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The TRS-80 Users Journal

Volume III, Number 1 Jan/Feb 1980

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Editorial Remarks * *

I remember way back when, in the boonies of the Great Midwest, getting all sorts of goodies in the mail. (We were so far out in fact, that it was said to cost $1.00 just to send a penny postcard). Anyway, it had to be by mail; there were no Radio Shacks or any other kind of electronic stores in existence in our part of the world.

The big gun in those days was Allied Radio, which was headquartered in Chicago. They put out one fantastic wish book, one you could spend all winter on, mostly drooling. Looking back today, it is inconcievable to imagine getting excited over those 7 and 9 pin miniature tubes. The age of miniaturization had arrived! But - you still had to have an "A"battery, "B" battery and sometimes even a "C" battery. The "A" battery always went first, the filaments got dim, and then died.

The real value of Allied, Lafayette, Newark and all the others who put out these catalogs, was in the amount of real education you could gain from really studying the specifications and descriptions of what they sold. They told you everything about the product, and many times even included sample circuits which showed how to use those components. They were as good or better than many textbooks.

The Heath Co in their first few years, even printed the entire schematic diagram with component values and pin numbers. Later, they left off the component values and started screening the schematic behind a picture of the product.

Nowdays, you have to learn to read between the lines of most advertising. It is usually what they don't tell you that turns out to be most important. The Model II TRS-80 for example, boasts of 2 Megabytes on line. It really can have it, and if you have that many programs to store and retrieve it's fine. But what if your business files grow, and you need to span across 2, 3 or all four disks with one file?

Another case can be made for advertising for line printers which have a reasonable price, good size, immediate delivery and all the rest. What they don't tell you is that they only print on that "tinfoil" which you can go blind trying to read, and is only available from: Guess who?

And how do you back up a file with an X-Megabyte storage unit without getting a second one for "just $3200.00" or more?

It is very interesting to watch the use of words and how they come and go. "Right On!", used to be an "in expression", now using it makes one sound dated and "out of it". Words like "upward compatible" and "batch processing" have made the rounds, and are now being replaced with new, higher powered, more impressive sounding terms such as "Distributed Data Base Processing Environment", "Dynamic Data Definition","Multi-drop communications Networks" and the like. One we all recently "got off" on, was "Combinatorially segment-tested" software.

Words are counterfeit. They only stand for the real thing so that when someone says "white horse", you can conjure up your own image of a white horse. The words are not the horse, but represent an idea of the horse. How you perceive the horse may be totally different than the view of the person who said it.

Several years ago, it was "in" to say: "Have a Cool Yule, and a Frantic First"...We at 80-US hope you did! Mike

80-U.S.
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Letters to the Editor

I hope you can help me with a problem, but before I go on I would like to say how pleased I am with every issue of your Journal. I see improvement every time. Now, the problem: Every time I use an INKEY$ loop inside a program, I have to press the proper key six or seven times before the system will recognize it and continue as it should. I have tried just about all the characters possible, especially the ones that don't bounce. The unit is a Level II 16K, not quite a year old. I would like to know if anyone else has this problem, and would sincerely appreciate any ideas you've got.

Edward Robinson
Wichita Falls, TX

Depending upon how you use it in a loop, you may not be pushing the key when the system is looking at the keyboard. This would be especially true when the loop is a long one with many IF statements between the FOR and the NEXT statements. You may like to play with the following:

```
10 FORI=1TO1000
20 PRINTI;
30 C$=INKEY$:IFC$=""THEN40ELSE50
40 NEXT
50PRINT"I STOPPED HERE, BECAUSE
   YOU PUSHED ";C$
```

Where are you getting the mailing labels with "PEEL HERE"? How about a qustionaire in a future issue. Also, as you have grown bigger, seems like you have cut down on programs.

J S Wright
Ogden, UT

The labels are available from MOORE BUSINESS FORMS Inc, and are TAB 5615 SW DUO COPY, made by Avery International Co. Before you run out and buy a bunch though, be advised they cost 6 times more than ordinary labels, even in 10K quantity. We got 15K of them, and when they are gone we will be back to the regular ones. Only the IRS dosen't seem to mind using them at that price. As to the questionaire, we are thinking of doing one, probably in March or May. There are several things going on in the industry right now that need to "settle out", so that we can get a better look at them. Our program listings vary from issue to issue. When we were still 40 and 48 pages it was difficult to include many large listings without robbing space from other material. Now we have compressed most of the listings by about 30% and turned them sideways, which allows twice the listing for a given space.

I am a new subscriber and would like to commend you on the latest (Sep-Oct 79) issue - it was excellent. The contrast between it and Vol I #1 clearly shows the advances made in microcomputer sophistication in one short year.

David T Sorensen
St Cloud, MN

Your article and program in the Jul-Aug 79 issue (No Hardware Lowercase) was excellent. But as you can see from this letter (*it was typed in caps, Ed.*) I was unable to use it. It worked fine as stated for 16K. When I tried to adapt it to 32K I ran into problems. I am not too familiar with either assembler or machine language or I wouldn't be writing this letter. When I tried to adapt it I used BFABH as the starting point and promptly got an error message when I assembled the program. What I really need is a way of adapting it to disk and being able to access it from BASIC. I would really enjoy an article on that, since I have a printer capable of lower case and no good way to get it.

Stan Tishler
Bardonia, NY

I am using your software lowercase driver with my TRS-80, however, I am having a problem making a SYSTEM tape into a disk file. I have tried using the Tapedisk utility to make a /CMD file, but it dosen't execute properly even though it does seem to load into high memory. I am using a 32K machine with the program relocated to BFAB through BFFF. The SYSTEM tape works perfectly, even using NEWDOS and 2.2 Basic. I would appreciate an answer. Thank you for making such a useful driver available.

George B Shepherd Jr
Dallas, TX

Phil's program (No hardware lowercase) works fine as written when used in Level II. I have tried everything I know (which isn't much) to get it to work with disk. I stick it in the top of 48K, such as FF00, and set memory at 65280. I use the Editor/Assembler on NEWDOS; I have moved it around with LMOFFSET, cursed a lot etc. Even when calling up Level II with BASIC2 command it won't work from disk. Is there something about the DOS Boot that is screwing me up? Sure would like a suggestion or two. The nub of the whole matter is that things are changing. A year ago the emphasis was mostly on Level I, 4K and 16K. Now Level II is getting most of the attention. Time after time I see references to 16K but not beyond. It is time to pay more attention to the growing minority of disk system owners as we now represent about 30% of the TRS-80 population. I subscribe to a whole bunch of publications and so far yours is the best. Be a leader and give us 48K disk users some help.

Dawson K Hargrove
Orlando, FL

Help is on the way, keep reading.

Loved your Software Lowercase, but why only Level II? Many of we TRS-80 fans have disk systems and the program only works with BASIC 2. Also, why not lower case to the screen also, as one merely has to intercept the output of the character generator and decode as you did for LPRINT output. How about it?

Harry Goldberg
Concord, CA

There is NO way to get lower case on the screen without a hardware modification, since the ROM chip which holds that character is not there. This is why all hardware mods for lowercase add a 2102 ROM chip.

Now, as to the No Hardware Lowercase Mod not working above Level II 16K: It does now, see the article in this issue. In addition, we reasoned that since the only time you really need lowercase is when you are doing Text Editing/Letter writing, and many users have a software driver stuffed up there in RAM for their serial printers, we should make it a BASIC routine. Also, after using it that way for a time, we found the graphics blip on the screen just got in the way and messed up line lengths, especially when using line-oriented text editors. So we eliminated the blip, since you generally run draft copy off on the printer anyway. We tried it with Leo's Model 38 teletype with a TRS232 Serial Interface from Small Systems, on our own Trendata 1000 with the same serial interface and with our Selectra-Print, which runs off of the parallel printer port. All worked fine in 16K and 48K (we do have a 32K available), even when there was another driver up in protected memory.

*If you feel you **have** to fight that assembly listing from the Jul-Aug 79 issue, here is why it probably didn't work for you:*

In that listing line 190 returns you to BASIC with a JP to 1A19H instruction. So you assembled the program with a new origin for 32 or 48K and set a new memory size and created your /CMD file. But - when it executes (from DOS READY) it wants to come back to DOS READY, not Basic, as it would have for 16K Level II. Doing that from DOS READY will really drive the system up the wall! Try changing the origin to whatever you like, memory size to suit, and change line 190 to JP to 402DH. *This will return you to DOS READY after you have loaded your /CMD file. Why didn't we tell you that in the first place? Well, July 1979 was a million years ago, and we didn't know that then either!*

Thanks for another great issue! I have a couple of questions - Leo Christopherson created Android Nim with a no LLIST capability using what looks like a POKE statement to determine whether the printer is on or not. I have used some of this program to come up with the same results. It works fair now - however, you cannot use LPRINT either. Could he elaborate on some technique that could be incorporated into a program? I would be satisfied with a "No list at all" type explaination on this feature. Also, how about more on the audible tones using the OUT,X feature. Is there a patch that will keep you from locking up the

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computer if you get a key bounce and type LLIST instead of LIST - maybe a jumper on the edge-card? Incidently, is there a BASIC software lowercase instead of the machine language kind? Anyone wanting a recommendation for NEWDOS, they now have one. I know that's a lot of questions, but you can handle it! Please go monthly!!!

Rick Coulthurst
Marysville, WA

Leo created Android, and others, using as much of the system as he could to do the job the way he wanted it to be. It turns out that it is difficult to list some of his programs due to his "string packing" technique. It was not intended to be a "No list" situation. He used the printer device control block as a vector to machine code, to get away from having to use the USR calls which are different in L2 and DOS (this would have limited ANDY to one or the other, but not both). We have since found nicer ways to do it. We don't know of a patch to keep the system from hanging when you type LLIST without a printer, but it is something we intend to look into. The BASIC software lowercase is in this issue.

I really enjoy your magazine. Maybe I am the only one, but, I hope you don't go to a monthly frequency. From my own experience the increased postal cost of monthly issues and the hassle of monthly deadlines will, for a time at least, diminish the quality. Grow with it slowly, unless you want to be another Kilobaud. Build up the size of the JOURNAL until you could split any issue into two and then decide if you want to go monthly.

R G
Gammange Cup Books
Sacramento, CA

It is so nice to know that there is one person in the world who understands. Thank you.

I want to use my TRS-80 to write letters or any other text, and to print these on my printer, and to insert a character, line, sentence or paragraph and have automatic repositioning of all text lines to accept the insertion. I also want to be able to delete same and have it reposition to fill the spaces created by the deletion. In addition I want to have right justification, automatic line spacing and automatic page spacing. Will you please recommend software that I can buy for text writing that is reliable. Would the software require knowledge of machine language programming?

Bernard Warren
Howard Beach, NY

Generally, you do not need to know machine language to operate a Text Editor. There are several good ones around. I don't think any of them will meet all of your requirements though, but most of them will meet most of them. There is TEXT80 from the TRS-80 Software Exchange, the Electric Pencil by Michael Shrayer and the Electric Secretary from the Peripheral People. Or, if you don't really need all those bells and whistles, try the one we are listing in this issue.

You have created the best TRS-80 mag of them all. Only Softside and PROG-80 come close (also quite good). As a new disk user (PERCOM & NEWDOS+), I would like to see more on use of disk files, DEBUG and NEWDOS (especially SUPERZAP and LMOFFSET). If possible, more software and hardware reviews (the Star Trek review a few issues ago was great). I am also interested in your opinion of need for Line Hash Suppressors and filters. Can all the equipment be turned on with one switch, or does the keyboard need to be turned on separately after the others? Also on NEWDOS: Since a one disk system can't keep all the modules on each data disk, I'd be interested in what combinations others acutally use.

Paul M Steen
Sturbridge, MA

Unless you are in an exceptionally "clean" electrical area, you will probably need hash suppressors. The re-boots to DOS are not entirely due to the absence of the buffered cable; ours sometimes re-boots when we turn on any other piece of equipment, even our postage meter can do it from another room. The sequence we use is to turn on the Expansion Interface then the Printer, then the Keyboard and Screen and then the Disks. Then insert the system disk and use RESET to boot in the DOS. - Page 3 of your NEWDOS instructions gives the minimum modules required for various operations. The minimum system will consist of 10 granules (Boot, DIR, SYS0 through SYS4).

I would like to see a review of the various Light Pens that are offered for the TRS-80. Are they gimmicks or useful items? Will the software support work with actual programs or is it just for demonstration? If it is general purpose, will it work with DOS? The ROM routine information in the Sep-Oct 79 issue was useful. Any information on the calling sequences for the arithmetic routines in ROM would be of interest also. Why is Radio Shack so secretive about this? Are the ROMs changing to correct problems?

Doug Smith
Vincentown, NJ

We are awaiting the arrival of a Light Pen which was promised for review. We have a few more places to go in ROM, should be in this issue under "Notes on Basic". Radio Shack and MicroSoft seem to play ping-pong with questions about ROM, remember the old kids game called "keep-away"? There have been about four very minor changes to the ROM, you would probably never notice the difference.

With the permission of the producers, I would like to see your publication do some sample runs of some of the business software that is available. By doing this, it could help some of us to better select the programs which would fit our individual needs. I realize that a $500 program may be excellent for one type of application, yet too extensive for another in which a $50 program would suffice. I feel that a lot of users are like myself and would have to travel many miles just to view a few programs and never have the opportunity to see the one that would have been just right. Additionally, I would like to see some comparative articles on perhipherals, TRSDOS vs NEWDOS etc. I believe your publication has become big enough to give us users a better overview of available products and software.

Donald H Smith
Rockingham, NC

Since May 1979, when we started the Business Computing column, we have been urging producers of business software to send review copies of their products. The response has been fair, and we encourage more of it for the very reasons you suggest.

Your articles are the best! I use the No hardware lowercase, and print spooler assembly programs. Keep up the good work and hold down the "test reports" of expensive software.

Dave Ripplinger
Osseo, MN

I'd like to subscribe to your super-dooper 80-US Journal for one year. I must honestly confess that your Journal is the best mankind has seen in the last 2,000,000 years!! Keep the steam on..

George Pauly
Luxembourg

You should have seen what we looked like the year before that!

I have just received a copy of your Sep-Oct 79 issue and if the rest of them are this good, I am ready to order. The software and articles are outstanding. I immediately inserted the NEWDOS+ patch in "Pencil" and it cured my problem with the disk subsystem. Next I got interested in the possibilities of a spooler so I entered that program and was facinated. Then I got around to the stock program and found that it worked on the first try (something unusual for magazine programs). All in all, an excellent issue.

Harold Price
Montgomery, AL

Thank you. There is nothing worse than trying to type in a magazine program that is scrunched up dot-matrix, reduced in size to fit the page, or one that is done on a teletype which isn't hitting square and the D's, O's and C's all look alike. We are still not batting 1000 though, our Selectric likes to throw in a dash or underscore every now and then, and it is easy to mistake the dash for a minus sign. Starting this issue, we will also print a Variable Reference for the "tougher" programs, which should give you another shot at it in case of ink smudges or light spots.

But for one problem I am the happy possessor of a sound version of Androi

Nim, recently acquired from you. The problem is, of course, that efforts to show off our TRS-80 to friends by a demonstration of Good Ol' Nim are frustrated by a slow, slow tape load which all too often aborts and we have to start all over. Needless to say, smirks that sometimes follow these attempts aren't very comforting. I would like to put Android on disk for loading into the TRS-80 but being a 4K novice, I am afraid of ruining my tape.

W L Kumler
Los Angeles, CA

I know the feeling! Boot up DOS. When you get DOS READY (assuming DOS 2.0, 2.1 or NEWDOS), type in BASIC and enter. Answer the MEMORY SIZE and HOW MANY FILES questions with enter. Then type in CMD"T" and enter. Then type in CLOAD, get the tape ready and enter. After the tape is loaded you can either run it and/or save it to disk. To save on disk, get a basic READY by pushing BREAK, then type SAVE"ANDY", or whatever name you want to give it. The CMD"T" is necessary to stop the clock from inteferring with the tape operation. Use CMD"R" to turn the clock back on again if you want, but we leave ours off most of the time without ill effect. Please note that Android Nim (and some others of Leo's programs) will not function properly with DOS 2.2 or 2.3. They were written before 2.2 and 2.3 came on the scene, and may crash because they use some of the previously unused space and commands.

There is a bug in Hallen's "Drawing Board" program (Sep-Oct 79). If you choose not to call up the instructions then the program dosen't set the last half of the G(K) matrix to 128. Then you get leading blanks on your data tape, and spend about one-half hour fiddling with the volume control, trying fruitlessly to eliminate the OD errors. The correction I made was to change line 200 to read:
200 IF LEFT$(Y$,1) <> "Y"THEN 360.
The new "Anatomy of the Program" column is great. It helped a lot in debugging the drawing program.

William Mason
Hornitos, CA

I am thinking about adding a disk drive to my TRS-80 and looking over the various brands/makes available is very puzzling. Do you think that 80-US might do a little article on disk drives that would answer some elementary questions that we non-technical types have about disks?

R P Johnson
Seattle, WA

We are working on that now.

Why does the rounding off formula given on page 7/3 of the Level II manual, (Z=INT(A*100+.5)/100) round .715 to .72 but 1.715 to 1.71? There appear to be many other such inconsistencies.

Don McKenzie
Pebble Beach, CA

Check page 50 of our Sep-Oct 79 issue. In it, George Blank describes 5 different ways to round off. We recommend using PRINTUSING "##.##";X. It will round off properly.

Thanks for the Psych program (Which Brain?, May-Jun 79 issue). For those of us without printers I think it is still too easy to go to an LPRINT mode and lose the program. My solution was to add:
85 PRT=0:REM REMOVE THIS LINE WHEN YOU BUY A PRINTER
That way, safety is assured. By the way, great program!

Jon C Fox
San Francisco, CA

Thanks for a fine anniversary issue, and congratulations on the birthday. When I first subscribed I asked you not to let me down. You haven't. Finally, I seem to be missing the Jul-Aug 79 issue. Please send me a copy. Thanks again, and may your next year be as good as the last.

H E Davis
Portland, OR

The Jul-Aug issue went into the mail about June 15th. For some reason, known only to the Post Office, more subscribers missed that issue than any other. Summer help maybe? **Mike**

ITEMS AT RANDOM

Is your subscription due? If the 3 character code after your name on the mailing label ends in -30 this is your last issue! If it ends in -50 the next (Mar-Apr issue) will be your last. It saves us a lot of time and money if you renew a little early, and you will get an un-interrupted flow of the good things we have coming up!

Here it is again, Mid-winter madness time, with holidays and the doldrums that set in following them. Fear not, we have plenty of goodies in this issue to keep your mind off of those South Sea Islands and on your computer keyboard. Yes, time flies when you are having fun! It seems like only about a week ago that we put out our now famous "8 blank page" January 1979 issue. Seems ironic that it had a cover showing a Selectric and included a Text Editor program. We really didn't intend for January to be Text Editing month, but in this issue you will find an "on screen" text editor for both Model I and II. All of it due to the unbelievable speed and dexterity (not to mention sleepless nights) of our Associate Editor, Terry Dettmann. I just love those calls from him that start with: "Hey, Mike, how would you like - - etc?". Hey! Mikie likes it!

Re-boots & KKeybounces

Well, we made it through our first "made at our place" issue (Nov-Dec 79). It turned out well we thought, considering we did the whole shebang, typesetting, layout and composition. (Note the new title for Cathy in the masthead.) But, there were bugs, and aren't there always?

Jim Crocker thought the review of TDISK, FLEXL and ATERM looked strangely familiar, since he had written it. Somehow, we got Roy Groth in there as the author. Will Jim write anything else for 80-US? Will he ever trust us again? Stay tuned ---

Then, to make matters even worser, in the same review we said TDISK cost $19.95. It turns out that ATERM costs $19.95 and TDISK and FLEXL (System Savers) cost $14.95 together.

Also in the Nov-Dec 79 issue on page 23, Notes on Basic - right column near the top of the page, the IF statement is missing a zero. There should be a zero right after the equals sign.

John Knoderer, who wrote the Stock Market Programs, wrote to tell us there is a line left out of the Stock/Pro article in the Jul-Aug 79 issue, page 32. Add this line:

```
95 IFLOF(1)=0THEN FIELD1,
 255ASA$:LSETA$=STRING$
 (255,0):PUT1,1
```

Again, in the Nov-Dec 79 issue, Steve Smith was given credit for assisting in the program on Engineering Calculations on page 26. It really should have been Eric Smith.

