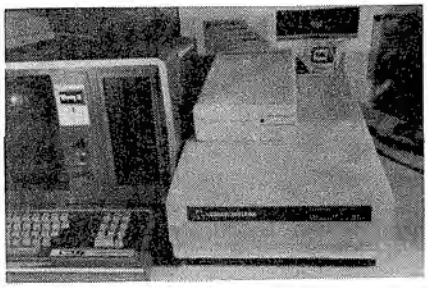


Photo 1. The Corvus system in operation with a Model II. The constellation controller sits atop the hard drive.

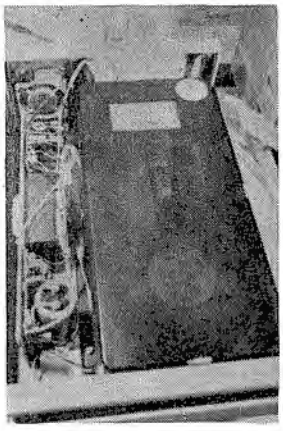


Photo 2. An inside view of the hard drive. Note the seal around the heads and platters.

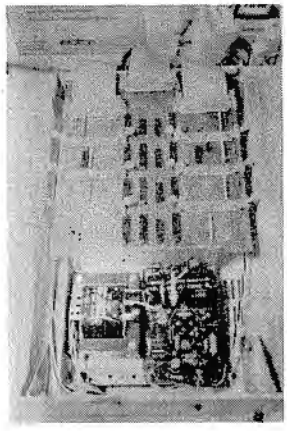


Photo 3. View of the constellation controller with cover removed. Note space for up to eight unit connections.

Disk Drives

Disk drives are complicated mechanically, but they are really quite simple. A disk is simply a circular platter like a record which is coated with a magnetic material.

When a disk is put into a disk drive, a head is moved close (or even onto) the disk surface. As the disk rotates with the head at a fixed position, it passes over a narrow portion of the surface called a *track*. By varying the magnetic field of the head as the track passes under it, we can store information on it the same way we store sound on a cassette tape recorder.

If we move the head by a small amount so that its new position doesn't interfere with the old position, we can store more information on the second track. By stepping back and forth over the disk, we can store information on as many tracks as the disk can hold and the read/write head arm can reach.

Each track on the disk is divided into *sectors*. A sector is a logical unit of information that is transferred into memory at one time.

If we have more than one platter, with one read/write head per platter, then the read/write heads normally work together and the tracks directly over one another (where the heads are at any one time) are grouped together and called a *cylinder*. Some people even refer to a single platter disk system's track as a cylinder.

With more than one platter, the heads are tied together on a *comb* which moves all the heads in and out as one unit.

Latency is the time it takes for a disk to come around to a piece of data that has been requested. The *minimum latency* is always zero (if the disk is there when you want it, you get the data immediately).

Maximum latency occurs when the information you wanted just passed the disk head as you called for it. *Average latency* is half the maximum.

Access time is the time it takes to move to any record on the disk. *Minimum access time* is the time it takes to move the head by one track. This is also called the *single track access time.*

We are generally more interested in the average and maximum access times, since they tell us more about the response of the system. ■

What is a Winchester?

There was a time when I used to assume that Winchester Disks were invented by a company named Winchester and that there was nothing really special about them except that it was inconvenient to back them up. Nothing could be further from the truth.

The Winchester disk system arose out of technological limitations in what could be called the traditional disk pack system. David Kalstrom and John Jenkins in a lecture at NCC '80 described the problems with the old disk systems.

To achieve high density, the read/write head had to "fly" over the disk as closely as possible to the surface. This required more and more loading force on the disk head, and led to an increase in the number of "head crashes", where the head actually touches the disk surface while it is rotating.

In 1973, IBM introduced their Model 3340 drive system to alleviate the problem. Originally, the design plan specified a dual drive configuration with each drive having 30 megabytes of storage. Dual drive capacity notation (30-30) lead to the name "Winchester" as a pun for the capacity of the system. While the drives eventually evolved to become 35 and 70 megabyte drives, the name stuck, and we now know all drives of this type as "Winchester" drives.

What is so special about them? Kalstrom and Jenkins list seven characteristics of Winchester technology:

1. Read/write heads and disks are in a sealed enclosure.
2. Heads come to rest on the surface when the disk is not rotating.
3. The surface of the disk is lubricated to prevent damage to the heads or disk.
4. The head flying height is 20 microinches compared to 31 for the older IBM 3330 or 120 for the 2311 drives. (This is why the units are sealed.)
5. The head load pressure is decreased to 10 grams from 350 on previous drives.
6. The head assembly is a special "trimaran" structure to make it fly better.
7. The disk surface is coated with only 50 microinches of magnetic oxide compared to 185 on some older drives.

The result of all these features is that Winchester disks are lower in cost than older style disks for a given amount of storage. Also, Winchester disks are less susceptible to errors, more reliable and more suitable for small system operation.