KILLED FILES, in the last issue, brought us just about the amount of comments we expected. Most were good, but a "glossover" was immediately spotted by several readers. Terry and I tried to re-construct the crime and got nowhere. It seems that at the top of page 36 it says that A6 = 1 1 0 0 0 1 1 0. Now, we all know that isn't so. A6 should be equal to 1 0 1 0 0 1 1 0. In that case, the little explanation which follows it is wrong. The 6 plus 2 for finding the correct sector is OK. It's the relative position in that sector which needs to be explained. Here goes: There are 8 groups of two lines in each directory sector. The two-line groups start with the number 0 and go through E. Properly decoded, the A6 would have started with 1 0 1 0. Taking the first 3 bits 1 0 1 (per the article) gives 5. Now, when you start counting at 0, when you get to 5 you will be at the relative postition within the sector for that directory entry. There is yet another, easier way to find it. Look at page 35 of that issue, and at Figures 2 and 3. The line numbers on the left, end in 00 through F0. The HIT sector entry will always be on the same relative line as the directory sector entry, as on page 35 it shows that the directory for "FILES" is on line ending in A0. and the HIT sector entry for FILES is also in the line ending in A0. We found this to be true in all cases.

RENEWALS

A larger than normal number of subscriptions expired with the Sep-Oct 79 issue because so many back-dated their subscriptions to include the first issues. We are very pleased that well over 95% of those have since renewed. Thanks for the vote of confidence!

75 MEG STORAGE?

According to information received from down south, there will be within about 6 months, a 75 megabyte, plug adaptable, hi-density, hi-speed, mass storage device for the TRS-80 Model I. Based on a 3M device, it will contain two 8080 microprocessors and will sell for less than $3500.00. The company is Mega Tape, Inc., 2610 San Mateo NE., Albuquerque, NM 87110 (505)881-5000

MOD II

The Model II parallel printer mating plug is an AMP 34 pin female #88479-6 (or Ansley 609-3430). This information is not given in the Mod II Manual, and even though they show you a picture of the plug, there is no way to tell if you are looking at it on the machine from the outside, inside or at the plug coming from the printer. Whichever way it is, it is not the same as the DB 25 connector shown on the opposite page. We are now pretty sure (but still not certain) that when looking at the back of the Mod II, pin 1 is in the upper left corner of the plug.

The 8 inch disks used with the Model II turn out to be Verbatim FD 34-8000. These are available from many sources, including International Ribbon House, PO Box 98223, Tacoma, WA 98499. The dash 1000 disk looks like the dash 8000 except for the write-enable notch. Yes, it is a write-*enable* notch, just the opposite of Model I. On the Mod II you put the tab over the notch to *enable* it to write.

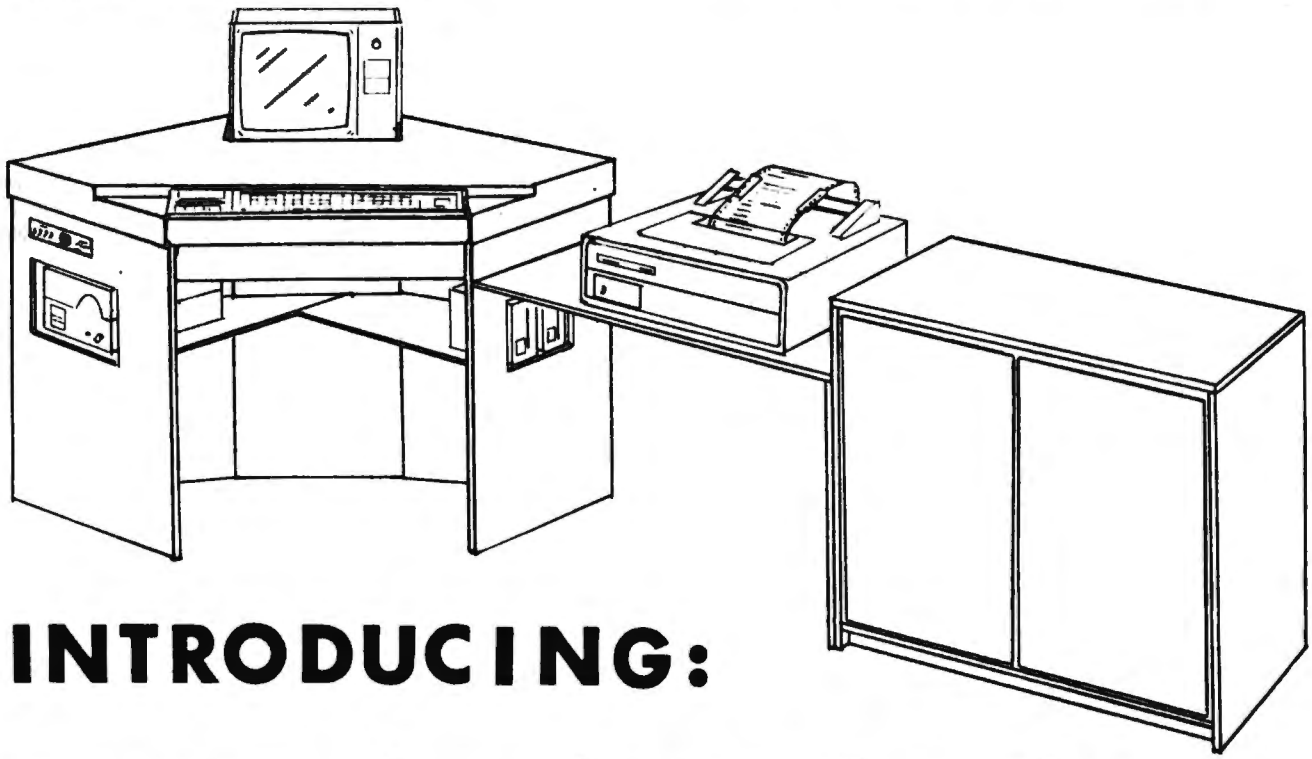
TANDY WATCHING

Being a "Tandy Watcher" is interesting. For example, the Mod II operating system apparently has already in it the ability to page 4 sections of 64K memory. It seems that there are also 16 address lines already in the hardware. The CPU board plugs in, and there are 4 empty slots (in a store-bought 64K system, less if you add 32K to a 32K system) for more boards. In the 22 Oct 79 issue of COMPUTERWORLD magazine, Tandy advertised for positions for Systems Analysts with experience in BASIC-COBOL and Z80 ***and 6809*** processors. The 6809, in case you haven't heard, is the new hot-dang chip from Motorola. So much for the facts, start your own rumors!

Make a nice day, and tell them you saw it in the JOURNAL. Mike●

TRS-80 has a HOME

TRS-80 is a product of Radio Shack, A Tandy Corporation



INTRODUCING:

Custom furniture for the TRS-80 office or home decor.

Now for the first time for any computer, custom all wood office furniture is available for the TRS-80 micro-computer system to complement any office or home decor. It has been designed, not only to enhance the decor, but to provide maximum work surface area, and ease of operation.

The unit fits snuggly into the corner and mates with an optional matching printer/typewriter platform and/or storage hutch. It normally replaces or works in conjunction with a storage hutch usually found behind executive desks, to provide wrap around operation.

The corner unit is capable of handling a complete TRS-80 system, with the line printer setting on either the option printer/typewriter platform or the storage hutch. All TRS-80 units, though built in, simply drop into place and do not require any mounting hardware or tools.

The standard unit includes: Mounting capabilities for the monitor, cassette, keyboard, and expansion interface; Keyboard cushion hand rest; and an accessory drawer. Also available are the options of mounting the screen printer and/or disk drives.

For complete details and pricing information contact:

AVS AUDIO-VIDEO SYSTEMS

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TRS-80 HARDWARE & SOFTWARE
FROM THE CPU SHOP

MEMORY: 16K memory kit complete with 8 RAM chips, jumpers & instructions for installation in your keyboard or expansion interface. A household screwdriver is the only tool you need, no soldering required.
300 ns. low speed **$69.00**
250 ns. medium speed **$75.00**
200 ns. high speed **$85.00**

DISK DRIVES & ACCESSORIES

DISK DRIVES- TRS-80 40 track disk drives complete with power supply & case **$314.00**
Cable for four drives **$35.00**
DISKETTES- Verbatim (box of 10) **$32.00**
Dysan (box of 5) **$25.00**
Dysan Allignment Diskette **$35.00**

DISKETTE STORAGE — Plastic case: holds 10 diskettes, built in flip stand **$3.99**
Diskette pouch: clear vinyl, holds 2 diskettes & 2 file cards,fits 3 ring binder ..... **$.99**
3 Ring Diskette Binder with your choice of 10 diskette pouches (above) **$12.95**
CASSETTES: High quality C-10 ..... **$1.25**
Buy 10 for **$9.00**

PRINTERS

NEC Spinwriter-letter quality printout on plain paper, high speed 55 cps, choose font style with interchangeable thimble, friction & tractor feed combined in same unit. Includes TRS-80 software interface **$2679.00**
Font thimbles **$14.50**
Ribbon cartridges-Carbon or Nylon **$6.50**
Centronics: Nationwide field repair by Centronics: Call Centronics (800) 258-1952

779 Tractor Feed-60 cps - same as line printer used by Radio Shack **$1050.00**
701 Tractor Feed- 60 cps - bidirectional, 132 clms **$1499.00**
P1 Micro Printer- same as quick printer used by Radio Shack **$399.00**
P1 Cable- to plug into expansion interface **$39.00**
Integral Data Systems - Upper/lower case - 100 cps. undirectional - switch selectable RS232 or parallel - paper width 8.5 edge to edge - can attach to keyboard with the TRS-232 or expansion interface with printer cable (below):
IP 125 - friction feed printer **$799.00**
Printer Control Option variable pitch under program control - 64-132 columns per line **$39.00**
IP 440 - The Paper Tiger has the same features as the IP 125 plus a maximum paper width of 9.5" tractor feed with form feed control, 8 switch selectable form sizes, paper-out detector **$995.00**
2K buffer & full graphics options **$149.00**
Expansion interface printer cable **$49.00**
Cable for TRS-232 interface, 10' (below) **$35.00**
TRS-232 PRINTER INTERFACE by Small System Hardware. Software driven serial output port with built in power supply - plugs into cassette aux. port - can be used to drive Integral Data, Diablo, teletype printers, etc.. works with the Electric Pencil **$49.00**
BIDIRECTIONAL RS—232C INTERFACE from Radio Shack **$99.00**
Computer Paper Available for Above Printers

NEW TRS-80 ACCESSORIES

TRS-80 VIDEO DISPLAY MONITOR: High quality/ high resolution 12" LEEDEX monitor with cable **$119.00**

POWER ACCESSORIES

POWER STRIPS: 6 grounded outlets with 6 ft. extension cord, 15A circuit breaker, on/off switch pilot light **$16.00**
SURGE SUPPRESSOR/HASH FILTER: protect your computer from AC line surges **$24.00**

THE CPU SHOP
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Accounts Payable / Accounts Receivable / General Ledger / and Payroll package by SBSG. 32K/3 drives fully interactive. Tested on the WANG for 5 years - a well documented proven system. Write or call for details. **$389.00**
Note** Above A/P, A/R, G/L and Payroll packages can be purchased individually for ***$99.00*** each module requiring only 2 drives to run. You can trade back for the full interactive system at any time.

SMALL BUSINESS BOOKEEPING from MMS - Based upon the popular "Dome Simplified Weekly Bookeeping Record" catagorizes deductions for fancy home accounting or small business uses. Requires 32K RAM, at least one disk drive, and optional printer **$25.00**
Dome Simplified Weekly Bookeeping Record **$5.95**
ELECTRIC PENCIL by Michael Shrayer - NOW ON DISK as well as cassette - a fine word processor with block movement and search plus more - instructions for modifying keyboard to get lower/upper case-cassette **$99.00**
New Disk Version **$150.00**
MAILING LIST SYSTEM —NAME & ADDRESS II by SBSG Requires 32K,2 disks, & printer.Sophisticated mailing list program. Use with the Electric Pencil files for automatic insertion of name, address and greetings in letters. Has ability to print envelopes. Separate files can be set up or all names can be contained in one file. You can enter or delete , update, search, sort, merge and print. Super fast zip code sort for bulk mail. Extract 1000 names per drive. Contains program to automatically convert data entered into Radio Shack mailing list program. System is menu driven. Comes with 40 page manual. **$129.00**
INVENTORY II by SBSG: 3K/2 disk drives - will handle up to 1000 inventory items per drive. Reports incl. Activity, complete or selected inventory listing, minimum quantity search. **$95.00**
PROGRAM CATALOG SYSTEM by SBSG: Keep track of all the programs and data files you own. Details each program by name, size, version, level, creation date, last date updated, and a brief function description. Diskette **$39.00**
FILE MANAGEMENT SYSTEM by SBSG - Ideal for anyone with specialized storage needs. Sorts files in ascending or descending order on 3 separate fields, scanable. Some applications have fixed assets, phone no's,names, slides & albums ..... Diskette **$49.00**
ST—80 III INTELLIGENT TERMINAL SYSTEM by Lance Micklus. Enables a TRS-80 to act as a dial-up terminal on any standard time sharing network. Provides a TRS-80 with Control key, ESC key, Repeat key, Rub Out key, Break key, full upper & lower case support, selectable printer output and program selectable transmission rates. Diskette **$150.00**

THE CPU SHOP UTILITIES SOFTWARE

G2 LEVEL III BASIC: Level II tape from Microsoft duplicates many disk features for TRS-80 users who do not own disk drives, also adds new quick screen graphics commands,

THE CPU SHOP

ten machine language user calls, TIME$ routines, relieves cassette loading problems and keyboard debounce, adds octal and hex constants. Uses 5K of RAM. Includes user's manual etc. **$49.95**

FORTH from MMS: For the serious hobbyist & professional programmer. Offers stack oriented logic and structured programming, machine-code speed and compactness, virtual memory, major advantages of interpreter, compiler, and assembler (all are co-resident), and your own commands in its extensible dictionary,etc.. Sample game of Life program and user information included.16K cassette..... **$35.00**
Disk with Disk I/O **$45.00**

"The MicroForth Primer" best manual for MMSFORTH **15.00**

NEWDOS from Apparat: Finally, an improved DOS with fixes for all known bugs in TRSDOS 2.1 plus additional features over TRSDOS 2.2 to make the DOS more useful. Some fixes include keyboard bounce, "APPEND", end-of-file markers, "LOC", the "VERIFY" command, SYS3 bugs which crashed the disk directory, several bugs which caused lost data errors. Enhancements ie.."RENUM" fast line renumbering, fast variable or constant locating program, LOAD and SAVE functions run up to 30% faster, more granule space saving, output checks, output of screen display to printer, all DOS commands can now be accessed from BASIC and more ! Available in 35 or 40 track versions.(please specify) **$49.95**

DISK UTILITY 7 PROGRAM PACKAGE from Apparrat - Includes the following: Entire package on diskette **$99.00**

NEWDOS: See description above.

DIRCHECK: Makes checks & lists/prints directory contents

SUPERZAP: Reads, writes, copies and displays sectors on disk regardless of protection: recovers "killed" programs.

DISASEM: Disassembles machine code to Z-80 source.

EDTASM: Moves Radio Shack editor assembler to disk.

LMOFFSET: Relocates machine language programs to specified memory locations.

LVIDSKSL: Stores, retrieves Level I programs to disk.

LEVEL I: Provides Level I in Level II capability.

DOS 3.0 by the original author of **2.1:** No keybounce. Check EOF, write EOF, SEEK, REREAD, REWRITE, LOC, variable length records, SKIP, disk logging of messages, BOOT, CHAIN, PAUSE,PURGE, SET, RESET, ROUTE. RUN and LOAD for 1 drive system. XFER, FORMAT w/o ERASE. DIR from BASIC,PATCH, LINK, user defined keys, key auto repeat, upper and lower case driver, shift lock, RS-232 drivers, MULTI PROTOCOL COMMUNICATIONS **$49.95**

FORTRAN for TRS-80 by Microsoft,plus **Z-80 Macro Assembler** versatile Text Editor, linking loader. Requires 32K system with one disk drive **$199.95**

KVP by Lance Micklus 16K Level II or DOS: A collection of machine language subroutines with utilities such as modem software, user adjustable keyboard debounce, printer utilities, upper/lower case capability, plus much more.
Cassette **$24.95**
Diskette **$29.95**

AUTOK & QEDIT from Discovery Bay Software - Level II loads at top of RAM. New and powerful BASIC screen oriented text editor. Move cursor to anywhere on screen, insert/delete characters, can even edit line numbers, adds auto repeat functions to keys and more for quick and easy editing of your programs.(state RAM size) cassette or diskette **$14.95**

RSM MONITORS by Small System Software - many functions including memory test, read and write machine language tapes, enter and execute machine language programs **$29.95**

DCV—1 by Small System Software - a disk conversion program for Level II machine language tapes so that the program can be saved and loaded from disk ..... Cassette **$9.95**

RENUMBER from Mad Hatter - machine language - improved renumber - renumbers your BASIC listings in seconds. Requires Level II - loads at the top of 4K, 16K, 32K or 48K.
Cassette **$14.95**
Diskette **$17.95**

SYSTEM INTEGRATION TEST by SBSG - A diagnostic tester. It checks your diskettes, disk drives, and control units. The RAM tester checks memory and notifies you of the failing address if there is any problem. Checks all characters on your printer. ..... Diskette **$29.00**

*****TRS-80* COMPLETE SYSTEMS*****

TRS-80 Level II-4K **$540.00**
TRS-80 Level II-16K with 10 key keypad **$799.00**
TRS-80 Expansion Interface **$269.00**
TRS-80 RS-232-C Interface **$84.00**

CAT MODEM: Originate and answer same as Radio Shack Telephone Interface II. **$169.00**

*****THE CPU SHOP GAMES SOFTWARE*****

MUSIC MASTER by David Lindberg: Enter up to 10 mins. of music for your TRS-80 to play, amplifier required.

200 MW SOLID STATE SPEAKER AMPLIFIER: modified for sound programs (above) **$12.95**

SARGON: BEST CHESS: This program has won chess tournaments. 6 Levels of play..... **$19.95**

MICROCHESS by Peter Jennings-machine language,4K Level I or Level II - one of the first and most popular. Play chess against your TRS-80. 3 Levels of difficulty. Includes instructions..... **$19.95**

BRIDGE CHALLENGER by George Duisman - 16K Level II, you and the dummy play against the computer in regular contract bridge. Complete with samples & instructions..... **$14.95**

PILOT by Bob Edison - Machine language version of the educational language PILOT with all the features of TINY PILOT and more. Includes built in editor plus sample programs..... Cassette **$14.95**
Diskette version with Disk I/O & Math capability **$24.95**

SPACEWAR from MMS - Not just another space game. Fast real time action - 2 players with space ships fire missles in selectable gravity,float, no edge bounce, reverse gravity no float sectors of space. Selectable game speed, missle speed, & hyperspace..... Cassette**$9.95**

AIRRAID by Small System Software - a real time shooting gallery for the TRS-80. Player shoots cannon as airplanes fly by and parachutes land at user adjustable speeds. Requires the skill of an arcade game. **$14.95**

STAR TREK III by Lance Micklus-(16K Level II). This updated and advanced version won't let you win easily. Object is to explore as much of the gallaxy as possible, destroy 20 klingons and locate planets. **$14.95**

THE LIBRARY 100 by The Bottom Shelf 16K Level II. 5 cassette album with 100 business/financial, educational, and home graphics and games programs. Value 50¢ per program..... **$49.95**

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Add $2.00 for regular or $3.00 for air shippingfor items 5lbs. or less. All other items freight collect.

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Monday -Saturday

New PRODUCTS

CARTA LESSON LIBRARY

Carta Associates Inc, Education Products Division, 640 Lancaster Ave, Frazer, PA 19355, has described its newest packages as VIC (Visual Instructional Computer) and the Carta Lesson Library series. VIC uses the TRS-80 display to teach basic computer architecture plus assembly and machine languages to the casual or beginning student. The Carta Lesson Library is a three-part package of study and test materials with the capability of asking questions in a variety of formats and, at the instructor's discretion, in timed sequences. The lesson tapes provide study and review data in a variety of subject areas - from math to science, to studies. The company says that additional data tapes will become available on an ongoing basis.

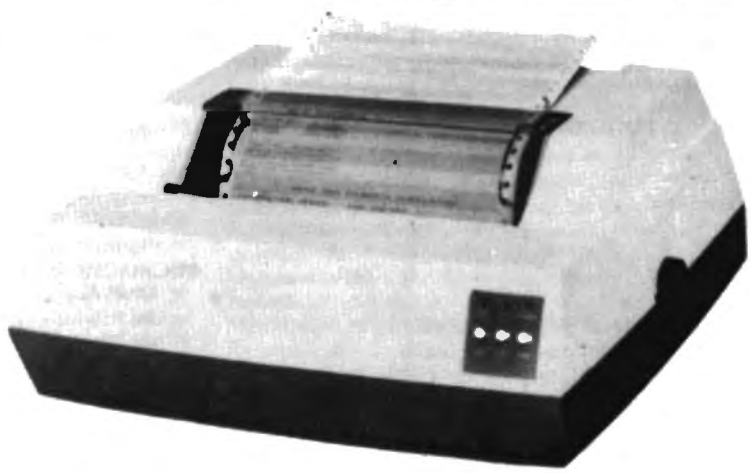
The Carta Associates educational software programs are available through computer stores nationwide. Product brochures may be obtained at no charge by writing directly to the company.

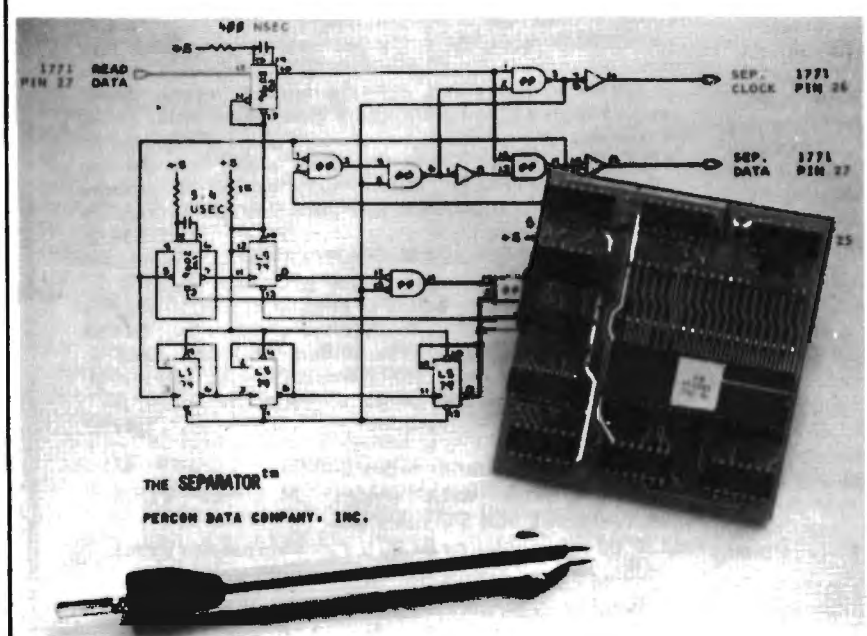
MATCHLESS PRINTER

Matchless Systems has added a printer to its line of TRS-80 related products. According to Mike Conner, President of Matchless, they have had such great success with the MS-80 Mini Disk Systems they felt it timely to add this new printer to the line. It features a print head life of 100 million characters. It is 80 column, bi-directipnal, 5 X 7 dot matrix, and uses a print mechanism of extremely simple design and high reliability. It has a print speed of 125 CPS and a throughput speed of 63 lines per minute. The adjustable sprocket feed mechanism allows use of forms from 4½" to 9½" wide, with loading from either the bottom or rear. A full 96 ASCII set permits printing upper and lower case, which can be expanded for double-width fonts in bold face. It has a special introductory price of $749. For literature or ordering information, contact Mike Conner, Matchless Systems, Dept 3, 18444 South Broadway, Gardena, CA 90248 or call (213) 327-1010

DISK DRIVE DECALS

The BADGEworks, 7709 La Verdura, Dallas, TX 75240, has engraved, stick-on decals for your disk drives. A set of four (for Drive 0, 1, 2, 3) can be had for $4.00 plus 50 cents postage/handling.





SEPARATOR

Percom Data Co announced that the company is now offering a plug-in adapter for the TRS-80 and Southwest Technical Products MP-F mini-disk controllers which virtually eliminates the data read errors caused when clock and data bits are not reliably separated during playback.

The problem relates to the higher storage density of the inner tracks, and is not uncommon with either controller.

Called the SEPARATOR, the adapter may be installed without making changes to the host system. The user merely removes the 1771 disk controller IC from the host controller, installs the IC in the DIP socket on the SEPARATOR card and then plugs the card into the vacated 1771 socket of the host system.

An assembled and tested SEPARATOR adapter sells for $29.95, including installation instructions. Orders may be placed by calling Percom toll-free at 1-800-527-1592, and may be paid by check, MO, COD or charged to VISA or Master Charge accounts.

IBM PROTOCOLS ON TRS-80

IBM Protocols can now be handled by a TRS-80. Through an interface technique developed by Omni Computer Systems Inc, IBM users can now easily transfer data to a TRS-80. The data is then available for special analysis or for managerial review. According to Jim McManus, President of Omni, Inc, the original application was an inventory management system for Spencer Gifts, Inc. He said that many companies who need specialized handling of data can benefit from this technique. Often this approach will prove more economical and quicker than modifying existing programs. Omni Computer Systems, Inc., 4 West Lafayette St., Trenton, NJ 08608

PROTECT BASIC PROGRAMS

Data Associates of Framingham MA have announced the release of a program that will automatically protect BASIC programs written for the TRS-80. It runs on a single disk system with 32K memory. By use of this program, BASIC programs can be protected against unauthorized modification and can be made confidential. Hidden passwords and copyright notices elected by the user are inserted and then the program is converted so that it cannot be listed or printed. The protected program can still be RUN, CSAVED, CLOADED, DISK LOADED, DISK SAVED as usual. The program, UNLIST8, is provided with an instruction manual and three copies on cassette. The cost is $19.95 postpaid, from Data Associates, PO Box 882, Framingham, MA 01701

EDUCATIONAL SOFTWARE

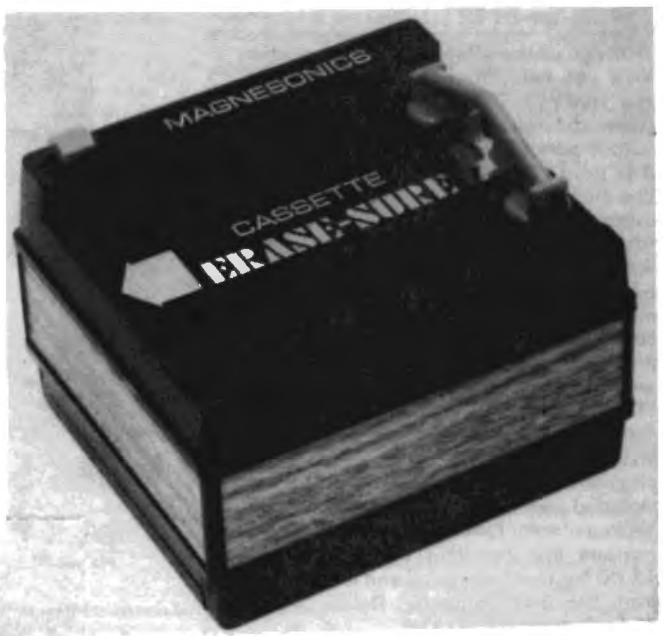
MicroGnome's CAIWARE is a software system for authoring and using Computer Assisted Instruction on the 16K Level II TRS-80. CAIWARE is not another programming language to be mastered. It is a true authoring system, whereby the author is guided and prompted by a set of well-defined prototype questions. CAIWARE is so easy to use that educators, parents and managers can be producing useful course-ware, and playing it back in their first session. It is intended as an aid, not as a replacement for the teacher or textbook. It is available on cassette for $24.95, MD residents add $1.25 tax. Order from Fireside Computing Inc., 5843 Montgomery Road, Elkridge, MD 21227 (301) 796-4165

AUTO TELEPHONE DIALER

Blechman Enterprises has just made available a "Telephone Dialer Program" for the TRS-80 Level II. This BASIC program will hold up to 500 names and numbers in 16K. It lists in alphabetical order on command, dials automatically when listed name is typed and entered. It displays the number, including area code as it dials, as well as the elapsed time of the call. At end of call you can enter the rate and the total charge is displayed. It can re-dial the last number. The telephone interface is made from Radio Shack parts that cost under $5.00 (not supplied). There is no modification to the TRS-80. Furnished on cassette with documentation for $10.00 (CA residents add 6%). Includes shipping USA only. Blechman Enterprises, 7217 Bernadine Ave., Canoga Park, CA 91307

TAPE ERASE-TAPE REWIND

Magnesonics, PO Box 758, Ventura, CA 93001 (805) 642-3092, has announced an exclusive Cassette ERASE-SURE and Cassette RAPID REWIND units. The ERASE-SURE uses a patented principle that consists of erasing a pre-recorded tape by passing it through a rotating magnetic field. The tape erased on this unit has a residual noise level equal to or better than new tape. The RAPID REWIND unit does a high speed rewind with a slight drag applied to the right hand spindle to insure an even pack, which helps eliminate wow, flutter and jamming. Both run on four size AA penlite cells for complete portability. Each is available for $24.50 plus $1.50 for handling and postage.



TINY FORTH

The Software Farm announces its tinyFORTH 2.1 computer programming language system, consisting of a program cassette and user's manual. tinyFORTH is a unique version of the versatile FORTH language tailored to the TRS-80 computer. tinyFORTH programs run faster and use less memory than similar programs in BASIC because it includes a compiler in addition to an interpreter. The complete tinyFORTH 2.1

system, cassette tape and documentation, for 16K and larger Level II TRS-80, costs $29.95. Shipping and handling charges are $1.50 per unit in the US and $6.00 per unit foreign. The Software Farm, PO Box 2304, Reston, VA 22090 (703) 437-9218

ISAM

Johnson Associates has announced the availability of a TRS-80 based Index Sequential Access Method (ISAM) for controlling business application files on diskette. The ISAM system is a series of subroutines the user includes in the application program. Calls to these subroutines store or retrieve data by referencing a "key field" within the record. An additional set of utility programs allow the user to create a new data file or to reorganize an old one. All ISAM files are supervised by the TRS-80 Disk Operating System, thereby providing standard space allocation, directory, copy, kill, backup and password services. The TRS-80 ISAM package is available for $50.00. For more information contact Johnson Associates, PO Box 1402, Redding, CA 96001

ROBOT VAN

The age of the affordable Robot is here. Now you can remotely control a model van from your TRS-80! A fully interfaced command unit that plugs directly into the output port of the TRS-80 operates the 3-G Robot Van by radio transmissions. The Robot Van extends the computer's output capabilities from the CRT screen to a moving object. The use of the Van is limited only by the user's ingenuity. Run one program and the Van delivers a message to your secretary. Another command can be entered and the Van drives through a complicated maze around your furniture.

The 3-G Robot Command Van is completely assembled and ready to plug into your TRS-80. A demonstration program and complete instructions are included with the Van. The complete package sells for $85.00 (plus $3.00 postage and handling within the US; $7.00 for foreign orders) and is available from the 3-G Company, Route 3 Box 28A, Gaston, OR 97119

10 MEGABYTE SUPER DISK

ELECTROLABS, PO Box 6721, Stanford, CA 94305 has announced a 10 Megabyte Superdisk, with a front loading removable cartridge for the TRS-80, Apple, S-100 and S-44. It features low power consumption, small size, and high performance with "attache case size" media. It comes with the controller and connectors supplied. It is 12 by 21 inches in size and has a warranty for 90 days parts and labor, "excepting improper handling, war, or events of divine indiscretion". Call 1-800-227-8266 (in CA call 415 321-5601)

CATALOGS

A new catalog from Electronic Specialists presents their line of Microcomputer interference control products. Protective devices are also included. Descriptive sections are included which outline particular problems. Suggested solutions are given. Typical applications and uses are also outlined. Request Catalog 971, from: Electronic Specialists Inc, 171 South Main St., Natick, MA 01760 (617) 655-1532

TRI-TEK, Inc 7808 N 27th Ave, Phoenix, AZ 85021 (602)995-9352 has a catalog filled with electronic parts (chips, transistors, diodes, connectors and all the rest). You can get a spare Z80 from them for $11.00

CUSTOM TICKERSCREEN

Max Ule & Co and Intersystems Software Inc have announced the introduction of Maxi-Micro(tm) TICKERTEC-TRS, a custom stock ticker screen(tm) software package designed to run on the Radio Shack TRS-80. Jay Moskowitz, president of Intersystems Software and developer of TICKERTEC-TRS, says the system allows the individual to watch the entire New York Stock Exchange or American Stock Exchange ticker tape on a real time basis with no delay as well as monitor 48 or more stocks, keeping track of their last sale prices and volume. He can see the last ten trades for any of these stocks on demand and monitor all reports, announcements and hourly exchange indices and volume information at the touch of a button. He can maintain the stocks in either of two alphabetical lists so that speculations, for example, might be kept separate from long term holdings. He can put price limits on any stock and the computer will visually inform him when these prices have been reached. The system is available for immediate delivery on cassette or disk with custom options available on request. Max Ule & Co, 6 East 43rd St., New York, NY 10017

ACCOUNTS RECEIVABLE

Micro Architect has announced a new Accounts Receivable package (ACCT-III) for DOS, Printer and 32K and up. It is not totally "invoice oriented", so that any service business can use it. It also can be used for order entry, sales analysis etc. The package is priced at $69.00 including 24 pages of documentation. For more information, write Micro Architect, 96 Dothan St., Arlington, MA 02174

EDUCATIONAL SOFTWARE CATALOG

A new mail order catalog devoted exclusively to Educational Software for personal computers is being published by Queue. The catalog will contain educational software listings from numerous publishers. Software listings will be separated by educational level and field, and by computer. For further information, contact Monica Kantrowitz, President, Queue, 5 Chapel Hill Drive, Fairfield, CT 06432

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BOARD & CARD GAMES

For years people have played board and card games. Now, with the personal computer you can learn how to play these games or always have a willing opponent. And at a small fraction of the cost of the dedicated games. These are the best programs we have found for the 16k, Level II TRS-80.

sargon II

by Dan and Kathe Spracklen from Hayden
The best of the micro chess playing programs that came in third in the 9th North American Computer Chess Championship! Personal Computing magazine said "Buy this program when it becomes available . . . unequaled in the end game . . ." $29.95.

mean checker machine

by Lance Miklus from TSE
A quick and brilliant checker playing program. Four levels of play are in this machine language program. $19.95.

gammon challenger

by Ray Daly and Tom Throop from Acorn
This backgammon player has three levels of play and many special features. A game in which it gammoned the Tryom's Gammonmaster was featured in the August issue of Personal Computing.

go moko

by Phil Pilgrim from Discovery Bay
Program plays you in the ancient Japanesse game of five-in-a-row. Play on a 9 by 9 grid. $14.95.

code breaker

by Mikal Pedersen from Acorn
Puzzling, challenging, exciting. A different game of determining the colors of four secret code pegs. Includes sound effects. $9.95.

poker pete

by David Gubser from Quality
Play five card draw poker against animated Pete. He shuffles and deals. Pete will bluff, raise, call or fold. Watch out - Pete's got a gun! $9.95.

win 21

by Phil Pilgrim from Discovery Bay
Don't gamble, learn to play expert blackjack. Includes book Beat The Dealer and comprehensive instructions. $29.95.

bridge challenger

by George Duisman from Personal
You play your hand and the dummy against the Challenger in 4 person Contract Bridge. Hands dealt at random or according to your criterion for high card points. You can review tricks, swap sides or replay hands when the cards are known. An always willing opponent. $14.95.

TRS-80

WE HAVE HUNDREDS OF PROGRAMS FOR THE RADIO SHACK TRS-80 COMPUTER. IF THERE IS A GOOD PROGRAM AVAILABLE, WE TRY TO CARRY IT. WE OFFER GIFT CERTIFICATES ON REQUEST. OUR PHONE IS ANSWERED 24 HOURS A DAY. ORDER TODAY!

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from bottom shelf
One hundred programs on 5 cassettes plus the programming language Tiny Pilot! 25 business and finance, 15 graphic, 15 home, 15 educational and 30 games. $49.95.

NEWDOS+

from Apparat
This disk operating system is quickly becoming the standard. Not only are fixes made to the Radio Shack TRSDOS, but several utilities are added, including LEVEL1, EDTASM, DIRCHECK, and SUPERZAP. $99.95.

"TRS-80 DISK"

by H.C. Pennington
We don't usually list books, but this one is so unique that we thought you would want to know about it. There are over 100 pages about how DOS works, how a disk is organized, and how to recover from errors. This is THE technical backup for NEWDOS with great illustrations. $19.95.

TUTIL & DUTIL

by Roy Soltoff from Misosys and Acorn
The Tape Utility (Tutil) and the Disk Utility (Dutil) provide you with a powerful software aid in debugging machine language programs, in using the Radio Shack Editor/Assembler, and in performing various utility functions. Examine, clear, initialize, move, compare and modify memory data plus search memory for up to 24-character strings; punch, load, verify, run machine language programs and display file names; display and modify registers in English; add and subtract in hex; jump and set breakpoints; and interface to E/A. Output to video and printer simultaneously. Includes E/A modify program.

The Disk Utility includes these features and more. Read and write disk sectors, even to the directory track; track read, sector scroll and disk save or restore of E/A test buffer.

Tutil $14.95 Dutil $19.95

COMPROC

by Johnston and Johnston from Racet Computes
Your programs can execute automatically at DOS boot. Turn on the system and be up and running. You can execute any series of DOS commands and even answer responses in a BASIC program. It makes the computer easier to use for the non-programmer. Well documented. $19.95.

BASIC-1P

from Small System Software
This program provides full Level I BASIC capability in any Level II, 16k TRS-80. Plus it adds the printing commands of LPRINT and LLIST so you can now list your programs and control your printer from Level I BASIC. Two new commands, LPRINT ON and LPRINT OFF allow you to print anything that is displayed on the screen. Using only 4k of RAM, you have 12k for your Level I programs. Any Level I BASIC program or data tape may be used without conversion. All commands and abbreviations are supported. $19.95.

INFINITE BASIC

by Johnston and Johnston from Racet Computes
Add 50 different string functions and 30 array and matrix functions to your Level II or DOS BASIC. $49.95.

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Or clip this coupon and mail your order today!

Arcade video games are always fun to play. Acorn Software Products recently released versions of four popular arcade games. Alien Invasion, Block'em, and Ting-Tong all have sound effects. You'll be hearing a lot more about Acorn.

alien invasion

by Roy Niederhoffer from Acorn
The arcade game that you've been looking for. You shoot your laser gun at the invaders while avoiding their bombs. Game includes sound effects and graphics. Watch out for asteroids and black holes. $9.95.

block'em

by Joseph Moran from Acorn
Maneuver your blockade so that your opponent crashes before you do. You get four different game options, nine speeds, and sound effects. For two players, in machine language and only 4k needed. $9.95.

space war

by Device Oriented Games from Acorn
Two-player, real-time space battle lets each player control a space ship with rotate, thrust, fire, and hyperspace. Five game options (including gravity) and three speeds are included. In machine language. $9.95.

ting-tong

by Ray Daly from Acorn
Ping-pong for the TRS-80. The game is for one or two players with eight speeds and includes sound effects. In machine language. Only 4k needed. $9.95.

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TEXT for the 80'S

T R Dettmann, Associate Editor

Over the past few years since the TRS-80 came on the scene, the market has seen all sorts of Text Editors. One year ago, we printed a complete Text Editor for the TRS-80. This year we take a giant leap and present for your use a Text Editor which can be used on the Model I System (with disk basic) or the Model II System (with the change of a few parameters).

We haven't stopped there however. Instead of having to learn a whole new command language for Text Editing, we have also written in an "On Screen" text editor. The editor is written completely in BASIC. There are no supporting machine language routines, no PEEKing or POKEing to get machine language. In this way, you can easily learn the program and modify it for yourself.

The Text Editor built around the On Screen editor is a very simple system with no frills. There are no attempts to provide the fancy on screen capabilities or off screen capabilities such as merging files, etc. The editor allows you to retype incorrect characters on the screen.

Line insertion or deletion, and character insertion and deletion are not included with this program, but adding them is possible. We have had this program running on both Model I and Model II for some time without problems.

THE EDITOR

The heart of any text editor is the editing module. As you can see from the program listing, all of the various modules for inputting and outputting it are very simple. It dosen't require a large amount of programming to get the text into or out of the computer, but what do you do with it when it is there?

The On Screen editor itself is called from subroutine 2000 which scans the text and stops at every screen-full. Once the screen is full, the operator is given the option of moving to the next screen of text or editing (routine 2500). If the decision is to edit, the program goes to subroutine 6000. Let's look at subroutine 6000 and see how it works.