Backup used to be a problem since the only way to do it was either inconvenient or unnecessarily expensive. With the introduction of the Video Tape Recorder, it has now become possible to backup a Winchester disk fully on a single video tape in as little as ten minutes for a tenmegabyte drive. ■

Inside the FOR . . . NEXT loop

For all models

R. C. Bahn

Programmed repetitive computer operations depend upon a programming technique known as the 'loop.' A programmed loop consists of control statements and operational statements. The control statements define the starting and stopping rules of the loop. The operational statements define the repetitive procedure(s) to be performed within the loop.

The control portion of the loop is largely automated by the FOR-NEXT statement of the BASIC language. The following programs illustrate several types of loops, some of which utilize FOR-NEXT statements.

Interactive Programs

The program listing consists of four subprograms which illustrate some principles of the programmed 'loop'. The initial section of the program is a menu driver which allows the user to select one of four options (lines 30-100). The first subprogram (130-180) counts from one to one-hundred. Although the video output is trivial, the few statements of the program illustrate the fundamental parts of a 'loop'. These parts are : initialization (140), incrementing of a counter (150), and testing for exit conditions (170).

Simple counting is a special case of a finite arithmetic series. A finite arithmetic series is a progression of numbers of length N with a constant difference D between successive terms. A finite arithmetic series is usually defined by a first term, a constant difference (D) and the number of terms (N). Alternately, it could be defined by a first term, an approximate last term and a constant difference. The latter are the parameters of a programmed 'loop'.

The second (190-310) and third (320-420) subprograms enable the user to display any finite arithmetic series. The second subprograms (190) implements this task without the use of the FOR-NEXT statement. Note that the logic of the exit decision is more complex (270) but now the loop can be made to run in either an ascending or descending direction with either integer or fractional differences between terms. These two programs demonstrate that the FOR-NEXT statement is merely an automation of finite arithmetic series for the control of a programmed 'loop'.

The sum of a collection or set of numbers may be computed by first setting a variable equal to zero outside a loop (140, 260, 370, 500, 600) and then incrementing this variable by the proper value during each pass of the loop (150, 280, 390, 530, 630). Note especially the appearance of the previous list of lines (150-630). These lines do not denote mathematical equality. The lines illustrate the assignment role of the equal sign (=) in the BASIC language. In this sense, each of the indicated lines should be interpreted as meaning: assign to the new variable, for example N, a value which consists of the previous value of N plus the indicated increment.

In the second and third subprograms (190-420), the sum of the generated arithmetic series is found by the above method (280, 390). The sum is displayed after adding each new term of the series (290, 400). The sum of a finite arithmetic series of length N may also be computed by the formula: SUM(N) = ((FIRST TERM + NTH TERM)/2)*N

In the fourth subprogram (430-670) the concept of the sum is extended to the computation of the mean (540) and the standard deviation (650). The set of numbers to be studied are entered from the keyboard in a loop extending from line 440 to 490. The mean or average is a measure of the central tendency of the set of numbers. The standard deviation is a measure of a variability or dispersion of the set of numbers. Additional comments concerning the function of each line of the program appear in a latter section.

Discussion

Study the construction of the programs carefully. You should be able to modify the simple counting program so that it can count forwards or backwards by any integer difference.

The outputs of the arithmetic series programs

are identical. Compare the programs and identify the statements in the second subprogram which serve the function of the FOR-NEXT statements of the third sub-program.

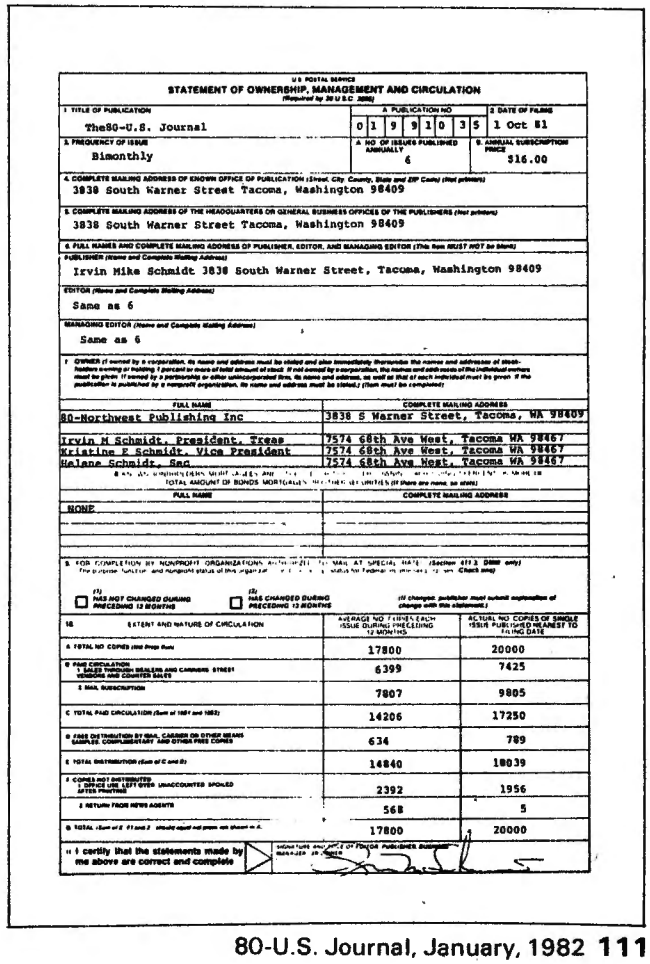
The routines for the mean and standard deviation are useful programs. The SUM of this program could be used to balance the checkbook or add the grocery bill. The MEAN might be useful in the analysis of your golf scores or school grades. The functions of several of the loops in the last program can be combined into one loop and the standard deviation can be computed by an alternate formula. These methods can readily be found in any handbook of statisitics.