On Screen editing can best be explained by following through the subroutine on entry to see what happens. As we enter at statement 6000, we initialize some variables:

X	The position of a character in a line
J	The current line on the screen that we are working on.
I1	The first line on the screen
K1	A flag to indicate that the current character is not recorded yet (-1)
PT$	The cursor character for On Screen Editing
K	The location of the current character on the screen

Statements 6020 through 6040 then check to see if the position of the cursor is within the text. At this point it is, because we have just set it

(Continued on page 18)

Clubs & Publications

Learning Level II

Dr Lien, nationally known authority on the TRS-80 and author of the popular TRS-80 User's manual has done it again This time in the form of "Learning Level II". He says that it takes up where the first manual left off. It is fully illustrated and enables readers to convert Level I programs of every kind to Level II quickly and with ease It may be ordered direct from Computer Books Division, CompuSoft Inc., 8643 Navajo Rd San Diego, CA 92119

The Computing Teacher

The Computing Teacher, Eastern Oregon State College, La Grande, OR 97850, is a journal for people interested in instructional use of computers at the pre-college or college levels It emphasizes teaching about computers, teaching using computers, teacher education, and impact of computers upon the curriculum. Address correspondence to David Moursund, Editor

Resource Handbook

The first New England Microcomputer Resource Handbook, a complete guide to low cost home, business and school computers, is out It is a Boston Computer Society publication, costs $2 00 plus 75¢ postage from the society at 17 Chestnut St Boston, MA 02108

The Dental Computer Newsletter

Edited by Ellis J Neiburger DDS, 1000 North Ave., Waukegan IL 60085 (312)244-0292, covers several of the most popular computers in use, and gives information on business software available and other "good to know" information You pay the postage to get it

80 Software Critique

A new quarterly publication, 80 Software Critique, is now available. Microcomputer owners are faced with a large and often bewildering number of software advertisements from dozens of vendors Owners of TRS-80 have a particular problem since there seems to be more software for them than for all others combined The first issue contained reviews of 50 programs and was 50 pages A one year subscription is $24 00 They are at PO Box 134, Waukegan, IL 60085

INSIDERS

The Insiders, PO Box 32296 Washington, DC 20007, has changed format to 8½X11 It is TRS-80 hardware oriented with machine software. It usually contains very good machine language routines by Tom Stibolt and others It was 16 pages in Sep 79, and costs $7 50 for six issues.

Ventura County Newsletter

Available from Nick Sharp, 2534 North Temple Ave., Camarillo, CA 93010 Their October 79 issue carried a complete list of Computer Bulletin Board telephone numbers

Program Exchange

The Craig County (VA) Public Schools have recently placed Level II TRS-80's in pilot programs in both elementary and secondary schools These machines are being used with Computer Assisted Instruction (CAI) programs and educational programs They would like to contact schools and/or other individuals interested in exchanging programs which they have developed Write to Earl R Savage, Craig County Public Schools, PO Box 245 New Castle, VA 24127

VTUG

The Valley TRS-80 Users Group (VTUG) meets at Patrick Henry Jr High School, 17340 San Jose St, Granada Hills, CA Contact Mr A Ficucell, 22440 Victory Blvd Woodland Hills, CA 91364

New Clubs Send notice of your meetings and/or a copy of your newsletter if you have one We would like to expand this column to at least a page per issue. Send yours to 80-US at 3838 South Warner St., Tacoma, WA 98409

Bring your TRS-80 keyboard to life!

A year ago we used this headline to introduce AUTOK and QEDIT, the keyboard autorepeat and quick edit utilities for Level II BASIC. They've been very popular, but we couldn't resist working them over anyway, in response to customer suggestions. The result? **KEYEDIT**, a vastly improved AUTOK, QEDIT, and a few things more.

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- Keyboard macro facility. Any frequently-typed pattern can be defined and later invoked in a single keystroke. You just fill in the blanks. Takes the drudgery out of repetitive keying. (See SYSTEM/COMMAND, this issue.)
- Screen-oriented editing. **KEYEDIT**'s cursor moves anywhere in a displayed program listing for instant insertions and deletions. Plus, whole statements can be copied to other parts of the program or combined to form longer ones, without retyping the text. Makes BASIC's EDIT function obsolete!
- Easy loading. **KEYEDIT** loads from cassette using CLOAD (even though it's written in machine language), and may be saved on disk. Features can be deleted selectively just by deleting lines. Once RUN, **KEYEDIT** protects itself in low memory and links into BASIC, where it unobtrusively awaits your command.
- Thorough documentation. Each feature is explained in detail along with instructions for user modifications.

KEYEDIT will save you hours of effort in BASIC program development. So why waste another minute? Bring *your* keyboard to life today with **KEYEDIT!**

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that way, but we will come back to these statements as we move the cursor.

Line 6050 establishes the location of the cursor on the screen. The current character is noted (stored in CH$) so that the next line can print the cursor character. After the cursor has been printed, the keyboard is checked for input. If there is none, a small delay is entered so the cursor will not flash too fast, the original character is replaced, another delay, and then back to the cursor in the previous line.

If a key was pressed, the ASCII code of the key is first checked against the value of the ENTER key (13), and the arrow keys. If the ENTER key was pressed, the routine terminates and returns to the calling program.

If an arrow key was pressed, the line position variables X and J are changed to reposition the cursor and then a jump is made to line 6150 to put the original character back and set up to start the process over again at the legal position check.

If neither an arrow key nor ENTER was pressed, then the program assumes the key pressed was to replace the current character, so line 6140 first prints the new character on the screen. Then it replaces the character in the original string. Finally, it moves the cursor one to the right.

From this point on, each character is simply a repetition of the last as far as working through the routine is concerned.

SOME CAPABILITIES & LIMITATIONS

When you start working with the editor, you have to realize that it has some limitations that must be observed.

The first limitation is that the text typed in during the input session or brought in from disk must not have more than 64 characters per line, and a line may not have a line feed. This occurs because the On Screen editor specifically assumes that each line fits on the screen.

This Text Editor is very rudimentary. It is intended to show how to do text editing on screen. The ability to insert characters or lines and delete characters or lines is missing.

An error trap is provided to prevent you from losing your text if an error occurs or you do something illegal. It will return you to the menu with your text intact so you can start again.

SPECIFICALLY FOR THE MODEL I

Model I users can use the program as it is, with the numbers as in the listing. However, Model I users will find that the cursor movement is slow, since for each space of movement the key must be pushed. Model II users have a REPEAT key which allows repeating the INKEY$ without removing your finger. To get this kind of effect on the Model I, replace the ASC(C$)=XX in statements 6100 through 6130 with:

IF PEEK(14400)=XX THEN

Where XX=32 for a left arrow, 64 for a right arrow, 8 for an up arrow and 16 for a down arrow.

Once this change is made, the key will keep repeating intself until you lift your finger. You may have to add a delay routine for timing.

FOR THE MODEL II

Model II users can use these routines as well(they

were developed on the Model II originally). To make the change, the Model II user need only change the constants at the beginning of the program.

Almost every constant in Line 60 has a new default for the Model II, so each one should be checked against the manual. The set of constants for the Model II are:

```
CU  2
CO  1
CE  145
SW  80
SL  23
LF  28
RT  29
DN  31
UP  30
```

Everything else is written for maximum flexability.

CLOSING

The purpose of this article has been to show how to do On Screen editing in BASIC on your TRS-80. There are still many complications to be met, but you will find the program a simple, and viable text editor. The text for this article was written using the Text Editor described here.

The listing for this program is heavily commented. You may wish to leave out these comments when entering it into your machine. All lines ending in "5" are remark lines which **can be left out.** Remark lines ending in "0" **must be left in,** although to save space, you may simply enter the line number and the REMARK symbol. ●

For Model I or II, DOS & Printer Required

```
10 REM------------ BASIC TEXT EDITOR -----------------------
20 REM THIS LISTING IS NOT COPYRIGHTED, USE IT AS YOU LIKE.
30 REM---------------INITIALIZATION---------------------------
35 REM  CLEAR MEMORY FOR TEXT
40 CLEAR2*MEM/3
45 REM  DEFINE ALL VARIABLES AS INTEGERS FOR SPEED
50 DEFINTA-Z
53 REM  CONSTANTS:  MX   MAXIMUM NUMBER OF LINES
                    CU   CURSOR OFF CHARACTER
                    CO   CURSOR ON CHARACTER
                    SW   SCREEN WIDTH
55 REM              CE   CURSOR FOR EDITING
```

```
                    LP   LINES PER PRINTED PAGE
                    NL   NUMBER OF LINES BETWEEN PAGES
                    SL   LINES ON SCREEN
57 REM              LF   LEFT ARROW ASCII CODE
                    RT   RIGHT ARROW ASCII CODE
                    DN   DOWN ARROW ASCII CODE
                    UP   UP ARROW ASCII CODE
60 MX=300:CU=15:CO=15:SW=64:CE=191:LP=60:NL=6:SL=16:
                    LF=8:RT=9:DN=10:UP=91
65 REM  TX$ IS THE TEXT FILE
70 DIM TX$(MX)
75 REM  FNHDR$ IS THE TITLE FUNCTION FOR SCREEN DISPLAYS
80 DEF FNHDR$(A$)=STRING$(SW,61)+STRING$((SW-LEN(A$))/2,32)
      +A$+CHR$(13)+STRING$(SW,61)+STRING$(2,13)
85 REM  ESTABLISH THE CONNECTION TO THE ERROR PROCESSING
      ROUTINE
90 ON ERROR GOTO 10000
100 REM-------------------- MENU ----------------------------
105 REM DISPLAY MENU
110 CLS:PRINTFNHDR$("MENU")
120 PRINTTAB(5)"1.  ENTER TEXT"
130 PRINTTAB(5)"2.  EDIT AND SCAN TEXT"
140 PRINTTAB(5)"3.  PRINT TEXT"
150 PRINTTAB(5)"4.  STORE ON DISK"
160 PRINTTAB(5)"5.  READ FROM DISK"
165 REM PUT THE SELECTION AT THE BOTTOM OF THE SCREEN
170 PRINT@960,"SELECTION: ";
175 REM SUBROUTINE 240 INPUTS A SINGLE NUMBER
180 GOSUB240
185 REM SELECT THE CORRECT SUBROUTINE
190 ON C GOSUB 1000,2000,3000,4000,5000
195 REM RETURN TO THE MENU
200 GOTO100
210 REM---------- SINGLE KEY (Y/N) INPUT -------------------
215 REM LOOP HERE UNTIL A KEY IS PRESSED
220 C$=INKEY$:IFC$=""THEN220
225 REM CHECK FOR EITHER Y OR N, IF NEITHER THEN LOOK FOR
      ANOTHER CHARACTER, OTHERWISE RETURN TO CALLING
      ROUTINE
230 IF(C$="Y")OR(C$="N")THENRETURNELSE220
240 REM-------------- NUMBER INPUT -------------------------
245 REM LOOP HERE UNTIL A KEY IS PRESSED
250 C$=INKEY$:IFC$=""THEN250
255 REM CHECK TO SEE THAT THE VALUE IS BETWEEN 0 AND 9
      IF NOT, LOOK FOR ANOTHER NUMBER, OTHERWISE RETURN
260 IFASC(C$)>=48ANDASC(C$)<=57THENPRINTC$;:C=VAL(C$):
      RETURN ELSE250
270 REM-----------------TIMING LOOP-----------------------
275 REM USED TO CONTROL THE FLASH RATE OF THE CURSOR IN
                    ON SCREEN EDITING
280 FORTL=1TO3:NEXTTL:RETURN
1000 REM------------ INPUT TEXT -------------------------
1010 CLS:PRINTFNHDR$("ENTER TEXT")
1015 REM LOOP FROM 1 TO MAX NUMBER OF LINES
      INPUT TEXT INTO TX$ WITH LINE INPUT (ACCEPTS
      ALL CHARACTERS)
```

(Continued on page 22)

```
1020 FORI=1TOMX:LINEINPUTTX$(I)
1025 REM STRING ".END" AT THE BEGINNING OF A NEW LINE
       TERMINATES INPUT
1030 IFLEFT$(TX$(I),4)=".END"THEN1050
1040 NEXTI
1045 REM SET N = NUMBER OF LINES INPUT AND RETURN
1050 N=I-1:RETURN
2000 REM------------- SCAN AND EDIT TEXT -----------------
2005 REM L2 IS ONE LESS THAN THE NUMBER OF SCREENS NEEDED FOR
       THE SCAN. L1 IS THE NUMBER OF LINES IN THE LAST
       SCREEN
2010 L1=N-INT(N/(SL-1))*(SL-1):L2=INT(N/(SL-1))
2015 REM PRINT EXPLAINATION
2020 CLS:PRINTFNHDR$("SCAN AND EDIT TEXT")
2030 PRINT"THE TEXT WILL COME UP ";SL-1;" AT A TIME ON THE"
2040 PRINT"SCREEN. PRESS <E> TO EDIT THE LINES ON THE SCREEN"
2050 PRINT"OR <ENTER> TO GO ON TO THE NEXT ";SL-1;" LINES"
2060 PRINT@960,"PRESS ENTER WHEN READY TO BEGIN";
2065 REM LOOP HERE UNTIL A KEY IS PRESSED
2070 IFINKEY$=""THEN2070
2075 REM CHECK, IF L2=0 THEN THERE ARE LESS THAN 1 SCREEN FULL
       OF LINES SO GO TO THE ENDING ROUTINE
2080 IFL2=0THEN2170
2085 REM LOOP OVER THE SCREENS
2090 FORJJ=1TOL2
2100 CLS
2105 REM KK IS THE NUMBER OF THE 1ST LINE ON THE SCREEN
       FROM THE TEXT BUFFER
2110 K=(JJ-1)*(SL-1)
2115 REM LOOP OVER THE LINES TO PRINT THIS SCREEN
2120 FORI=1TOSL-1
2130 PRINTTX$(K+I)
2140 NEXTI
2145 REM GO TO THE DECISION SUBROUTINE
2150 GOSUB2500
2160 NEXTJJ
2165 REM THE FINAL SCREEN
2170 CLS
2175 REM JJ IS USED IN THE SUBROUTINE TO CALCULATE THE
       FIRST LINE TO APPEAR
2180 JJ=L2+1
2185 REM LOOP OVER THE REMAINING LINES
2190 FORI=1TOL1
2195 REM K IS THE NUMBER OF THE LINE FROM THE TEXT BUFFER
2200 K=L2*(SL-1)+I
2210 PRINTTX$(K)
2220 NEXTI
2225 REM GO TO THE DECISION ROUTINE
2230 GOSUB2500
2240 RETURN
2500 REM-------------- EDITING DECISION --------------------
2510 PRINT@960,"<E> FOR EDIT, <ENTER> TO CONTINUE";
2515 REM LOOP HERE UNTIL A KEY IS PRESSED
2520 C$=INKEY$:IFC$=""THEN2520
2525 REM IF THE KEY IS NOT <E> OR <ENTER> THEN GO BACK TO LOOP
2530 IFC$="E"THENGOSUB6000:RETURN
                          ELSEIFASC(C$)=13THENRETURN
```

```
2540 GOTO2520
3000 REM------------ PRINT TEXT -------------------------
3010 CLS:PRINTFNHDR$("PRINT TEXT"):N1=0
3015 REM ASK FOR FORMATTING PARAMETERS
3020 PRINTTAB(5)"DOUBLE SPACE? ";:GOSUB210:PRINT:
       IFC$="Y"THENDS=1ELSEDS=0
3030 PRINTTAB(5)"CONTINUOUS ROLL";:GOSUB210:PRINT:
       IFC$="Y"THENCR=1ELSECR=0
3040 PRINTTAB(5)"PRESS ANY KEY WHEN READY";
3045 REM LOOP HERE UNTIL A KEY IS PRESSED
3050 IFINKEY$=""THEN3050
3055 REM PRINTING
3060 FORI=1TON:LPRINTTX$(I):N1=N1+1:IFDS=1THENLPRINT" ":
     N1=N1+1
3065 REM CHECKS TO SEE IF THE NUMBER OF LINES PER PAGE
       SPECIFIED HAS BEEN PRINTED, IF SO THEN
       GOES TO SUBROUTINE 3100
3070 IF(N1-INT(N1/LP)*LP)=0THENGOSUB3100
3080 NEXTI
3090 RETURN
3100 REM------------ END OF PAGE --------------------
3105 REM IF CONTINUOUS ROLL WAS SPECIFIED, PRINT SOME BLANK
       LINES AND RETURN
3110 IFCR=1THENLPRINTSTRING$(NL,138):RETURN
3115 REM IF SINGLE PAGES FOR PRINTING, THEN WILL HAVE TO WAIT
       FOR A NEW PAGE
3120 PRINT@960,"PRESS ANY KEY WHEN NEXT PAGE IN";
3125 REM LOOP HEREUNTIL A KEY IS PRESSED
3130 IFINKEY$=""THEN3130
3140 RETURN
4000 REM------------ STORE ON DISK ----------------------
4010 CLS:PRINTFNHDR$("STORE ON DISK")
4015 REM THE FILENAME CAN INCLUDE ALL SPECIAL CHARACTERS
4020 LINEINPUT"FILENAME: ";FF$
4025 REM OPEN THE FILE FOR OUTPUT
       NOTE THAT THE FILE IS NOT CHECKED BEFOREHAND
       IT IS POSSIBLE TO WRITE OVER ANOTHER FILE HERE
4030 OPEN"O",1,FF$
4040 FORI=1TON:PRINT#1,TX$(I):NEXTI
4050 CLOSE:RETURN
5000 REM------------ READ IN FROM DISK ------------------
5010 CLS:PRINTFNHDR$("DISK INPUT")
5015 REM THE FILENAME MAY CONTAIN ALL SPECIAL CHARACTERS
       ALLOWED AS FILE DESIGNATIONS
5020 LINEINPUT"FILENAME: ";FF$
5025 REM THE FILE IS OPENED FOR INPUT, IF IT DOESN'T EXIST
       AN ERROR WILL BE GENERATED AND THE ERROR TRAP
       WILL BE CALLED
5030 OPEN"I",1,FF$
5040 FORI=1TOMX:LINEINPUT#1,TX$(I)
5045 REM READ UNTIL END OF FILE OR END OF BUFFER,
       WHICHEVER OCCURS FIRST
5050 IFEOF(1)THEN5070
5060 NEXTI
5070 CLOSE:N=I:RETURN
6000 REM---------- ON SCREEN EDITING ----------------------
6005 REM  VARIABLES:  X   THE POSITION ALONG A LINE
```

```
                        J   THE CURRENT LINE
                        I1  THE BEGINNING OF THE SCREEN
                        K1 IFK1=-1 THEN THE CURRENT POSITION
6006 REM                CHARACTER HAS NOT BEEN PICKED UP YET
                        PT$ THE EDITING CURSOR CHARACTER
                        K   THE SCREEN POSITION OF THE CURRENT
                            CHARACTER
6010 X=1:K1=-1:PT$=CHR$(CE):J=1:I1=(SL-1)*(JJ-1)
6015 REM IF THE POSITION HAS GONE OFF THE TOP OF THE SCREEN
       THEN SET THE POSTION TO THE FIRST CHARACTER
6020 IFJ<1THENJ=1:X=1
6025 REM IF THE POSITION ON A LINE HAS GOTTEN TO THE LEFT OR
       RIGHT OF THE LINE, THEN MOVE THE CURSOR UP OR DOWN
       ONE LINE
6030 IF(X<1)THENX=LEN(TX$(I1+J-1)):J=J-1
       ELSEIF(X>LEN(TX$(I1+J))+1)THENJ=J+1:X=1
6035 REM HAS THE LAST STEP MOVED THE CURSOR OUT OF THE TEXT
       AGAIN?
6040 IF(J<1)THENJ=1:X=1ELSEIF(J>I)THENJ=I
6045 REM ESTABLISH THE POSITION OF THE CURRENT CHARACTER
6050 K=SW*(J-1)+X-1
6055 REM IF THE CURRENT CHARACTER HASN'T BEEN NOTED, THEN
       IDENTIFY IT. IF WE ARE PAST THE END OF THE CURRENT
       STRING, THEN SET THE CHARACTER BLANK
6060 IF(K1<K)THENK1=K:IFX>LEN(TX$(I1+J))THENCH$=CHR$(32)
       ELSECH$=MID$(TX$(I1+J),X,1)
6065 REM PRINT THE CURSOR
6070 PRINT@K,PT$;
6075 REM LOOK FOR A KEY PRESSED, IF NONE- THEN DELAY, PRINT THE
       CHARACTER, DELAY, AND RETURN TO THE CURSOR PRINT
6080 C$=INKEY$:IFC$=""THENT=2:GOSUB270:PRINT@K,CH$;:GOSUB270:
       GOTO6070
6085 REM IF A KEY WAS PRESSED, WAS IT ONE OF THE ALLOWED
       CONTROL CODES?
6090 IFASC(C$)=13THENPRINTCHR$(CO):RETURN
6095 REM 6100-6130 ARE THE ARROW KEYS MOVING THE CURSOR
       AROUND THE SCREEN.
6100 IFASC(C$)=LFTHENX=X-1:GOTO6150
6110 IFASC(C$)=RTTHENX=X+1:GOTO6150
6120 IFASC(C$)=UPTHENJ=J-1:GOTO6150
6130 IFASC(C$)=DNTHENJ=J+1:GOTO6150
6135 REM IF THE KEY PRESSED WAS NOT AN ARROW KEY OR <ENTER>,
       THEN PRINT THE KEY AT THE CURRENT LOCATION, PUT IT
       THE STRING, AND INCREMENT THE CURSOR POSITION
6140 PRINT@K,C$;:MID$(TX$(I1+J),X,1)=C$:X=X+1:GOTO6020
6145 REM THE KEY PRESSED WAS AN ARROW, SO PUT THE CHARACTER
       BACK WHERE IT BELONGS AND SET UP TO GET THE NEXT
       CHARACTER
6150 K1=-1:PRINT@K,CH$;:GOTO6020
10000 REM---------- ERROR TRAP -------------------------
10010 CLS:PRINTFNHDR$("ERROR TRAP")
10020 PRINT@960,"PRESS ANY KEY TO RETURN TO MENU";
10025 REM LOOP HERE UNTIL A KEY IS PRESSED
10030 IFINKEY$=""THEN10030
10035 REM RETURNS CONTROL TO THE MENU.  USING RESUME ALLOWS
       ADDITIONAL ERROR PROCESSING TO OCCUR
10040 RESUME 100        (You are finally done!)
```

Omikron transforms TRS-80* into a powerful business system.

STANDARD DRIVES 8" Drives give you 5 times the speed and 3 times the storage of your mini drives! Our system provides a standard Shugart interface so you can use either your 8" drives or ours.

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★ ★ ★

MAPPER I is a memory management unit which adapts your TRS-80* to run standard CP/M*? The user can choose either CP/M* or TRS-80* DOS through keyboard control. The package includes CP/M* software on 5" diskette and documentation. Specify memory size when ordering. $199.

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*CP/M is a TM of Digital Research. TRS-80 is a TM of Tandy Corporation.

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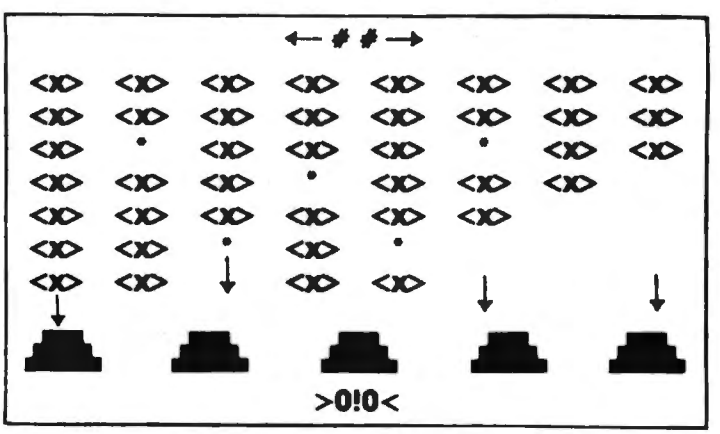

COLLEGE SELECTION PROGRAM

Cameron Brown, Tacoma, WA

For Level II 16K and UP

This program was developed to help students find colleges that may be of interest to them. The program will run on 16K Level II and up, and about 90 colleges can be included in the data list.When students answer the questions honestly, the computer will include at least one school that they have considered. This routine has been used by over 50 students, and their scores were used to determine what constitutes a strong match.

Probably the best feature of the program is the series of questions that are asked. Many students do not select colleges by following any consistent criteria. Quite a few students who have used the program commented that they wish they had run it before applying to schools. The program is informational only, and should never be considered the final word in selecting a school.

The program is rather direct in its scoring and judging of the schools. Questions are asked and the student gives priorities to his choice. It is this priority factor which is added to a schools' total score. In some cases "mean" responses give points to a school's score. For example, a school on the west coast is given some points if the student chose the Pacific Northwest. Responses of "does not matter" do not add to a school's score. When asked for areas of study, the first response is considered a mandatory requirement, only schools that have that major available are listed in the output. Schools which happen to offer degrees in both areas are given bonus points in their score.

The program was continually modified as students pointed out other areas that should be included in the routine. This led to modification of the data listing without drastically changing the whole program. For that reason, the data has some packing of information in decimal representation. All information listed was derived from the eighth edition of *Barron's Profiles of American Colleges*. The copyright date of this guide was 1972, and prices for tuition and room and board have been adjusted to approximate current costs.

When listing schools, the computer will give first the colleges with the highest overall score. When two colleges have equal scores, it selects the one with the fewest majors. The idea behind this is that the school with the fewer majors will emphasize the programs that they do offer.

As an aid to debugging the program after you have entered it, input the following, and see if your output matches the sample run which accompanies this article:

Region 4
Priority 5
Type 1
Priority 3
Difficulty 2
Size students 3
Priority 2
Major Area 1
Priority 5
2nd Choice 3
Priority 4
Tuition Cost 2
Priority 5
Style 1
Housing 3
Priority 3

```
YOUR CHOICES INDICATE YOU SHOULD CONTACT THE FOLLOWING SCHOOLS

SCHOOL                          LOCATION              RATING POINTS
UNIV OF MICHIGAN                ANN ARBOR MICH              53.5
PURDUE UNIV                     LAFAYETTE IND               52.5
UNIV OF NOTRE DAME              SOUTH BEND INDIANA          50.5
ANTIOCH COLLEGE                 YELLOW SPRINGS OH           49.5
OHIO UNIV.                      ATHENS OHIO                 47.5
TRINITY COLLEGE                 HARTFORD CONN               47
DUKE UNIVERSITY                 DURHAM NC                   47

THIS LIST SHOWS ONLY THE  7  HIGHEST SCORING SCHOOLS FROM
AN INTERNAL LIST OF  90  SCHOOLS.
A RATING ABOVE 44 SHOWS A STRONG MATCH WITH YOUR PREFERENCES.
A RATING BELOW 33 MEANS NO CLEAR CHOICE EXISTS.
              DEPRESS ENTER TO RUN AGAIN? _
```

Sample Run - College Selection

MODIFICATION

If you wish to alter the data, or include schools that are not on the list, you must be sure to follow the format used by the program. The numbers for a school correspond to the numbers assigned in the questioning routine. All data is in the following order:

NAME, ADDRESS, LOCATION, TYPE, SIZE.HOUSING, MAJORS, TUITION, DIFFICULTY.STYLE

Note the use of decimals. for the representation of housing and style of the school.

```
>LIST
10 REM"COLLEGE SELECTION PROGRAM"CAM BROWN*(C)1979 80-US JOURNAL
*
20 CLS:PRINT"LOADING DATA - HOLD ON"          Please Note:
30 CLEAR 1500                                 0 = Zero
40 DEFINT A-J,N,X                             O = Ooh
50 N=90
60 'NAME,ADD-LOCATION,TYPE,SIZE.HOUSING,MAJORS,TUIT,
   SCORE,DIF.STYLE
70 DIM C$(N),A$(N),B(N),T(N),SI(N),MA$(N),TU(N),S(N),D(N)
80 FOR J=1 TO N
90  READ C$(J),A$(J),B(J),T(J),SI(J),MA$(J),TU(J),D(J:
100 NEXT J
110 CLS
120 PRINTTAB(10)"COLLEGE SELECTION ASSISTANCE"
130 PRINT:PRINT"THIS PROGRAM WILL HELP YOU DETERMINE POSSIBLE CO
LLEGES
140 PRINT"TO APPLY TO. THE COMPUTER WILL ASK QUESTIONS AND THEN
SEARCH"
150 PRINT"OUT THOSE WHICH BEST MATCH YOUR ANSWERS."
160 PRINT:PRINT"***  DO NOT ASSUME THAT THIS LIST IS COMPLETE **
**"

170 PRINT:PRINT"IT IS ONLY MEANT TO BE AN AID IN SEEKING FURTHER
 INFORMATION."
180 PRINT"THE LIST INCLUDES ONLY COED,AND NO SINGLE-RELIGION SC
OOLS.":PRINT
190 PRINT"BESIDES ASKING FOR YOUR CHOICE, YOU CAN GIVE A WEIGHT
TO"
200 PRINT"YOUR SELECTION. TYPE IN A PRIORITY=5 IF IT IS VERY IMP
ORTANT"
210 PRINT"AND ENTER PRIORITY=1 IF NOT TOO IMPORTANT TO YOU."
220 PRINT
230 PRINTTAB(24)"";:INPUT"DEPRESS ENTER TO GET STARTED";Q$:CLS
240 PRINT"GEOGRAPHICAL LOCATION":PRINT"ENTER THE NUMBER OF THE R
EGION WHERE YOU WISH TO GO TO SCHOOL"
250 PRINT:PRINT"1.PACIFIC NORTHWEST"
260 PRINT"2.WEST COAST"
270 PRINT"3.SOUTHWEST UNITED STATES"
280 PRINT"4.MIDWESTERN UNITED STATES"
290 PRINT"5.EASTERN UNITED STATES"
300 PRINT"6.SOUTHERN UNITED STATES"
310 PRINT"7.DOES NOT MATTER."
320 PRINT;INPUT"WHICH AREA ";A
330 IFA=7THENA=0:GOTO360
340 INPUT"PRIORITY FACTOR 1=LOW TO 5=HIGH";P1
350 IFP1<1ORP1>5THEN340
360 CLS:PRINT"COLLEGE TYPE"
370 PRINT"ENTER THE NUMBER OF THE TYPE OF SCHOOL YOU DESIRE"
380 PRINT:PRINT"1.PUBLIC /FOUR-YEAR COLLEGE"
390 PRINT"2.PRIVATE /FOUR-YEAR COLLEGE"
400 PRINT"3.TRADE OR VOCATIONAL INSTITUTE"
410 PRINT"4.DOES NOT MATTER"
420 PRINT:INPUT"WHICH TYPE OF SCHOOL";B
430 IFB=4THENB=0:GOTO460
440 INPUT"PRIORITY FACTOR 1=LOW TO 5=HIGH";P2
450 IFP2<1ORP2>5THEN440
460 CLS:PRINT"DIFFICULTY OF THE SCHOOL"
470 PRINT:PRINT"1.MOST COMPETITIVE":PRINT"2.VERY COMPETITIVE":PR
INT"3.COMPETITIVE":PRINT"4.LESS COMPETITIVE"
480 PRINT:INPUT"WHAT LEVEL OF DIFFICULTY";P9

1000 IF H=4THENH=0:P7=0:GOTO1020
1010 INPUT"PRIORITY FACTOR 1=LOW TO 5=HIGH";P7
1020 CLS:PRINT@320,"AM THINKING ... PLEASE WAIT"
1030 FOR J=1TON:S(J)=0:NEXTJ
1040 'SCORING
1050 FOR I=1 TO N
1060 IFB(I)=2ANDA=1THEN S(I)=S(I)+P1-1
1070  IF B(I)=ATHENS(I)=S(I)+1.5*P1
1080  IF T(I)=B THENS(I)=S(I)+1.2*P2
1090  R=INT(SI(I))
1100  IF ABS(R-C)<2 THENS(I)=S(I)+P3-ABS(R-C)
1110 M1=0:M2=0
1120  FOR X=1 TO LEN(MA$(I))
1130   IF D=VAL(MID$(MA$(I ,X,1)) THENS(I)=S(I)+2*P4:?=99:M1=1
1140   IF E=VAL(MID$(MA$(I),X,1)) THENS(I)=S(I)+P5:M =
1150  IF M1=1ANDM2=1THENS I)=S(I)+3
1160  NEXT X
1170  IF TU(I)=FTHENS(I)=S(I)+P6
1180  IF TU(I)=5ANDF=4THENS(I)=S(I)+P6
1190 Q=INT(D(I)):R=ABS(Q-P9
1200 IFR<2THENS(I)=S I)+3-R
1210 IF G=(D(I)-INT(D(I)))*10THENS(I)=S(I)+3
1220 'HOUSING
1230 IF H=0THEN1270
1240 R=1000*(SI(I)-INT(SI(I))):H1=INT(R/100):H2=INT((R-100*H1)/1
0)
1250 H3=R-100*H1-10*H2
1260 IF H=H1 OR H=H2 OR H=H3THENS(I)=S(I)+P7
1270 NEXT I
1280 CLS:PRINT"YOUR CHOICES INDICATE YOU SHOULD CONTACT THE FOLL
OWING SCHOOLS"
1290 PRINT:PRINT"SCHOOL";TAB(30)"LOCATION";TAB(50)"RATING POINTS
"
1300 O=0
1310 FOR X=1 TO 7.
1320  GOSUB 1440
1330 IF S(M)=0THEN1370
1340 PRINT C$(M);TAB(30)A$(M);TAB(55)S(M)
1350 O=O+1
1360 S(M)=0
1370 NEXT X
1380 PRINT:PRINT"THIS LIST SHOWS ONLY THE ";O;" HIGHEST SCORING
SCHOOLS FROM"
1390 PRINT"AN INTERNAL LIST OF ";N;" SCHOOLS."
1400 PRINT"A RATING ABOVE 44 SHOWS A STRONG MATCH WITH YOUR PREF
ERENCES."
1410 PRINT"A RATING BELOW 33 MEANS NO CLEAR CHOICE EXISTS."
1420 PRINTTAB(15)"";:INPUT"DEPRESS ENTER TO RUN AGAIN";Q$:GOTO11
0
1430 END
1440 'SEARCH FOR HIGHEST SCORE
1450 W=0
1460 FOR I=1 TO N
1470 IF S(I)>W AND Z=99THENW=S(I):M=I
1480 IF S(I)=W AND Z=99 AND LEN(MA$(I))<LEN(MA$(M))THENM=I
1490 NEXT I
1500 RETURN
1510 'DATA  NAME,ADD,LOC,TYPE,SIZE.HOUSING,MAJ,TUIT,DIFF.STY
1520 DATA UNIV OF WASH,SEATTLE WA,1,1,1.123,123456780,4,3.1
1530 DATA WASH STATE UNIV,PULLMAN WA,1,1,1.123,123456780,4,4.1
```

```
490 CLS:PRINT"SIZE OF STUDENT BODY"
500 PRINT"ENTER THE NUMBER OF THE SIZE THAT BEST APPEALS TO YOU"
510 PRINT:PRINT"1.OVER 10,000 STUDENTS"
520 PRINT"2.5000-10,000 STUDENTS"
530 PRINT"3.2500-5000 STUDENTS"
540 PRINT"4.1000-2500 STUDENTS"
550 PRINT"5.UNDER 1000 STUDENTS"
560 PRINT"6.DOES NOT MATTER"
570 PRINT:INPUT"WHICH CATEGORY DO YOU PREFER";C
580 IFC=6THENC=0:P3=0:GOTO610
590 INPUT"PRIORITY FACTOR 1=LOW TO 5=HIGH";P3
600 IFP3<1ORP3>5THEN590
610 CLS:PRINT"MAJOR AREAS OF STUDY"
620 PRINT"SELECT FROM THE LIST BELOW THE NUMBER OF THE MAJOR YOU
 WISH."
630 PRINT"YOU WILL HAVE TWO CHOICES FROM THIS LIST."
640 PRINT:PRINT"1.ENGINEERING"
650 PRINT"2.ARTS AND MUSIC"
660 PRINT"3.PHYSICAL SCIENCES (CHEMISTRY,PHYSICS,MATH ETC)"
670 PRINT"4.BIOLOGICAL SCIENCES/PRE-MEDICAL"
680 PRINT"5.FOREIGN LANGUAGES"
690 PRINT"6.BUSINESS ADMINISTRATION"
700 PRINT"7.ENGLISH/LITERATURE"
710 PRINT"8.SOCIAL SCIENCES (PSYCHOLOGY,SOCIOLOGY,ECON.,HISTORY,
ETC.)
720 PRINT"9.PHILOSOPHY/THEOLOGY"
730 PRINT"10.PHYSICAL EDUCATION"
740 INPUT"NUMBER OF 1ST CHOICE";D
750 INPUT"PRIORITY FACTOR 1=LOW TO 5=HIGH";P4
760 INPUT"SECOND CHOICE";E
770 INPUT"PRIORITY FACTOR FOR 2ND CHOICE 1=LOW TO 5=HIGH";P5
780 IFD=10THEND=0
790 IFE=10THENE=0
800 CLS:PRINT"TUITION COSTS"
810 PRINT"SELECT THE NUMBER THAT BEST APPROXIMATES THE TOTAL COS
T PER"
820 PRINT"YEAR THAT YOU ARE WILLING TO PAY (TUITION + ROOM/BOARD
)
830 PRINT:PRINT"1.OVER $7000
840 PRINT"2.$5000-$7000":PRINT"3.$2500-$5000":PRINT"4.UNDER $250
0"
850 PRINT"5.DOES NOT MATTER"
860 PRINT:INPUT"YOUR CHOICE IS";F
870 IF F=5THENF=0:GOTO890
880 INPUT"PRIORITY FACTOR 1=LOW TO 5=HIGH";P6
890 CLS:PRINT"WHAT STYLE OF SCHOOL DO YOU PREFER"
900 PRINT:PRINT"1.TRADITIONAL DEPARTMENTAL FORMAT"
910 PRINT"2.INTER-DEPARTMENTAL APPROACH OR BROAD BASED PROGRAM":
PRINT"3.SELF-DESIGNED CURRICULA"
920 PRINT"4.MUCH INDEPENDENT AND OFF-CAMPUS LEARNING"
930 PRINT:INPUT"WHICH NUMBER BEST FITS YOUR STYLE OF LEARNING";G
940 IFG<1ORG>4THEN930
950 CLS:PRINT"TYPE OF HOUSING:":PRINT
960 PRINT"1.DORMITORY OR RESIDENCE HALLS"
970 PRINT"2.FRATERNITIES/SORORITIES"
980 PRINT"3.APARTMENTS/OFF-CAMPUS HOUSING":PRINT"4.DOES NOT MATT
ER"
990 PRINT:INPUT"WHICH NUMBER DO YOU PREFER";H
```



```
1540 DATA WESTERN WA ST. UNIV,BELLINGHAM WA,1,1,2.13,1234567890,
4,3.1
1550 DATA WHITMAN COLLEGE,WALLA WALLA WA,1,2,4.12,23456789,3,2.3
1560 DATA UNIV OF PUGET SOUND,TACOMA WA,1,2,3.123,23456780,3,3.1
1570 DATA SEATTLE UNIV.,SEATTLE WA,1,2,4.13,1234567890,3,3.1
1580 DATA MASS INSTITUTE OF TECH,CAMBRIDGE MASS,5,2,3.12,1345678
9,2,1.1
1590 DATA YALE UNIVERSITY,NEW HAVEN CONN,5,2,3.1,123456789,2,1.2
1600 DATA TRINITY COLLEGE,HARTFORD CONN,5,2,4.12,1234567890,2,2.
4
1610 DATA LOYOLA UNIV,CHICAGO ILL,4,2,2.13,23456789,4,3.1
1620 DATA NORTHWESTERN UNIV,EVANSTON ILL,4,2,2.123,123456789,3,2
.1
1630 DATA DARTMOUTH COLLEGE,HANOVER NH,5,2,3.12,1234562,2,1.3
1640 DATA COLUMBIA UNIV,NEW YORK NY,5,2,3.123,123456789,4,1.2
1650 DATA GUILFORD COLLEGE,GREENSBORO NC,6,2,5.1,23456789,4,2.1
1660 DATA REED COLLEGE,PORTLAND OR,2,2,4.13,345789,4,1.2
1670 DATA UNIV OF CAL,BERKELEY CA,2,1,1.123,1234567890,4,2.2
1680 DATA STANFORD UNIV,STANFORD CA,2,2,2.1,134568,1,2.2
1690 DATA UNIV OF NOTRE DAME,SOUTH BEND INDIANA,4,2,2.1,12345678
9,2,1.1
1700 DATA JOHNS HOPKINS UNIV,BALTIMORE MD,5,2,3.13,12348,3,1.1
1710 DATA RICE UNIV,HOUSTON TX,3,2,4.1,13456789,3,1.1
1720 DATA UNIV OF DALLAS,IRVING TX,3,2,5.1,23456789,4,3.1
1730 DATA PACIFIC LUTHERAN UNIV,TACOMA WA,1,2,4.13,234567890,3,3
.1
1740 DATA GONZAGA UNIV,SPOKANE WA,1,2,4.13,123456789,3,3.1
1750 DATA EVERGREEN STATE UNIV,OLYMPIA WA,1,1,4.13,23456789,4,3.
3
1760 DATA ARIZONA ST. UNIV,TEMPE AZ,3,1,1.13,1234567890,4,3.1
1770 DATA SOUTHERN OREGON COLLEGE,ASHLAND OR,2,1,3.1,256780,4,4.
1
1780 DATA UNIV OF OREGON,EUGENE OR,2,1,1.123,1234567890,4,3.1
1790 DATA CARNEGIE-MELLON UNIV,PITTSBURG PA,5,2,3.123,12345678,3
,2.2
1800 DATA S.DAKOTA SCHOOL OF MINES,RAPID CITY SD,4,1,4,1346,4,2.
1
1810 DATA CARROLL COLLEGE,WAUKESHA WI,4,2,4.12,23456789,3,2.3
1820 DATA HARVARD-RADCLIFF,CAMBRIDGE MASS,5,2,3.1,123456789,1,1.
2
1830 DATA GENERAL MOTORS INSTITUTE,FLINT MICH.,4,2,3.123,16,4,2.
1
1840 DATA MICHIGAN STATE UNIV,EAST LANSING MICH,4,1,1.1,12345678
9,3,2.1
1850 DATA BOWDOIN COLLEGE,BRUNSWICK MAINE,5,2,5.12,2345789,3,1.2
1860 DATA LOYOLA COLLEGE,BALTIMORE MD,5,2,4.123,23456789,3,3.1
1870 DATA CARLETON COLLEGE,NORTHFIELD MINN,4,2,4.1,234589,2,2.2
1880 DATA CREIGHTON UNIV,OMAHA NEBRASKA,4,2,3.123,23456780,3,2.1
1890 DATA TULANE UNIV,NEW ORLEANS LA,6,2,3.123,1234567890,3,1.2
1900 DATA EMORY UNIVERSITY,ATLANTA GA,6,2,3.123,23456789,3,2.1
1910 DATA UNIV OF CALIF,LOS ANGELES CA,2,1,1.123,1234567890,3,2.
1
1920 DATA WESLEYAN UNIV,MIDDLETOWN CONN,5,2,4.123,23456789,2,1.3
```

```
1930 DATA SEATTLE PACIFIC UNIV,SEATTLE WA,1,2,4.13,234567890,3,3
.1
1940 DATA EASTERN WASH STATE,CHENEY WA,1,1,3.123,2345678,3,4.1
1950 DATA OHIO UNIV.,ATHENS OHIO,4,1,1.1,1234567890,3,3.1
1960 DATA OBERLIN COLLEGE,OBERLIN OHIO,4,2,4.1,234567890,2,2.3
1970 DATA DUKE UNIVERSITY,DURHAM NC,6,2,2.12,1234567890,2,2.2
1980 DATA SYRACUSE UNIV,SYRACUSE NY,5,2,2.123,123456789,3,2.1
1990 DATA ST. JOHN'S COLLEGE,SANTA FE NM,3,2,5.1,25789,3,2.3
2000 DATA N.M. INST OF MINING/TECH,SOCORRO NM,3,1,5.13,1345,4,2.
1
2010 DATA LINFIELD COLLEGE,MCMINNVILLE OR,2,2,5.13,23456789,3,3.
2

2020 DATA BOSTON UNIV,BOSTON MASS,5,2,1.123,13456789,3,2.1
2030 DATA OREGON STATE UNIV,CORVALLIS OR,2,1,1.123,234567890,4,4
.1
2040 DATA PRINCETON UNIV,PRINCETON NJ,5,2,3.1,123456789,2,1.2
2050 DATA CLAREMONT COLLEGE (5 SCHOOLS),CLAREMONT CA,2,2,5.1,234
56789,3,1.2
2060 DATA COLORADO SCHOOL OF MINES,GOLDEN CO,4,1,4.123,136,4,2.1

2070 DATA BRANDEIS UNIV,WALTHAM MASS,5,2,4.13,23456789,3,1.1
2080 DATA NEW ENG. CONSV. OF MUSIC,BOSTON MASS,5,2,5.123,2,3,1.2

2090 DATAUNIV OF DENVER,DENVER CO,2,2,2.12,1234567890,2,3.1
2100 DATASHIMER COLLEGE,MT CARROLL ILL,4,2,5.13,25789,2,2.4
2110 DATAUNIV OF CHICAGO,CHICAGO ILL,4,1,3.123,1348,2,2.2
2120 DATABROWN UNIV,PROVIDENCE R.I.,5,2,3.1,123456789,2,1.3
2130 DATACORNELL UNIV,ITHACA NY,5,2,1.12,12345678,2,1.1
2140 DATA MILITARY ACADEMIES,VARIOUS STATES,0,1,3.1,134560,5,2.1

2150 DATACOLGATE UNIV,HAMILTON NY,5,2,4.12,235789,2,1.4
2160 DATA MONTANA ST. UNIV,BOZEMAN MONT,2,1,2.123,123456780,4,4.
1
2170 DATA UNIV OF CALIF,SAN DIEGO CA,2,1,3.13,235789,3,2.2
2180 DATA WILLAMETTE UNIV,SALEM OR,2,2,4.123,1234589,2,3.1
2190 DATA VANDERBILT UNIV,NASHVILLE TENN,6,2,2.123,13456789,1,2.
1
2200 DATA FORDHAM UNIV,NEW YORK NY,5,2,2.13,2356789,2,2.2
2210 DATAUNIV OF SANTA CLARA,SANTA CLARA CA,2,2,3.13,12356789,3,
2.2
2220 DATA UNIV OF MICHIGAN,ANN ARBOR MICH,4,1,1.123,123456780,2,
2.1
2230 DATA PURDUE UNIV,LAFAYETTE IND,4,1,1.123,123456780,2,3.1
2240 DATA UNIV OF CHICAGO,CHICAGO ILL,4,2,3.123,12345678,1,2.2
2250 DATA PENN STATE UNIV,UNIVERSITY PARK PA,5,1,1.123,12345678,
2,2.1
2260 DATA MICH STATE UNIV,EAST LANSING MICH,4,1,1.123,12345678,3
,3.1
2270 DATA ADELPHI UNIV,GARDEN CITY NY,5,2,3.123,2345678,2,3.1
2280 DATA TEXAS A&M UNIV,COLLEGE STATION TX,6,1,1.13,12345678,2,
3.1
2290 DATA FISK UNIV,NASHVILLE TENN,6,2,4.123,234567890,3,4.1
2300 DATA VALDOSTA STATE COLLEGE,VALDOSTA GA,6,1,3,23456780,3.12
3,4.1
2310 DATA PRESCOTT COLLEGE,PRESCOTT AZ,3,2,5.1,345678,3,2.2
2320 DATA GRAMBLING COLLEGE,GRAMBLING LA,6,1,3.123,3456780,3,4.1

2330 DATA TOWSON STATE COLLEGE,BALTIMORE MD,5,1,2.13,34578,3,4.1

2340 DATA AMERICAN UNIV.,WASH. D.C.,5,2,2.123,2345678,2,3.1
2350 DATA ANTIOCH COLLEGE,YELLOW SPRINGS OH,4,2,4.13,123456789,1
,2.4
2360 DATA TUSKEGEE INST.,TUSKEGEE INST. ALA,6,1,3.13,123456780,3
,4.1
2370 DATA YORK COLLEGE OF PENN.,YORK PA,5,2,4.123,2345678,2,4.1
2380 DATA OCCIDENTAL COLLEGE,LOS ANGELES CA,2,2,4.123,23456789,1,2.1
2390 DATA MAYVILLE ST. COLLEGE,MAYVILLE ND,4,1,5.12,23456780,3,4.1
2400 DATA DENISON UNIV,GRANVILLE OH,4,2,4.13,23456789,1,2.1
2410 DATA BUCKNELL UNIV,LEWISBURG PA,5,2,3.123,123456789,1,2.1
```