Program Documentation of 'loop'

Line #	Comment
10 - 180	Driver program
30	Label
40 - 100	Menu
110	Check limits of input
120	Branch to appropriate program
130 - 180	Simple counting loop routine
140	Initialize
150	Increment N
160	Output results
170	Test for end of loop
190 - 310	Arithmetic series routine
210 - 230	Input parameters of series
240	Label columns of output
250 - 260	Initialize NUM, N, SUM
270:1	Increment NUM
270:2	Test for end of increasing or decreasing series
320 - 420	FOR-NEXT loop routine
340 - 360	Input parameters of loop
370:1	Initialize N counter needed for auxiliary loop index
370:2	Initialize SUM
375	Print column headings
380 - 410	The loop
390	Increment N and SUM
400	Output results
430 - 670	Mean and standard deviation routines
440 - 460	Initial data collection routine
460	Reconcile length of list with dimensions of X(J)
470 - 490	Interactive keyboard data entry
500	Initialize SUM
510	Print column headings
520 - 570	FOR-NEXT loop to compute SUM and MEAN
530	Accumulate SUM
540	Compute cumulative average
550	Print current results
560	Hold screen every 12 lines for sequential inspection
580 - 590	Save final SUM and AVERAGE
600	Initialize SUM of squared deviations from mean (SSQ)
610	FOR-NEXT loop to compute standard deviation
620	Compute deviation from mean
630	Accumulate sum of squared deviations (SSQ)
650	Compute standard deviation (root mean square)
660	Print separating graphics line
670	Print results

Program listing for Models I, II & III

```
5 REM ***   BASIC INTERACTIONS    ***
6 REM ***    LOOPS --- BY RCB     ***
10 CLEAR 500 : DIM X(100)
15 REM***        MENU DRIVER       ***
20 CLS
30 PRINT "                    BASIC  INTER
  ACTIONS
                        BY R.C.BAHN"
```



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```
40 PRINT "      (COUNTING,ARITHMETIC SE
  RIES,FOR-NEXT LOOP,SUMS)" : PRINT : P
  RINT
50 PRINT "          1.)SIMPLE COUNTING
  LOOP"
60 PRINT "          2.)ARITHMETIC SERIE
  S"
70 PRINT "          3.)FOR-NEXT LOOP
80 PRINT "          4.)MEAN,STANDARD DE
  VIATION"
90 PRINT : PRINT
100 INPUT "SELECT PROGRAM"; A
110 IF A < 1 OR A > 4 GOTO 20
120 ON A GOTO 130, 190, 320, 430
130 REM*** SIMPLE COUNTING LOOP ***
140 CLS : N = 0
150 N = N + 1
160 PRINT N;
170 IF N <> 100 GOTO 150
180 END
190 REM***   ARITHMETIC SERIES   ***
200 CLS
210 INPUT "ENTER BEGINNING NUMBER"; A
220 INPUT "ENTER APPROXIMATE LAST NUMBE
  R"; B
230 INPUT "ENTER INCREMENT"; D
240 CLS : PRINT"INDEX", "VALUE", "SUM"
250 NUM = A - D
260 N = 0 : SUM = 0
270 NUM = NUM + D : IF (D < 0 AND NUM <
   B) OR (D > 0 AND NUM > B) GOTO 310
280 N = N + 1 : SUM = SUM + NUM
290 PRINT N, NUM, SUM
300 GOTO 270
310 END
320 REM ***     FOR-NEXT LOOP    ***
330 CLS
340 INPUT "ENTER BEGINNIMG NUMBER"; A
350 INPUT "ENTER APPROXIMATE END NUMBER
  "; B
360 INPUT "ENTER INCREMENT"; D
370 N = 0
375 CLS : PRINT"INDEX", "VALUE", "SUM"
380 FOR I = A TO B STEP D
390 N = N + 1 : SUM = SUM + I
400 PRINT N, I, SUM
410 NEXT I
420 END
430 REM MEAN,STANDARD DEVIATION PRGM
440 CLS
450 INPUT "ENTER NUMBER OF VALUES"; N
460 IF N > 100 GOTO 450
470 FOR J = 1 TO N
480 PRINT "ENTER VALUE #"; J; : INPUT X
  (J)
490 NEXT J
500 CLS : SUM = 0
510 CLS : PRINT "INDEX", "VALUE", "CUM.
  SUM", "CUM.AV"
520 FOR J = 1 TO N
530 SUM = SUM + X(J)
540 AV = SUM/J
550 PRINT J, X(J), SUM, AV
560 IF 12 *(INT(J/12)) = J THEN INPUT "
  PRESS ENTER TO CONTINUE"; Z$
570 NEXT J
580 TSUM = SUM
590 TAV = AV
600 SSQ = 0
610 FOR J = 1 TO N
620 D = X(J) - TAV
630 SSQ = SSQ + D * D
640 NEXT J
650 SD = SQR(SSQ/N)
660 PRINT STRING$(63, "-")
670 PRINT "SUM="; TSUM, "MEAN="; TAV, "
  STANDARD DEVIATION="; SD
```

Changes required for operation on the Color computer.