Anatomy of the Program (College Selection)

R C Bahn

SUMMARY

This program contains a data base of ninety entries (names), each possessing a descriptor (address), and eight coded attributes.

The program first asks the user to express a choice and a preference priority for each attribute. The program then compares the user's choices and priorities to the list of entries and picks the seven closest matches.

The program illustrates storage of data as simple integer variables, as string variables and as decimal variables. The appropriate decoding processes are subsequently demonstrated.

LINE BY LINE COMMENTARY

10 Tape documentation.

20 User message.

30 Reserve memory for string variables.

40 Define integer variables to conserve memory.

50 Define length of data list.

60 Document categories of data.

70 Dimension arrays.

80-100 Read data.

110-230 Directions

240-350 Print menu for selection of first attribute (A) and its priority (P1).

360-450 Print menu for selection of second attribute (B) and its priority (P2).

460-480 Print menu for selection of third attribute (P9).

490-600 Print menu for selection of fourth attribute (C) and its priority (P3).

610-790 Print menu for selection of first and second choices of fifth attributes (D,E) and respective priorities (P4,P5).

800-880 Print menu for selection of sixth attribute (F) and its priority (P6).

890-940 Print menu for selection of seventh attribute (G).

950-1010 Print menu for selection of eighth attribute (H) and its priority (P7).

1020-1270 Compute a score S(J) for each entry in the data list.

1030 S(J) is the storage location of scores and is initialized at zero.

1040 Documentation.

1050 Set up loop to process each entry in data list (N=90). This loop extends to line 1270.

1060-1070 Scoring for attribute A. Scoring for attribute B. Note permissive use in BASIC II of unsubscripted B and subscripted B(I) variable names in lines 1070, 1080.

1090-1100 The data related to the user's response stored as C is contained in the integer portion of SI(I). This is recovered as R, in line 1090. Scoring rule occurs in line 1100.

1110 Initialization of flags for matching of attribute D and E.

1120-1160 The data (related to the user responses stored as D and E) is stored as a string variable MA$(I) of unknown length. Find length in line 1120. The string must be "unpacked", 1 alphanumeric character at a time, and tested against D and E. If there is a match, the score is incremented and flags M1 and/or M2 are set to 1. In line 1150, if both flags are set, additional scoring occurs. Z is used in sort routine in lines 1470, 1480.

1170-1180 Scoring for attribute F.

1190-1200 Scoring of user response stored as P9. The related data resides in integer portion of D(I). The latter is recovered and stored as Q in line 1190.

1210 Scoring for attribute G.

1220-1260 Scoring for attribute H.

1240 The related data resides in decimal portion of SI(I). The latter is recovered and first stored as three digit variable R. Next, the individual digits of R are recovered as H1, H2, H3.

1280-1430 Video output routine.

1280 Video page title.

1290 Column headers using TAB statements.

1310 Search list of scores (S(N)) and pick the seven highest values. The search routine starts at line 1440.

1350 Note alpha character "O" used as counter in lines 1300, 1350, and 1380 should not be confused with symbol for zero.

1400-1410 Interpretation of scores.

1420 Use of input statement and string variable Q$ does not need keyboard entry. Q$ is a dummy variable and is followed by the unconditional branch, GOTO 110.

1440-1500 Search routine.

1450 W will be value of current greatest score. Initialize at 0. M is address in list of 90 entries of the greatest score. M might be initialized to 1 in this line.

1460 Set up loop to search data list.

1470 Select greatest current score and store address in M and value in W.

1480 Rule for sequencing tied scores.

1490 End of loop.

1500 Return to program. Note that after information recovered in this subroutine is used in lines 1330 and 1340, the score S(M) in line 1360 is reset to zero. The list of scores S(M) is now ready to be searched for next highest score.

1510-2410 Data; study formats and significance of string variables and decimal variables.

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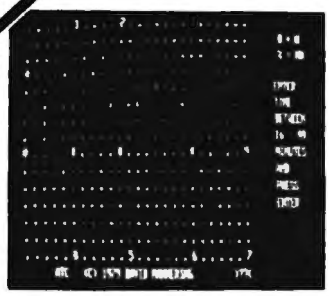
More Games, Challenging Problems And Programs ThanYou Can Shake A Joystick At!

TRS-80 LEVEL II

Air Traffic Controller, CS-3006 (16K) $7.95



This real time machine language program puts you in the chair of an air traffic controller. There are 27 airplanes—jets and prop planes—which must be controlled as they land, take off and fly over your air space. You give the orders to change altitude, turn, maintain a holding pattern, clear for approach, and land at your two airports. This realistic simulation includes navigational beacons, and requires planes to take off and land into the wind. Air Traffic Controller was written by an air traffic controller and is a favorite of the Creative Computing staff!

Strategy Games, CS-3005 (16K) $7.95

1. Tunnel Vision

Tunnel Vision gives an exciting visual twist to the popular maze game. You are transported into a massive labyrinth and must find the exit or be lost forever. A mouse's eye view is displayed as you wander through the maze, seeing walls, turn-offs, and dead ends as they are encountered. This is an excellent example of three dimensional perspective using TRS-80 graphics.

2. Evasion

In this real time game, you are pursued around the game board by an evil-looking snake. The arrow keys control your small drone as it tries to avoid being bitten for as long as possible. (Evil-looking snakes always catch their drones.) Variations of play include two different speeds and hyper-jumps which randomly relocate you on the board. Looking for an escape? Try Evasion.

3. Jigsaw

Jigsaw is a computer-age puzzle game making extensive use of TRS-80 graphics. The computer generates a random puzzle and puzzle board. Using a combination of deductive reasoning and luck you must fit the graphically represented puzzle piece into place. Jigsaw has four different options featuring concealed pieces and helpful clues.

4. The Masters

Are you a wandering pro or just a Sunday golfer who would like to keep in practice? Each hole is graphically depicted from tee to green. You choose a club for your next stroke—wood, iron, or sand wedge. Once you're on the green, a worm's-eye view is displayed for putting.

5. Motor Racing

Motor Racing combines real time racing action with advanced graphics functions. You racing car may be driven on two skill levels. The first allows only for directional control on a simple track, while the second skill level offers a choice of professional tracks, the Indianapolis Speed Way or a road race course. The graphics and animation make Motor Racing fun to watch as well as play.

Board Games-1, CS-3001 (16K) $7.95

1. Mugwump

Mugwump is a board games which uses a 10x10 grid on which four friendly Mugwumps are hiding. Your mission is to locate these mysterious animals and capture them. You input X and Y coordinates for each move and after each round the distances from each mugwump are displayed. What is a mugwump? No one really seems to know, but if you find one, maybe you'll let us in on the secret.

2. Flip Disc

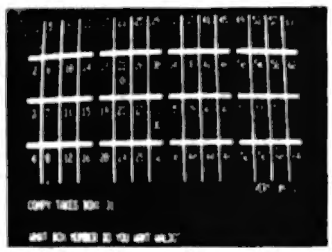
Are you an Othello freak? Do you wish there were someone who would provide you with a challenging game at a moment's notice? Flip Disc is a program which will turn your computer into an excellent opponent. Flip Disc provides the game board, chips, and handles all playing functions. Three different skill levels, (good, expert, and genius), provide an introduction for the novice and continuing interest for the experienced player.

3. Wumpus

Chances are if you ever leave your keyboard you have heard of the mythological Wumpus. In the game of Wumpus 1, you are scouring a network of underground caves in search of the prized Wumpus. The dreaded super bats and bottomless pits make Wumpus hunting a risky affair. On each turn, as you wind your way through the caves, you have a choice of moving or shooting through the cave. Bagging a Wumpus wins the game, but if you accidentally stumble into his cave, the Wumpus will enjoy a tasty dinner of sauteed computer freak.

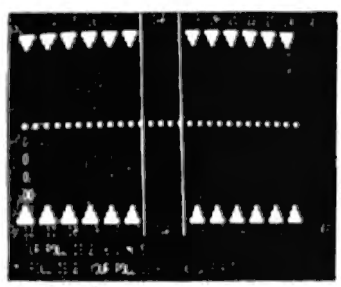
4. Wumpus 2

If you master the dodecahedron cave network in Wumpus 1, you may proceed to Wumpus 2 which allows you to choose from five different caves, or you can design your own. Super bats and the infamous bottomless pits are also included in Wumpus 2, so be prepared to jump into the frying pan!



5. Qubic

Qubic is a three dimensional Tic Tac Toe game. The game is played in a 3 dimensional cube (4x4x4). The object is to outwit the computer and place four pieces in any straight line. Be warned, the computer plays a very tough game and makes no concessions for your ability, or lack of it.



6. Backgammon

This is the TRS-80 adaptation of the popular board game. Backgammon uses graphics and all the standard backgammon rules, not a strange computer variation. The computer is your opponent in this version, written by Scott Adams of "Adventure" fame.

TRS-80 SOFTWARE ON DISKS, (32K)

Creative Computing Floppy disks are not just cassette programs stored on a disk, but enhanced menu-driven libraries for the ultimate in ease of use. All only $24.95 each.

CS-3507 Mission Impossible Adventure and Voodoo Castle
CS-3504 Text Processing/ Checking Account
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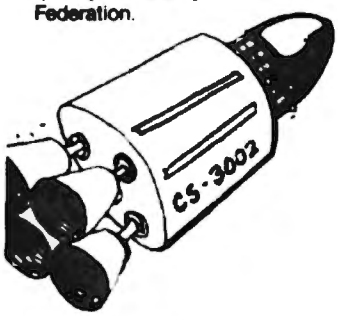
CS-3501 Ecology Simulations-1
CS-3502 Ecology Simulations-2
CS-3508 Social & Economic Simulations
CS-3505 Advanced Statistics
CS-3506 Adventure and Pirate Adventure

Space Games-3, CS-3002 (16K) $7.95

1. Ultra-Trek

Ultra-Trek is a fast-paced version of Star Trek, complete with "real time" action graphics, lasers, Nilon space mines, high energy photon torpedoes, enemy ships that move, and an experimental ray which does something different each time you use it. At the beginning of your mission, you are told the number of Klingon base ships and battle cruisers you must defeat. Klingons have sharp eyes and quick torpedo launchers. They don't wait for you to type in your moves, so you must act quickly to save yourself and the Federation.



2. Romulan

Your mission is to destroy an invading Romulan space craft, but you'll have to find it first. The Romulans have a new cloaking device. By activating your sensors, the Romulan's position will be shown briefly, but the sensors use a lot of energy. Maneuver through space and around stars looking for the deadly enemy, but be careful! The nasty Romulans fire back.

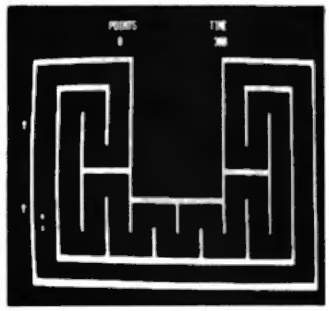
3. Star Wars

If you hate Darth Vader, you'll love Star Wars. Take an X-Wing fighter into combat and save the Rebels' base camp. Using the keyboard to control the ship, you must line up the TIE fighters into your sights and zap them with your lasers. This real time game is fun for aliens of all ages. May the Force be with you!

4. Star Lanes

Imagine yourself the president of an intergalactic shipping company. In Star Lanes you control sections of the galaxy and, on each turn, are given chances to buy stock in developing businesses. You are free to roam about the galaxy and engage in bartering, business ventures, stock splits, and company takeovers. If you're successful, you may be named Imperial Advisor on Economic Affairs. Entrepreneurs: to your ships.

Pursuit Games, CS-3004 (16K) $7.95



1. Stock Car Race

Stock Car Race is a real time racing game on a road race circuit. Your high speed racer is controlled by the "arrow" keys, as you shift up and down through four gears. Take the turns slowly, "floor it" on the straights, but don't blow your engine!

2. Maze

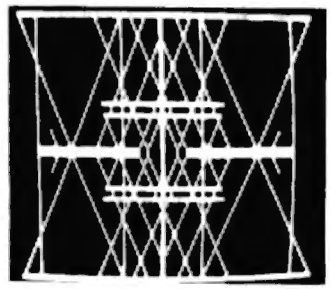
Maze for the Level II 16K machine is a high speed pursuit game. You are timed throughout your run and rated on the basis of elapsed time and the number of moves required to escape. A different maze every time. Nine skill levels.

3. Indy Racer

Indy Racer is a real time racing game for the TRS-80. You're in the driver's seat of a red-hot Indy car, changing gears and weaving around the track as you pass your competitors. Indy Racer is similar to the popular arcade-style driving games.

4. Depth Charge

As commander of a destroyer, your mission is to destroy as many enemy subs as possible. Move your ship back and forth on the water, positioning yourself over enemy subs as they cruise into range. Depth charges sink slowly, so timing and position are important in this re-creation of the Battle of the Atlantic.

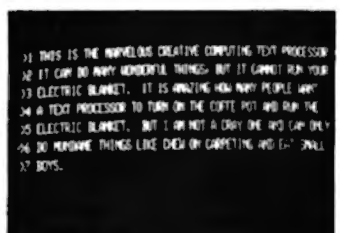


5. Kaleidoscope

This graphics demonstration program turns your TRS-80 into a computer age kaleidoscope. You enter the number of lines and size of the display to produce changing patterns on the video monitor. Truly hypnotizing, Kaleidoscope runs continuously to brighten up your home or office.