```
30 PRINT "       BASIC  INTERACT
IONS":PRINT"           BY R C BA
HN"
40 PRINT "  (COUNTING, ARITHMETI
C SERIES,":PRINT"       FOR-NEXT
 LOOP,SUMS)" : PRINT : PRINT
50 PRINT "1.)SIMPLE COUNTING LOO
P"
60 PRINT "2.)ARITHMETIC SERIES"
70 PRINT "3.)FOR-NEXT LOOP
80 PRINT "4.)MEAN,STANDARD DEVIA
TION"
220 INPUT "ENTER APPROX. LAST NU
MBER"; B
240 CLS : PRINT "INDEX";TAB(10);
"VALUE";TAB(20);"SUM"
290 PRINT N;TAB(10);NUM;TAB(20);
SUM
350 INPUT "ENTER APPR. END NUMBE
R"; B
375 CLS : PRINT "INDEX";TAB(10);
"VALUE";TAB(20);"SUM"
400 PRINT N;TAB(10);I;TAB(20);SU
M
510 CLS : PRINT "INDEX   VALUE
 CUM.SUM  CUM.AV"
550 PRINT J;TAB(8);X(J);TAB(16);
SUM;TAB(24);AV
660 PRINT STRING$(32, "-")
```

■

Product evaluation

EXATRON, from page 47

modified and saved on a normal Color Computer diskette. Unfortunately, the process is in one direction and the reverse cannot be accomplished. We even tried several versions of disk track readers with no success. Timing signals and directory formats are different.

File Handling

CCDOS is limited to 11 file buffers rather than the 15 maximum allowed under TRSDOS. There is no default number set aside. The buffers appear to be held in the upper RAM bank and so do not take away from user memory.

The syntax for sequential files is similar to other disk systems. The commands allowed are:

OPEN "O", *buffer-number, filename*
PRINT# *buffer-number, variable(s)*

CCMON Command Chart

Command	Description
A, ssss-eeee	Display memory in ASCII from ssss to eeee
B, aaaa	Set breakpoint at aaaa
D, ssss-eeee	Display memory in hex from ssss to eeee
G, aaaa	Go to memory location aaaa
L,	Load CCDOS
M, aaaa	Modify memory location aaaa
O, ssss-eeee TO aaaa	Move memory (ssss to eeee) to aaaa
Q,	Perform memory test
S, xx-> ssss-eeee	Set memory ssss to eeee to constant xx
X,	Return to BASIC

Color computer memory map with the Exatron CCI and DOS

Hex	Decimal Addresses	4K	16K	32K	CCI	Description
0000	00000	X	X	X	X	
		X	X	X	X	System and BASIC stack use
03FF	1023	X	X	X	X	
0400	1024	X	X	X	X	
		X	X	X	X	Screen, Graphics & user memory
0FFF	4095	X	X	X	X	4K system user RAM limit
1000	4096		X	X	X	
3FFF	16383		X	X	X	16K system user RAM limit
4000	16384			X	A	
7FFF	32767			X	A	32K system user RAM limit
8000	32768		X	X	X	
			X	X	X	Extended BASIC ROM
9FFF	40959		X	X	X	
A000	40960	X	X	X	X	
		X	X	X	X	Color BASIC ROM
BFFF	49151	X	X	X	X	
C000	49152				A	
					A	CCMON ROM area
C7FF	51199				A	
					A	Upper 16K RAM bank
C800	51200				A	
					A	CCDOS RAM area
FEFF	65279				A	
FF00	65280	X	X	X	X	
		X	X	X	X	Input/Output area
FFFF	65535	X	X	X	X	

CLOSE
CLOSE *buffer-number*
OPEN "I", *buffer-number, filename*
INPUT# *buffer-number, variable(s)*
LINEINPUT# *buffer-number, variable$*

where *buffer-number* is 1 to 11, *filename* is a legal file name, *variable(s) is one or more numeric or string variables, and variable$* is a single string variable.

Random, or direct access files are also similar to those used on the other three TRS-80 models. Only five file buffers may be used for this type of file at any one time. Each record will contain 255 characters. There is no provision for shorter record lengths. The commands available are:

OPEN "R", *buffer-number, filename*
FIELD *buffer-number, length* AS *variable$, . . .*
LSET *variable$=*
RSET *variable$=*
=MKN$
=CVN *(variable$)*
PUT# *buffer-number, record number*
GET# *buffer-number, record number*
LOF *(buffer-number)*
EOF *(buffer-number)*
LOC *(buffer-number)*

where *buffer-number* refers to a file buffer, *filename* is a legal file name, *record number* is from 1 to 255, *variable$* is a string and *record number* is the record number within that file. LOF, EOF and LOC stand for length of file, end of file and location, respectively. The MKN$ and CVN functions are used for number conversion in the Color Computer which does not have separate numeric variable types.

Conclusions

The only real reservations we have concern those already mentioned: diskette density and possible incompatibility with Radio Shack's operating system. Taken by itself as only a disk interface, the price is a bit steep. But in light of the ROM to disk and Model I to Color Computer capabilities, this interface is a winner. ■

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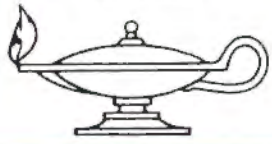

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Reviews

Tuesday Morning Quarterback
Automated Simulations
P.O. Box 4247
1988 Leghorn Street
Mt. View, CA 94040
1-800-824-7888
$29.95 Disk only 48K + $2.00 s/h
Machines: Model I and III

Attention all computer widows! If your computer-nut husband happens to also be a football addict, DO NOT even allow him to see Tuesday Morning Quarterback from Automated Simulations. You may never see him again. This latest offering from the dynamic software company that brought you such classics as Invasion Orion, Datestones of Ryn, and Temple of Apshai, is a masterpiece of ingenuity. It is more than a game, it is an actual simulation of each of the teams in both pro leagues. You can pit the Seahawks against the Cowboys or the Steelers against the Saints, or any possible combination of all the pro teams.

Tuesday Morning Quarterback (TMQ) is only available for those of you fortunate enough to own 48K with a disk drive. I can see you now, trying to talk Mama into that expansion interface and drive. There are several modules on the disk and the program uses overlays and the limited chaining capabilities of TRSDOS in order to stay within the bounds of the memory. In other words, this is a very complex, detailed piece of software that occupies 35446 bytes of RAM. It is complete with a full range of sound effects, such as penalty flags, end of play signals, and even a half-time marching band. The graphics are quite clever, with 3 dimensional views of the playing field when punting or attempting a field goal. During regular play, the player is given an aerial view of the field. The players are represented with X's and O's on the field and are lined up in standard formations. The players do not move in real time; however, each play is described in detail by messages that flash on the screen.

Examples of the messages are: "The ball is snapped", "Johnson fades back for the pass", "The press is on", "Incomplete - meant for Smith", "Interception by Perry", "Man down on the play", "Injury - sprained ankle". The action is quite realistic, with each player choosing a team in either the NFL or AFL. A

single player may also play against the computer. During initialization, a menu of 30 teams is displayed, and the choice is given to each player. Each team's player's names are contained in a disk file along with the characteristics of the team. The 46 page rule book contains information about each team's strengths and weaknesses, their general rating, tips on how to simulate the real team, and strategies for defeating the team.

Several variables determine the outcome of a game. First, the team characteristics determine how strong a particular team is in running, passing, defense, and offense. Second, on every play, the defensive player first discreetly chooses one of six defensive lineups, such as Blitz, Normal, Goal Line, or Butkus. Next, the offensive player chooses one of the 16 offensive plays, such as the Bomb, Draw, Sweep, Quarterback Sneak, Trick Play, Pitchout, Short Curl, etc. The outcome of the play is largely determined by how well you call the shots. Third, an intangible force known as "momentum" determines how a team will fare on a particular play. A small marker is displayed on the score board indicating the game's momentum. When a team is doing well, the momentum shifts to them, and makes it easier for them to complete passes, make field goals, first downs, and long gains.

The actual play is quite detailed, with every phase of a real football game simulated. The captains toss a coin, which really goes up and comes back down on the screen. The kickoff is shown as a 3D view looking down field. The ball is displayed in a high arc as it travels down field and lands in enemy territory. The same view is shown when attempting a field goal. The ball actually sails over the goal posts in real time. This feature is most entertaining. To aim the kick, a moving dot must be lined up with the ball and the goal post, and the space bar pressed at the right moment. This takes a lot of coordination, especially when kicking out at 40 yards. Penalties are called, as in a real game, mostly on key plays. The captain on the receiving end of the penalty is given the option to accept or decline the penalty. TMQ even displays the conditions of an accepted penalty before any choice is asked for.

Fumbles are taken care of in a unique manner. When a fumble occurs, each player must scramble to press a certain key first in order to recover the football. The official rules state that "it is not cricket to rest your finger any closer to the R key than 3 and 3/4 inches." Statistics are kept, and can be displayed at any time during the game. Injured players are automatically removed from the game and replacements are called in as needed from a pool of standbys. Time outs are allowed during the game and a real time clock displays the time remaining. To keep the game short, each player is allowed only a total of 30 seconds to determine which play they are going to choose. A penalty of 5 yards is assessed if this limit is exceeded. A half-time show, complete with The University of Texas marching Dots is provided. Sorry guys, it doesn't even come close to the real thing.

Other features include provisions for updating team rosters and substitutes so that the teams will

always stay current. Advanced programmers could also possibly change the team ratings to correspond more closely to the actual team performance by updating the disk files of each team. A kicking practice is provided for developing your skills as a punter. The documentation has to be the best in the industry for this type of program. It is done in color, with excellent art work, on quality paper. It is easily understood, with an introduction to football, how to play the game, team rosters, play calling, and a very thorough glossary of football terms for non-jocks.

Overall, TMQ deserves very high marks. This is one of the most requested games around our house. It is extremely well thought out and highly structured; but, more than that, it is a lot of fun to play, even if football is not your passion.

Jim Klaproth

Space War
Acorn Software Products
634 North Carolina Ave. S.E.
Washington, D.C. 20003
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The original spacewar, one of the first computer games, was developed at MIT long before the TRS-80 was a gleam in Tandy's corporate eye. It was the first with high-resolution graphics (about 1K by 1K points). It became a lasting favorite because it gave an even challenge between two players involving action and strategy.

Spacewar is a two-player game in a cat and mouse chase trying to shoot each other. Four keys are assigned to each player to rotate, thrust, fire, and enter the respective player's ship into hyperspace. While the TRS-80 does not have the high resolution graphics, the game is more than challenging enough to make up for this deficiency. In addition to each other, the players must also worry about a star in the center of the screen around which the mages revolve. Because of the star's mass, it has a gravity field which can easily pull a ship into its furnace, giving the opponent a point. On the other side of the coin, the gravity field makes an orbit possible and, incidentaly, very difficult to hit the ship.

The game has five preset universes or modes: no gravity or inertia gives the players an opportunity to learn their controls; inertia (the ships "float") and edgebounce where the players learn to work with thrust but must take into account screen edgebounce); in the third mode, gravity is introduced to the conditions of the second mode; in the fourth universe, edgebounce is eliminated and the screen "wraps around"; finally edgebounce is back and, as an additional challenge, the gravity field of the star is reversed introducing the effects of antigravity. When the universe has edgebounce, missiles don't bounce or wrap around. With no edgebounce, missiles wrap around as the ships do and are not destroyed unless they hit a ship or the central star. Missiles travel at a relative speed to the ship and it is possible through acceleration to run into your own missile and be destroyed.

Spacewar is played in real time against the clock. The players choose game and missile speed and universe mode and then battle it out until time is up. Whoever accumulates the most points is the winner.