Text Processing, CS-3302 (16K) $24.95

This program turns a 16K, TRS-80 and lineprinter into a line oriented text-processing system.



Developed exclusively for the TRS-80, this program lets you use the computer to enter general text or business letters, edit and modify your work, save text on cassette tapes, and print out a perfect report, document, or letter every time.

Editing commands are similar to those used in Level II BASIC, so there are no complicated new commands to learn. Lines may be either inserted or deleted. A special format is available to speed entry of business letters. Final printout can be done in numbered pages and you may print multiple copies.

A NEW TYPE OF GAME

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Adventureland CS-3007 You wander through an enchanted world trying to recover the 13 lost treasures. You'll encounter wild animals, magical beings, and many other perils and puzzles. Can you rescue the blue ox from the quicksand? Or to find your way out of the maze of pits? Happy Adventuring...

Pirate Adventure CS-3008 "Yo Ho Ho and a bottle of rum" You'll meet up with the pirate and his daffy bird along with many strange sights as you attempt to go from your lonely flat to Treasure Island. Happy sailing matey...

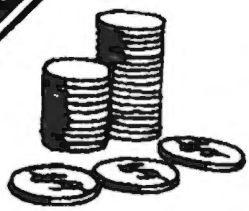
Mission Impossible Adventure Good Morning, your mission is to save the world's first automated nuclear reactor... plenty of suspense. Good luck...

Voodoo Castle CS-3010 Will you be able to rescue Count Cristo from the fiendish curse, or is he forever doomed? Beware the Voodoo Man...

The Count CS-3011 You wake up in a large brass bed in a Transylvanian castle. Who are you, what are you doing here, and why did the postman deliver a bottle of blood. You'll love this Adventure, in fact, you might say it's love at first byte.

-All for only $14.95 each.

TRS-80 LEVEL II



Investment Analysis, CS-3305 (4K)

This program was originally developed for personal use by an investment specialist. Creative Computing Software now makes this package available for you to analyze your investments and investment decisions. Programs in this package include regression analysis, stock market simulations, market/stock values, risk analysis, time related investments, and tax analysis.

$49.95

Checking Account, CS-3304 (16K)

This program does not replace the standard method of checkbook balancing. Instead it acts as an aid in keeping track

of individual and monthly expenses. You enter the amounts and payees of individual checks, and save the information on cassette tape. The program then allows you to analyze your checks by payee or date of payment. Keep track of where your money is going and how effective your budget is.

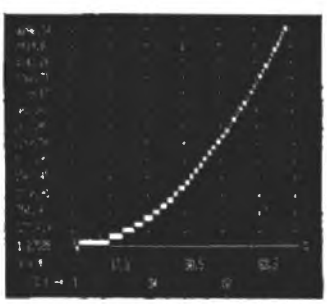
$7.95

Graphic Package, CS-3301 (16K) $7.95

This package provides a variety of interesting and useful graphing routines. Graphing Package combines text and TRS-80 graphics to plot a variety of functions and other graphs.

1. Bar Graph

Bar Graph plots graphs for up to six different categories. An optional display does conversion to a line graph.

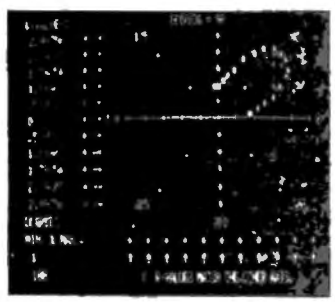


2. Cartesian Coordinate Graphing

This program plots a standard X, Y graph from a user entered function. A special feature of this program automatically scales of the Y-axis.

3. Polar Coordinate Graphing

Rarely found in computer graphing packages, this polar



graphing program provides plots of polar functions. The program labels all axes, features automatic scaling, and lets you input the range and increment of the plot. A unique and valuable program.

4. Parametric Graphing

Parametric functions are functions in which both x and y are expressed in terms of an independent variable t. The resulting graph is X vs. Y. This program allows the user to input two parametric functions and produces a graph.

5. Linear and Parabolic Regression

These two programs are used for data analysis which can later be entered into the graphing routines. Regression routines analyze how well a series of points fit on a linear or quadratic function.

Tape Manager and Advanced Statistics, CS-3303 (16K) $24.95

This package may be the ultimate in statistical applications for the 16K TRS-80. Attractively packaged in a vinyl binder with a large instruction booklet, Advanced Statistics will provide you with the ability to perform statistical tests never before available on small computers. Its cassette based data file system allows you to store, retrieve, and transform data files for use in several different tests.

1. Tape Manager

Tape Manager, the heart of the statistical file management, allows you to create, edit, and transform data files. Unique to this program are features that allow the user to perform transformations on variables, extract and create subfiles, and selectively copy records. Up to twenty variables and an unlimited number of cases can be processed.

2. Descriptive Statistics

Descriptive Statistics computes the mean, standard deviation, standard error of estimate, variance, skewness, kurtosis, range, median, and quartiles for a variable and constructs a histogram for each value. A test scoring option for conversion of raw scores into percentiles is included.

3. Two Variable Statistics

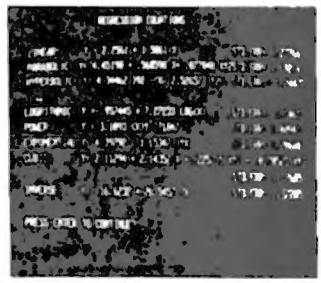
This program calculates descriptive statistics for each variable. It performs a t-test for the difference of means, computing the product-moment correlation coefficient and its associated significance level. In addition, it performs linear regression and computes standard error of estimate for Y.

4. Crosstabulation

This program constructs contingency tables for displaying frequencies, column percentages and table-wide percentages for each cell. It computes the Chi-square, the level of significance and gamma statistics. Tables as large as 10x10 may be evaluated.

5. Regression-Trend Analysis

This program computes least-squares regression coefficients from time-series or paired data for best-fit equations (linear, parabolic, hyperbolic, logarithmic, power, exponential and cubic types). Calculates standard error of estimate for each equation and more.



6. Multiple Linear Regression

Performs multiple linear regression using up to ten independent variables. The program computes both unstandardized and normalized coefficients, covariance, multiple correlation coefficient, and the standard error of estimate.

7. Correlation Analysis

Computes product-moment correlation matrices, multiple correlation coefficients and partial correlation coefficients with their associated significance levels.

8. Analysis of Variance

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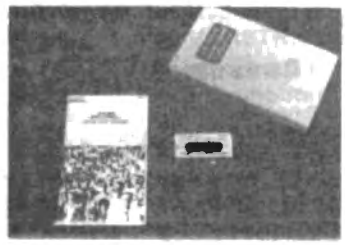
The Ecology Simulations series are a unique educational tool. They are based on "simulation models" developed by the Huntington Two Computer Project at the State University of New York at Stony Brook under the direction of Dr. Ludwig Braun. The programs and accompanying documentation are written for self-teaching or classroom use and include background material, sample exercises and study guides. Graphic displays were specially developed by Jo Ann Comito at SUNY and Ann



Corrigan at Creative Computing The Ecology Simulations packages are a remarkable educational application of micro-computers

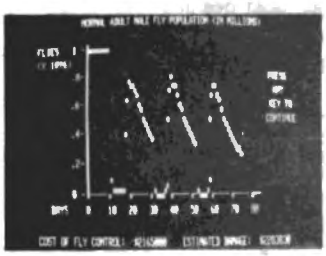
Ecology Simulations-1, CS-3201 (16K)

1. Pop

The POP series of models examines three different methods of population projection, including exponential, S-shaped or logistical, and logistical with low density effects. At the same time the programs introduce the concept of successive refinement of a model, since each POP model adds more details than the previous one.

2. Steri

STERL allows you to investigate the effectiveness of two different methods of pest control—the use of pesticides and the release of sterile males into the fly population. The concept of a more environmentally sound approach versus traditional chemical



methods is introduced. In addition, STERL demonstrates the effectiveness of an integrated approach over either alternative by itself

3. Tag

TAG simulates the tagging and recovery method that is used by scientists to estimate animal populations. You attempt to estimate the bass population in a warm-water, bass-bluegill farm pond. Tagged fish are released in the pond and samples are recovered at timed intervals. By presenting a detailed simulation of real sampling by "tagging and recovery," TAG helps you to understand this process

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IQ tests have been the subject of a great deal of controversy in the past few years. Yet, few of us know our IQ score. Now you can find out with our IQ test.

Taking advantage of the TRS-80's graphic capabilities, this test consists of 60 multiple choice questions. A special machine language routine does the scoring of the test and makes cheating almost impossible.

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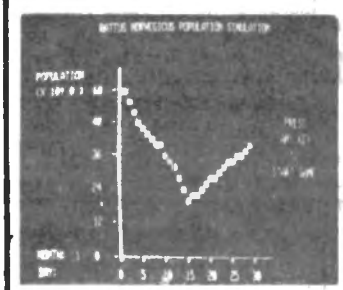
Ecology Simulations-2, CS-3202 (16K)

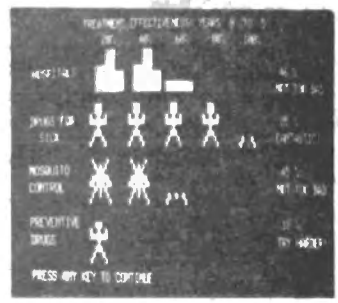
1. Pollute

POLLUTE focuses on one part of the water pollution problem, the accumulation of certain waste materials in waterways and their effect on dissolved oxygen levels in the water. You can use the computer to investigate the effects of different variables such as the body of water, temperature, and the rate of dumping waste material. Various types of primary and secondary waste treatment, as well as the impact of scientific and economic decisions can be examined.

2. Rats

In RATS you play the role of a Health Department official devising an effective, practical plant to control rats. The plan may combine the use of sanitation and slow kill and quick kill poisons to eliminate a rat population. It is also possible to change the initial population size, growth rate, and whether the simulation will take place in an apartment building or an entire city





3. Malaria

With MALARIA, you are a Health Official trying to control a malaria epidemic while taking into account financial considerations in setting up a program. The budgeted use of field hospitals, drugs for the ill, three types of pesticides, and preventative medication, must be properly combined for an effective control program.

4. Diet

DIET is designed to explore the effect of four basic substances, protein, lipids, calories and carbohydrates, on your diet. You enter a list of the types and amounts of food eaten in a typical day, as well as your age, weight, sex, health and a physical activity factor. DIET is particularly valuable in indicating how a diet can be changed to raise or lower body weights and provide proper nutrition.

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Social and Economic Simulations CS-3204 (16K)

1. Limits

LIMITS is a micro-computer version of the well known "Limits to Growth" project done at MIT. It contains a model of the world that is built of five subsystems (population, pollution, food supply, industrial output, and resource usage) linked together by six variables: birth rate, death rate, pollution generation, resource usage rate, industrial output growth rate, and food production rate.

2. Market

Market allows two or more people to play the roles of companies who are competing for the market for a particular product: in this case, bicycles.

Each player makes marketing decisions quarterly including the production level, the advertising budget, and the unit price of the product for his/her company.

3. USPop

USPOP allows the user to study many aspects of the United States' human demography (population change) including population growth, age and sex distribution. USPOP makes population projections and investigates the consequences of many different demographic changes.

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TRS-80 LEVEL I

Games-1, CS-2001 (4K)

1. Battling Deathstars

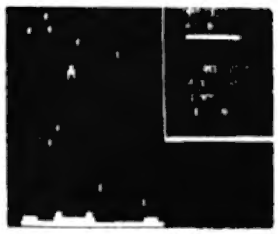
Battling Deathstars is an action-packed, two player game which operates in real time. You control a powerful and deadly Deathstar travelling in hyperdrive on a special mission to destroy your opponent. Using keyboard controls, you rotate and move your Deathstar in all directions, and fire from your gunport. The closest thing yet to a galactic dogfight!

2. Hangman

Hangman for the Level I TRS-80 is an adaptation of the classic word game. Use the built-in word list or enter your own stumpers. This game with its entertaining graphics provides an amusing and educational passtime for children of all ages.

3. Lunar Lander

Lunar Lander is a Level I version of the classic moon landing computer game with full graphics. You control the amount of thrust of the retro rockets as the capsule descends. Try to touch down



under 5 ft/sec, or you may create a new lunar crater!

4. Math Race

Math Race uses graphics to involve the user in arithmetic problems. Players enter their names, choice of board marker and decision to play against the computer or a friend. Players' ages and skill levels determine the difficulty of the problems. A helpful tool for learning arithmetic.

5. Checkers

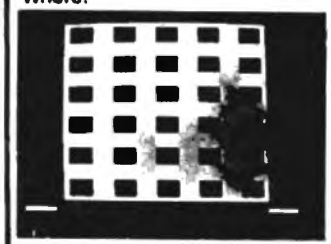
Checkers for the TRS-80 is a two-program package consisting of an instruction program and checkers program. Playing on a beginner's level, the computer uses straightforward strategy to make its moves. Checkers is ideal for introducing the game to children.

$7.95

Games-2, CS-2002 (4K)

1. Remember Where

Remember Where is a one or two player game similar to the card game (and television game) of Concentration, in which memory and daring are the keys to success. This game uses a graphic board and allows you to match memory and skill with the computer or another person. Ready, set, Remember Where!



2. Biogram

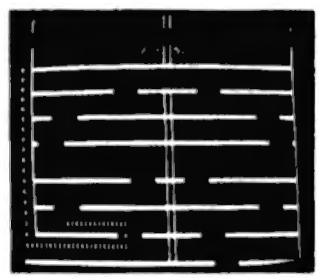
Feeling lethargic and depressed, or are you on a dangerous "critical day"? Whether or not you're a true believer in biorythms you'll find it interesting to watch Biogram generate graphic representations of your physical, emotional and mental states for each day of the month. Biogram also has extended forecast features and special highlighting of "critical days".

3. Yahtzee

Yahtzee is our version of the popular dice and strategy game for the TRS-80. You and a friend compete for the highest score.

4. Maestro

Have you ever wanted to compose music? This 4K Level I program comes complete with a pre-programmed tape of Yankee Doodle Dandy and all the software needed to compose your own tunes. An excellent introduction to computer synthesized music at a fraction of the normal cost. Maestro requires no hardware modifications to your computer and plays music through an ordinary AM radio.



5. Quick Maze

In Quick Maze, you guide an automated robot through a computer-designed maze. Depending on your skill and coordination, it can clear the maze or crash head on into a wall. This real time game offers a choice of eight different speed for fast, frantic fun!

$7.95

Geography, CS-2201 (4K)

The Creative Computing Geography series covers all regions of the United States, Europe, Central and South America, and Africa. Each drill contains several multiple choice questions about world geography (states, countries and bodies of water). All data used in these programs have been selected from a 1976 World Atlas and all are current (including the African nations). Unique program design ensures different questions throughout each run. Geography is an excellent instructional tool for personal and educational applications.

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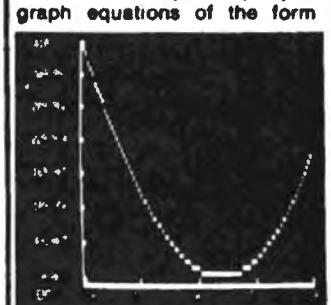
Tape Manager/Graphics/Statistics, CS-2301 (4K) $7.95

1. Tape Manager

Tape manager is a cassette tape data management system for the 4K Level I TRS-80. This program allows you to use long cassette tapes (C-60s) to store up to 8 programs. Each program can be later located automatically by the Tape Manager program.

2. Function Graph

Function Graph helps you graph equations of the form y=f(x). Functions of any type (exponentials, parabolas, ellipses, etc.) may be represented graphically using this program. Function Graph allows you to enter both x and y limits, or will scale the y-axis automatically.



3. Statistics

The following five programs provide the Level I owner with statistical computations. All will load and run in 4K of memory.

ELEMENTARY STATISTICS computes the mean, variance, and standard deviation for a population or a sample.

LINEAR CORRELATION allows you to determine the strength of the linear relationship between two variables. The primary statistic provided is the linear correlation coefficient. In addition, the program computes the means and variances of the variables.

t-TEST determines whether the differences between the means of two groups are statistically significant. You may choose either matched pairs or standard design.

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VARPTR (Variable Name) -by Dick Straw

Of all the numerous commands implemented in Level II BASIC, the most perplexing is probably VARPTR.

What is so difficult about VARPTR for most of us is the explanation, which, like so many found in computer reference manuals, seems to be written mostly for people who don't need it. If you are among those who happen to know what the "two's complement" of a binary number is, or to whom the "normalized exponential form" is an even greater mystery, you haven't found a lot of help in the manual!

Then, of course, there is the proper question, so what? If you want to check the stored value of a variable at run time, it is certainly easy enough to ask the computer to print it out for you in immediate mode. For example, assuming X has had a value assigned to it, you say ?X (ENTER) and the '80 replies 7.3 (or whatever it happens to be) READY

Why would anyone want to look at the value as it is stored in memory? Curiosity is probably the most important reason -- it was enough for me, anyway. Let's let it rest there for the moment.

If you ask for VARPTR (name) to be printed, you get a number somewhere between 17129 and the top of your memory. How big a number you get depends on the size of your program, since all the variable pointers are strung together just after your program text in user RAM. Remember that you will get a function call (FC) error if the program has not been run at least once so that some value has been assigned to the variable you are looking for.

In order to learn anything about the variable itself you need to look into memory around the location VARPTR sends you to, using the PEEK command. And, in order to get the whole picture, you really need to start looking three bytes ahead of the VARPTR location: that is where the variable type and name are stored.

Simple variables (arrays are a little different) are stored in four different formats, since there are four types of variables defined in this BASIC -- integer, single precision and double precision floating point numbers, and strings. The kind of variable being stored is indicated by the first byte, which tells how many bytes are needed to store the variable. That number may be a 2, 3, 4, or 8. Integers are put into two bytes, single precision variables in 4, and double precision variables in 8. The three bytes stored for string variables only tell you how long the string is and where in memory the string itself begins-- the other address. The actual value of the string is not stored with the other variables just following the program text.

Next after the type byte are two bytes that give the name of the variable, in ASCII code. Their order is reversed; the first of the two has the second letter or number of the variable name (if there is one) and the next byte, the code for the first letter. Thus, the name 'D2' would be stored as 50 68, the ASCII codes for 2 and D, respectively. The one letter variable name, 'X', would be stored 0 88 -- the zero indicating no second letter, and 88, the code for X. All the ASCII codes are shown on page C/2 of the appendix.

At last, there is the number VARPTR pointed to. If it belongs to a string variable, this number is the number of bytes (characters) in the string itself (if it is the source of data for the LEN function, too). The next two give the address where the begining of the string is actually found. Using the terms of the manual, if VARPTR points to location K, and if we let (K) be the value stored at that location, (K+1)+256*(K+2), and the whole string is (K) bytes long. At those locations, the characters of the string are stored as their ASCII codes.

If the string was given a value in the program text itself, say in a DATA or LET (type) assignment statement, the pointer will refer to that text location. For string variables that are entered at run time in response to INPUT statements, the values are stored in order from the top of memory downward, the highest one being the first one given a value. In order to reserve space for these strings, a default allocation of fifty bytes is provided, and the base of the stack begins at the next lower memory location. This is why you must reserve space for your strings with a CLEAR n statement early in your program if you will overflow the default allocation.

For numbers, VARPTR points to the least significant byte (LSB) of the number. The numbers are there in binary form, but when you use PEEK to look at them, you see the decimal equivalent values of each of the individual bytes, no matter how many (two to eight) bytes are needed for the entire value.

Interpretation of integers is quite straight forward. If the second of the two bytes is less than 128, the number is positive, but if 128 or higher, the number is negative. This is because the first (highest) of the eight bits of the most significant byte (MSB) -- actually bit 15 in the usual method of numbering the bits in two bytes-- is used to indicate the sign. It is 1 for negative numbers and 0 for positive numbers, and a 1 in that bit means the byte has a value of at least 128.

Checking the number stored is easy enough. For positive numbers, just as we decoded the location of the actual string for string variables, we multiply the MSB by 256 and add the LSB: (K)+256*(K+1). Negative numbers are a bit trickier, but you can easily get the positive equivalent of the negative number using this formula:

256-(K)+256*(255-(K+1)) or, alternatively,
256-LSB+256*(255-MSB).

Just don't forget that the number is really negative. These manipulations are needed because the numbers are stored in two's complement form.