Spacewar is an enjoyable game. It is supplied on 16K tape and, like all Acorn products, it accompanied by good, easy to understand documentation.

Pat Perez

BASIC Faster and Better & Other Mysteries by Lewis Rosenfelder
IJG Inc.
1260 West Foothill Blvd.,
Upland, CA 91786
(714) 946-5805
288 pages. Soft Cover.
$29.95 + $2.00 shipping
For Models I, II, and III

This new book from IJG may very easily become the most popular book in the history of the TRS-80. It is, as the tag line on the cover reads, "A guided tour of BASIC programming tricks and techniques". The book is well-written and has a lot of programming examples. Two disks, containing much of this material, are available for purchase from IJG.

Most of the book is for disk users with the Extended Disk BASIC. Tape and stringy floppy users can glean a great deal from this book if they are willing to spend the time to program around certain disk-only commands.

Model II owners are not left out

either. References to notes contained in chapter 15 constantly flag appropriate routines throughout the book. Even with TRSDOS 2.0a, a Model II user will be able to use almost every routine in the book.

The Pocket computer receives no attention and the machine language routines will not work on the 6809-based Color computer. However, some of the techniques and tricks can be adapted.

Features

After a short introduction, there are four chapters on what could be called standard concepts and routines. These are needed for the rest of the book. You may not agree with Lewis Rosenfelder's variable "standards", but, as he admits, they are arbitrary and do work for him. If you aren't a time-jaded programmer from the early days of computing, then they just might work for you, too.

One of the areas most programmers ignore in BASIC is the Function Definition capabilities of BASIC. Rosenfelder addresses this area throughout the book including packing some pretty fancy IF...THEN logic into a single function call.

The real power of the book, though, comes from machine langauge routines and USR calls. Although you don't need them, Bill Barden's *TRS-80 Assembly Language Programming* book from Radio Shack and an Editor/Assembler are recommended companions. Because most of the book deals with diskette use, one of the disk-based Editor/Assembler is appropriate. With these tools and some spare time, one is ready to get the most from this book.

Rosenfelder's "Magic Strings" centers on Leo Christopherson's forte: string packing a machine language routine and then executing the string. "Magic Arrays" covers a concept which is similar: load an integer array with a machine language routine to be executed.

The final section in this "standard concepts and routines" portion of the book covers memory use and concepts. Resetting memory size from BASIC is explained, along with reserving low memory, partially restoring data statements (moving the pointer to some point in the DATA portion of the program), and an active variable analyzer.

Articles explaining these concepts have appeared in the past in various computer journals, but here, at long last, one book brings these separate ideas together. It makes for heavy reading—something which won't be easily consumed in one or two sittings.

The next eleven chapters and the eleven appendices cover such things as BASIC overlays to save memory (chapter 5); number crunchers, rounding, remainders, print using, arrays and conversions (chapter 6); strings, peeks, pokes, code look-up, string compression and upper case conversions (chapter 7); date and time manipulations (chapter 8); bit manipulation (chapter 9); numeric arrays, searches and sorts (chapters 10 and 11); video and keyboard routines and tricks (chapter 12); data entry routines (chapter 13); some "Useful Utilities" including a "Pretty Printer", a program merge and renumber utility and a DOS address finder (chapter 14); and finally an entire chapter on unique attributes of the Model II. There are

also extensive notes on how to make the rest of the book work on the Model II TRSDOS 2.0 (chapter 15).

Chapter 16 discusses two disks (available from the publisher at $19.95 each plus a shipping charge) which contain most of the utilities and demo programs presented in the book.

The eleven appendices cover conversions, addresses (in most of the current disk operating systems), divisors of 255 and 256, graphic characters (Model I and III), and an index of functions, major subroutines, and USR routines.

Shortcomings

As with any work of this type, one needs to be aware of changes in operating systems. While the appendices are a great help in some areas, they don't cover DOSPLUS 3.4, LDOS 5.1, or NEWDOS80 2.0. Like the original book of this series, *TRS-80 Disk and Other Mysteries*, some of the material is going to become out-of-date. But, as long as the user is aware of differences in newer versions of disk operating systems, ROMs and what-not, there shouldn't be many problems getting the most from this book.

I found the contents pages far more useful in locating material than the index and a bit more complete in some respects. Also, this book is not for the beginner. Programming still takes a lot of work to do right. Learning to properly lay out a program is far more important than using one of these techniques to impress your friends.

Conclusions

If you are beyond the raw beginner stage and still don't understand READ and DATA statements, or, many of the programs in the various computer magazines don't work because you can't troubleshoot your own typos, then this book is not for you. But if you type in your own programs, take them apart and modify them for your own use, then this book should be at your fingertips.

Clay Caldwell

BasicPro
Softworx, Inc
PO Box 9080
Seattle, Washington 98109
16K Level II Models I & III
$24.95 on cassette

Softworx's BasicPro utility will give the cassette-based user many of the diagnostics which disk owners have learned to love, plus a few they should envy. This program includes ten commands which are easily accessible. The program is loaded under the system command and resides in high memory. Once the program is entered, a programmer has a number of useful commands available.

You can move or copy a block of code within the program; renumber a section of code; join two different BASIC programs together from cassette; get a cross reference of all variables which tells where they are defined and used; and even rename the variables if you wish. The find command will search the program for a specific variable and tell where it occurs. The list command will tell you about all the variables and their line references.

The authors of this program have included a command which is worth it all. By entering the command "/P", you can recover a program which you have previously killed with the NEW command. That sure beats saying "Oops".

The utility also includes the ability to compress a program by having all blanks and remark statements removed, joining together lines of code, and automatically renumbering the program lines to 1, 2, 3, etc. The amount of processing time this saves is minimal, but it may help a little. I did find that when the utility went to compress very large lines of code (greater than 240 bytes), errors would result. There is also the reverse command to unpack the program, but don't expect to see the remark statements or the original line numbers come back.

Included with the program is a very straightforward 11-page booklet which describes all the commands and their syntax.

Cameron C Brown

Typing Tutor
Dick Ainsworth and Al Baker
Microsoft Consumer Products
400 108th Ave. NE suite 200
Bellevue, WA 98004
(206) 454-1315
$19.95 plus shipping
Models I & III Level II

Those of you who you have grown weary of the hunt-and-peck style of typing will be glad to hear of a new program from Microsoft called

Typing Tutor. This program, one of the better examples of Computer Aided Instruction, is designed to instruct and drill the novice to real mastery of touch typing.

Although this 16K, Level II program is written in BASIC, it contains a machine-language subroutine that enables it to monitor each key twenty times a second. The resulting interaction with the typist is therefore in real time.

After you've loaded and Run the program, the screen presents this menu of options:

1. Letters
2. Numbers
3. Symbols

Option 1, of course, teaches new letters. Option 2 teaches both number and letters. Option 3 teaches all three categories together.

If you enter 1, the program pauses for a few seconds, then presents this choice:

1. Typing Tutor
2. Practice Paragraph

The Typing Tutor is the part of the program designed to teach you new letter, numbers and symbols. If you select Typing Tutor, the program prints the following headings at the top of the screen: Fast, Lesson Key, and New. Letters that appear under the Fast heading during the course of the program are those over which you have gained mastery. The letters that appear under the Lesson Key heading are those that the program is currently presenting for drill. The letter under New are those yet to be introduced. Each lesson consists of ten sets of two, four-character 'words', separated by a single space. As each letter or symbol is typed in, it is printed on the screen directly below the corresponding character in the lesson 'word'. If a mistake is made, a graphic block is printed below the response.

Option 2, the Practice Paragraph, is actually a set of words and character combinations that test the typist's skill with what has already been learned. These words are drawn from a data list in the program, and are not randomly created combinations. You type these 'words' as quickly as you can. When you are finished, the program informs you of any keys missed, which keys you were slow on, your accuracy in percent, and your speed in words per minute.

After the completion of each lession in Typing Tutor,you are presented with an evaluation of your performance, such as:

Your accuracy is 94 percent at 16 words per minute.

You then have four further options:

1. Allow Slower Response
2. Same Response
3. Require Faster Response
4. Practice Paragraph

Choosing Option 1 actually results in your being introduced to new letters at a faster rate. This is because the option lowers the required response time criteria by twenty percent. The program normally judges letter proficiency at the rate of twenty words per minute. After Option 1 is chosen, the required rate is lowered to only 16 words per minute. Option 3 presents just the opposite choice, and requires that you type a letter at twenty percent greater speed before you are considered proficient. You can reset these options after every ten lessons. Option 2 presents another lesson at the same speed, while Option 4 allows you to call up a Practice Paragraph.

After the completion of the Practic Paragraph, the only options are:

1. Typing Tutor
2. Another paragraph.

Generally speaking, Typing Tutor is a pleasure to use. There is, of course, room for some improvement. The Practice Paragraph does not subtract errors when it calculates your speed, as do many other typing tests. The diagram of the keyboard presented in the instruction booklet is rather small. A larger diagram removable from the book for ready reference, would have been quite helpful. The word lists for the Practic Paragraph contain many BASIC commands. This is well and good, but this program can obviously serve a much wider audience, not all of it either sophisticated, or even familiar, with programming jargon. Perhaps additional word lists might be entered into the program from data tapes.

My overall impression of this program is excellent. It is modestly priced, well designed, and user-adjustable. Its speed at adjusting to your increased skill is amazing. You will not tire of this program quickly, and it should do wonders for your typing powers.

Dan Cataldo

The two functions "&" and "&H" are used to convert an octal or hexadecimal constant to decimal. This is a convenient feature but if you want to use it on a variable within a program, you will find it won't work. It is designed to be used only with a constant.

The constant following the "&" and "&H" is treated as a string but without the normal quotes associated with such. Thus, the function "&HA$" will give you garbage. The key to fooling the interpreter on the Model II and Color computer (extended BASIC version) is to use the VAL function. Try the following program, limiting the input to two or four digits. Use "FF" and "EA00" for examples.

```
10 INPUT A$
20 A = VAL("&H"+A$)
30 PRINT" Hex value = "; A
40 A = VAL("&" + A$)
50 PRINT"OCTAL VALUE ="+A
60 GOTO 10
```

This trick will only work on the Model II and Color computer. It does not function on the Model I or III.

Thanks to Bill Dickson, New Orleans, LA

In the Model II, the random access memory used for video memory is switched in and out of locations F800 through FF7F. You can do this manually by sending 81 to port FF to switch it in (overlaying that portion of memory) and send 01 to switch it out. All figures are expressed in hexadecimal.

Thanks to Gerald Lippey, Los Angeles, CA

When the tape recorder is under computer control the drive is left engaged as long as the play and/or record function is pressed. If left this way for more than a moment, the tape can be physically distorted by the capstan and pinch roller. The resulting dimple may interfere with future use of the tape. With shorter "data" tapes, such as Radio Shack's Certified computer tape, this problem is exaggerated by the thicker base material. Avoid this difficulty by leaving the third (smallest) plug disconnected. The tape will continue to run until the stop key is pressed which will disengage the drive mechanism.

Thanks to C. W. Evans, Sun City, AZ

Many times in programming, it is useful to print the month name on the screen or printer. One method is with the user defined function:

```
DEFFNMO$(M) = MID$("  JanFebMarAprMay
JunJulAugSepOctNovDec",M*3,3)
```

This method does not use up string space, as storing the names in a variable or array, or use time as a FOR...READ...NEXT loop would. Note the two required blanks at the start ("bbJanFeb...").

For the number of days in any month, use this function:

```
DEFFNND(M) = VAL(MID$(" 3128313031303
13130313031",M*2,2))
```

If you want it for leap years as well:

```
DEFFNND(M,Y) = VAL(MID$(" 31283130313
0313130313031",M*2,2)) - (Y/4 = INT(Y
/4)) + (Y=1900)
```

The year 1900 was *not* a leap year. Only the centuries evenly divisible by 400 are leap years. Also note the required blank at the beginning of "b31283130...".

Thanks to C. D. Robertson, Ft. Worth, TX

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