To understand that a little better, let's look at the binary numbers themselves. Two bytes total 16 bits, with the bits numbered from the right (least significant) end at 0 to the left (most significant) end, at 15. The value of a 1 in any of those bits is 2n, where n is the bit number. The value of the entire number is the sum of all the 2n's for all the bits set to 1 in the number (for positive numbers). Thus, bit 14 has a value of 16384, bit 8, a value of 256, and bit 0, a value of 1. The binary number, 01000001 00000001, then has a value of 16641 in our decimal notation.

Now, suppose you see the values, 128 and 12, in the LSB and MSB of an integer (the decimal number is 3200). Putting the bytes in our normal order, 12 128, we can get the binary equivalent by inspection--looking for the combination of bits whose values total the desired number--or by repeated division by 2. In

this case, we can easily see that 12 is the sum of 8 and 4, which are 2^3 and 2^2, respectively, so the MSB has bits 2 and 3 set to ones. Bit 7 is the equivalent of the 128 in the LSB, so putting the two together for the 16 bit binary number, we have 00001100 10000000 (I have separated the bytes to see them more easily).

To calculate the binary equivalent of a decimal number, follow this procedure: First, divide the decimal number by 2 and record the remainder (which must be either 0 or 1) as the right-most digit of the binary number. Then divide the quotient by 2, and record the remainder as the next binary digit to the left. Continue dividing each quotient and recording each remainder in turn until the last quotient is either 0 or 1. After putting down the remainder in its binary place, put the quotient into the most left position (and add any more zeros you want to get to 8 or 16 bits, if desired). For example, let's find the binary equivalent of decimal 115:

```
                                        quotient is most
                                        significant digit
                1  r1                   (bit 6)
Step 6      2|3  r1
            2|7  r0                     (etc)
            1|14 r0                     (next one left)
            2|28 r1                     (last digit, bit 0)
            2|57 r1
Step 1      2|115  = 01110011   (a zero was added to the left)
```

Negative numbers are obtained by finding the two's complement of the positive binary number. To do that, we first get a one's complement by changing every 0 to 1 and every 1 to 0:

thus, 115 = 01110011

1's compl = 10001100 ---then add a binary 1 to get the 2's compl. 10001101

remember that 1 + 1 = 10(put down 0, carry 1) in the without making it into a big theoretical deal, we use the two's complement numbers (and the highest bit as a sign bit) because the computer can't subtract. If we add the two's complement of a subtrahend (the number being subtracted) to a minuend (the number it's subtracted from), the result is the desired difference--in binary, of course. Any carry into a higher bit than exists (say, into bit 16, which would be the lowest order bit in a third byte if there were one) is ignored. Try it out. Just remember that 1+ 1 = 10(put down 0, carry 1) in the binary system.

In case you had begun to wonder why the LSB is stored ahead of the MSB in memory, it has to do with the way the bytes are used in arithmetic operations in the computer. Just as we begin with the right-most digit in our ordinary decimal calculations, so the machine begins with the right-most byte--the LSB--and proceeds to the highest, carrying any overflow to the next highest byte if necessary. Someone decided they would be easier to access in the order from LSB to MSB.

Floating point numbers, either single or double precision, are stored in a totally different way. The only difference between the two is the number of bytes used for the number-- four for single and eight for double precision, as mentioned earlier. Actually, it's only three and seven, since the last byte is the exponent rather than the MSB, while the MSB of the number itself is third or seventh in line. The number that VARPTR points to is still the LSB, with increasingly significant bytes beyond it.

The so-called normalized exponential form of storing numbers has some confusing points, so maybe a more detailed example than the manual's will help. Suppose you find stored number (from K to K+3) to be 206 247 3 131. You know 131 is the exponent; we'll put it aside for a moment and arrange the other three in what is normal order for us 3 247 206 and translate them into binary notation. You should get this:

00000011 11110111 11001110

Because the highest order bit (farthest left digit) is zero, you know the number is positive. On the other hand, in this normalized format that highest bit is always considered "set", whether it is zero or not! So, just keeping in mind that the sign is positive, we'll write down the "real" number as

10000011 11110111 11001110

Now we're ready for the exponent. The base-line exponent is 128, and if the exponent is 128, the decimal point is considered to be set just to the left of that highest order bit. Now, subtract 128 from the exponent digit in the fourth byte. In our example that byte was 131, so the difference is +3. Move the imaginary decimal point three places to the right, then translate the binary digits remaining to the left of it into the whole number portion of the coded number. In our example, these three digits are 100, which is decimal 4.

There are still a lot of zeros to the right of our assumed decimal point. Just as digits set to 1 on the left side of the decimal are interpreted as powers of two, so the bits set on the right are read as reciprocals of the powers of two - 1 2 or more usually, 2 --this time reading from left to right. We do the same thing in our deciamal system, with base 10 instead of base 2 (which is 10 in the binary notation). If you now count toward the right from the decimal point, you will find the following bits set: Numbers 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 18, 19, and 20. Therefore, the fractional part of our number will be $2^{-4}+2^{-5}+2^{-6}$ etc. It helps a great deal to have a table of these reciprocals if you really want to compute this value (see fig 1). When rounded off, the full number will be 4.124. That's almost all there is to it.

Negative numbers really have the highest-order bit set to 1, instead of just make believe. The negative value, -4.124, looks exactly like +4.124 except for that important bit. But that bit, of course, changes the value of the MSB from 3 to 128 + 3, or 131, so we would find in storage from K to K+3 the numbers 206 247 131 131. As in integers, if the MSB is 128 or greater, the whole number is negative.

The exponent value is very important also, of course, although its bit 7 is not a sign bit. If the exponent is 129 or larger, the number is greater than 1, and if 128 or less, the complete number is less than 1 -- approaching zero as the exponent gets smaller. Just remember to subtract 128 from the exponent byte's value. If the difference is positive, move the assumed decimal point the indicated number of bits to the right and compute the whole part of the number (to the left of the decimal point) and the fractional part (to its right) separately.

If the difference between the exponent and 128 is negative (meaning the exponent is less than 128), you must move the decimal point that many places toward the left of its starting point, adding any leading zeros that are needed. In this case, the number is a fraction without any whole part, and you interpret the string of bits accordingly, as shown in figure 1.

One important point, however -- and perhaps a reason for looking at the way the values of your variables are stored -- is that decimal fractions that are not exact negative powers of two (or exact sums of them) are at best approximated under the normalized exponential system. The number stored in memory will carry more bits than are represented by the rounding off to six significant figures, and a long series of sums might yield some strange results among fractional values. You might wish to look at the numbers in this case, though there is not anything you can do about it except use double precision if needed.

Arrays are stored in a manner very similar to individual variables, but have only one name set of three bytes, plus some other information, for the whole array. If you use VARPTR you must reference one of the elements to locate its storage and then back up in memory to find the array information.

The first three bytes for an array are the same as for an individual variable -- the type digit (2, 3, 4, or 8), and two bytes with ASCII codes for the name. Following the name are two bytes that tell how many additional bytes are required to store the array. The total storage used will be the integer value of these two bytes (interpreted as before) plus the five bytes used up to and including this point. One added byte then tells how many dimensions are used in the DIM statement -- far more are possible than any rational programmer would use, as you can see.

Following that byte, two more bytes tell, in integer format, how many elements were specified in the first dimension. If there are more than one dimension, additional pairs of bytes tell how large each is in turn. Clearly, it is possible to specify a larger matrix than most systems can store. Suppose you have in your program statement, 10 DIM D$ (3).

When you locate the array data using VARPTR, you will find the following (the underlines and letters excepted, of course):

3	0 68	15 0	1	4 0	X
A	B	C	D	E	

A indicates the type of array (3 for $ or string array);
B is the name (68 is the ASCII code for 'D';
C is the length of the storage space allocated beyond this point -- 15 more bytes, starting with D;
D is the number of dimensions ---1; and
E is the size of the one dimension (you thought you dimensioned it to 3, but you get the zero element whether you want it or not -- these values will always be one more than you entered).

The storage of the data on the strings begins at X, which is the first location you can access via VARPTR-(D$ (0)). These three bytes, beginning here, tell as before the length of the string for the element and the location of its beginning in memory. As there are four elements, there will be four sets of three bytes one for each. These 12 bytes, plus D and E, are the 15 bytes defined in C. In principle you can save three bytes of storage per value (after the first two or three) by storing variables in arrays, but you will lose some of the gain by needing more bytes to reference the values in your program. You will probably gain more than you lose, however.

The other fallout from all this information is an understanding of the limits on variables listed on page A/16 of the Level II manual. For example, -32767 and +32767 are the largest negative and positive numbers that can be specified by 16 bits using bit 15 as a sign bit. Line numbers are also stored in integer format, but since bit 15 is not a sign bit (they are all positive numbers), the total is 65529. It should be $2^{16} = 65536$, perhaps, and I really don't know what happened to the other seven possibles, but I have never yet been strained by this limit, at least in the '80.

The ranges of single and double precision numbers relate to the exponent byte in normalized exponential form. Remember that 255 is the largest value possible with 8 bits (no sign bit), and that 128 is the base line for exponents. The highest positive exponent one can get is then 255 - 128 = 127, so the value of 2^{127} is the largest magnitude number that can be expressed in the system. That rounds off to 1.701411×10^{38} --either positive or negative, depending on the sign bit of the MSB. Negative exponents make the number smaller and smaller -- closer to zero -- as they get larger, and don't enter into this calculation.

Strings can be 255 bytes long because that is the largest value that can be specified in one byte. That is also the size of the I/O buffer and the largest line that can be entered.

Figure 1: Translating the fractional part of the example.

Bit number set to 1	2^{-n}
4	.062 5
5	.031 25
6	.015 625
7	.007 812 5
8	.003 906 25
9	.001 953 125
11	.000 488 281 25
12	.000 244 140 625
13	.000 122 070 312 5
14	.000 061 035 156 25
15	.000 030 517 578 125
18	.000 003 814 697 265 625
19	.000 001 907 348 632 812 5
20	.000 000 953 674 316 406 25
Total	.123 999 495 542 089 843 75

Rounded to .124

(Data from Intel 8080/8085 Assembly Language Programming, Intel Corporation, 1978 (p. D-2))

But back to the value of having all this information that VARPTR leads us to. Aside from wanting to know all this and perhaps wanting to track down a variable that does not seem to be behaving well, the average programmer may not find much practical value in VARPTR. But I guess it is not clear that there is such a thing as an average programmer, and some will find it fun, if not necessarily practical, to change values in memory in subtle and devious ways for similar reasons. The best possibilities I can see are described in Mike Schmidt's expose' on string packing, seen in these pages at an earlier date. This technique opens up the real possibility of using machine language subroutines without the bother of SYSTEM tapes, etc. Some of us find that idea very attractive.

No doubt some of the more ingenious will find additional uses as time goes on. ●

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MODEL ROCKET

Performance and Design

For many years, model rocketeers have wished to know how a rocket would fly before it was launched, or even to tell if a rocket would fly well, or "go ape", looping around violently out of control.

Roy Groth, Brookline, MA

What is a model rocket? The rocket usually consists of a nosecone, made of balsa or plastic; a body, made of a cardboard tube; some sort of recovery system, usually a parachute or a streamer; fins for stability, usually made of balsa; and a solid propellant engine. Length is usually less than a meter, and weight is less than 400 grams.

In 1958, hobbyists became aware of the importance of the relation between the model's center of pressure (CP) and its center of gravity (CG). If the CP lay aft of the CG, the rocket would be stable; otherwise the rocket would be unstable, and its actions would be unpredictable.

Recently, formulas have been developed to accurately describe the reaction of a rocket to various perturbing forces (winds, fin flutter, etc.). This program uses these formula to graphically display the reaction of the rocket.

The best way to understand this program is to use it. Let's go step by step through the rocket program. Since we wish to determine the coefficients for this rocket, we answer the first question with a "NO", or simply "N". "Yes" or "Y" lets you see the effect of changing coefficients upon a rocket's flight. You could then modify your design to attain these coefficients.

Next, you must describe to the program the configuration of the rocket. You enter all parts by entering the type of the part, and then the name of the part, until all parts have been entered. After this, enter "9" to go on.

(We will use (E) to denote ENTER in the following.) Input the sample rocket as follows: 1, NOSE (E), 5, CHUTE (E), 6, BODY (E), 7, POWER (E), 8, FINS (E).

At this time there should be a list of part names and types to the right of the screen. You may use any names you wish. Now, press "9" to exit this routine.

We do not have experimental data for the moments of inertia. Interested readers should consult Mandell (see reference 1) for the methods.

Next, we must input all the data about the rocket. All inputs in this section of the program are terminated by pressing ENTER. Follow the questions asked, and the following input sequence.

1.23, 6.66, NO, 3, (E), (E), 6.46, 4,. (E), (E), 3.6, 9.6, (E), (E), 3.18, 13.65, (E), (E), 16.78, 22.98, 3, 4.06, 5.84, 3.04, 6.01, 1.23, 20.63, 7.08, 18.03, (E), (E), 13.49, 23.7, (E), (E)

The following coefficients should then be displayed:

CG is 18.5963 cm behind tip of

For all of you "Trekkers" who want to go out and get 15 Klingons in 30 Stardates: Realize first that you must have some means of leaving Earth. Here is a challenging program which allows you to design and modify your rocket until it flys right! And, when you fizzle and crash, there is not too much lost. You simply try again, and when you have the data needed, you can have more assurance that the real model will fly. You also get the rare opportunity to stop time and run it backwards, something that would be very handy in real life!

REFERENCE LIST OF VARIABLES

Since this is a very difficult program to type into your machine, we have included a Reference list of Variables. For those of you unfamiliar with this sort of thing, it is a list of all the variables and references used in the program. The list starts with 0 and ends in ZZ.

As an example, let's look at the variable A. According to our reference, this program uses A in line 100 twice as a string variable, it uses A as a simple variable again in line 130 three times and in 140 once, etc. The variable AX is used in line 50 as a subscripted variable, denoted by the open parenthsis. The numbers referring to other numbers are GOTO's, GOSUB's, PEEK's POKE's etc.

We realize this takes up a lot of valuable space, but since this is a difficult program, the added facility to double check what you type should be worth the space, especially when de-bugging a program that will not run.

There should also be a sample run, but the output is graphic and has many variations. The sample input data given in the text should provide a check against which you can compare your run. - See you at the Cape!

The reference list is made possible by using the REF feature found in NEWDOS.

(See pages 46 & 47)

nose, CP is 21.0589 cm back. (From this we can see the rocket is stable.) The longitudinal moment of inertia is 2419.32 Gm cm E2, and the radial moment of inertia is 476.74 Gm-cm E2. The larger the moments of inertia, the harder it is to deflect the rocket.

The corrective moment coefficient (C1) is 0.0797531 * V E2 Dyne-cm, where V is the rocket velocity. The damping moment coefficient (C2) is 2.42754 * V Dyne cm-sec. If C1 is negative, the rocket is unstable. C2 determines how rapidly oscillations will die out.

The last four numbers completely describe the rocket's reactions. These are the numbers which must be input if you answer "Yes" to the very first question.

Pressing ENTER starts the graphing segment of the program.

A past disturbance is a condition where the rocket has been deflected, and now has no perturbing forces acting on it.

A step input is a constant moment acting on the rocket. An example of this would be a horizontal wind.

An impulse input is a very strong force of very short duration, resulting in an instantaneous angular acceleration. An example of this would be a perturbation resulting from staging.

Let us consider the case of a non-rolling rocket with a past disturbance. For an example rocket velocity, enter 15000 cm/sec.

A word of caution here: Deflections of greater than 0.2 radians invalidate some of the assumptions made to simplify calculations, so their presence cannot be tolerated.

For our sample case, choose a deflection of 0.05 radians, arisen by a sudden transition through a wind layer. After a few seconds you should be informed that the maximum deflection is 0.113192 radians, that 0.398647 seconds have been graphed, that the damping ratio is 0.0873806, and that our rocket is stable.

The deflection and time values give the maximum limits on the graph, so you can attach meaning to the curve which is graphed. The damping ratio is a dimensionless number which is characteristic of the rocket's reactions.

At this time, a graph will be drawn of deflections vs time, and two flashing graphics blocks will appear. The block between the graphs may be moved up and down with the arrow keys. As this block moves up and down, the other block (upper right on your screen) moves to a position corresponding to the position of the nose of the rocket at that point in time. You are in effect looking down on the nose of the rocket at that point in time, and as you controll the flow of time with the up and down arrow keys.

This feature is primarily provided for rolling rockets, where deflections occur in both directions, and are difficult to visualize. Pressing "Q" exits this mode, and allows you to enter another disturbance.

Some disturbances you may wish to try have the following input sequences:

2, 15000, 1.5E6
3, 10000, 3E4
4, 15000, 0.1 -0.05,0,0,600 (an unbelievably fast roll rate, but interesting).
5, 15000, 1.5E6,100
6, 15000, 3E4, 50

If you mess up the display, just press ENTER when selecting the mode to redraw the display.

Pressing "Q" for a mode quits graphing, and lets you change data on the parts of the rocket.

Press the letter corresponding to the part to enter new data for that part. Pressing ENTER computers new coefficients. Pressing "Q" lets you start over from the beginning, where you decide to input coefficients or not.

EFFECTS OF THE COEFFICIENTS

Increasing the longitudinal moment of inertia can be done by adding weight far fore and aft of the center of gravity (CG). This decreases the damping ratio, and the rocket will become more difficult to deflect. However, the rocket will become heavier, reducing the altitude capability. Also, resonance sets in at lower roll rates, severely enough to cause crashes.

Decreasing the moment also reduces the weight of the rocket. This was popular for a time, as it was believed that the lighter a rocket was, the higher it would go. Unfortunately, such rockets were severely deflected by even slight disturbances. Even though recovery is rapid, the rocket is deflected so often that much of the flight is spent at a large angle of attack, increasing the drag.

Increasing C1 may be done by increasing the size of the fins, and/or moving them to the rear. This also increases C2. If this does not appreciably change the longitudinal moment of inertia, the time taken to return the rocket to vertical alignment is decreased.

Unfortunately, this method of increasing C results in large deflections due to step disturbances, such as winds. This phenomenon, known as weathercocking, can result in a rocket flying almost parallel to the ground.

A better method to increase C1 is to increase the airspeed of the rocket. But, when carried to excess, this increases the drag and can actually lower the altitude of the rocket. Decreasing C1 leads to instability.

Adding more fin area fore and aft of the center of gravity will increase C2. This raises the damping ratio, which is good, up to a damping ratio of 0.7071. It can greatly increase drag though. The damping ratio should be between 0.05 and 0.3.

For Level II, 16K and UP

```
10 REM  ROCKET STABILTY
20 REM  (C) 1979 BY 80-US PUBLISHING CO.
30 REM  BY ROY GROTH
40 CLEAR 300
50 DIM CN(15),ZB(15),MA(15),WB(15),PT$(8),NA$(15),TP(15),AX(43),
AY(43),IL(15),IR(15)
60 DATA NOSECONE,SHOULDER,PAYLOAD,BOATTAIL,RECOVERY SYSTEM,BODY
TUBE,ENGINE & MOUNT,FINS,NO MORE PARTS
70 DATA LONGITUDINAL MOMENT OF INERTIA (IN GM-CM^2),RADIAL MOMEN
T OF INERTIA (IN GM-CM^2),CORRECTIVE MOMENT COEFFICIENT/V^2,DAMP
ING MOMENT COEFFICIENT/V
80 FORI=0TO8:READPT$(I):NEXTI
90 CLS:B$="DO YOU WISH TO INPUT ALREADY DETERMINED COEFFICIENTS
(Y/N)?":T0=514
100 GOSUB960:IFA$="Y",GOTO1440:ELSEIFA$<>"N"GOTO100
110 PN=0:CLS:FORI=0TO8:PRINTI+1;CHR$(8);") ";PT$(I);TAB(26);CHR$
(170):NEXTI:PRINTSTRING$(27,131)
120 T0=704:B$="ENTER PART TYPE":GOSUB960
130 A=ASC(A$)-49:IFA<0ORA>8GOSUB980:GOTO130
140 IFA=8IFPN>0,PN=PN-1:GOTO170:ELSEGOSUB980:GOTO130
```

(continued on page 44)

REFERENCE:

Gordon K Mandell, "A Unified Approach to Aerodynamic Stability", TOPICS IN ADVANCED MODEL ROCKETRY (Cambridge: The MIT Press, 1973), pp 216 - 234.

```
150 TP(PN)=A:PRINT@704,"  NAME OF PART";:II=718:GOSUB870:NA$(PN)
=IN$:IFLEN(NA$(PN))>18PRINT@640,"<! NAME TOO LONG !>":GOTO150
160 PRINT@64*PN+28,NA$(PN);" (";PT$(A);")";:PRINT@640,STRING$(19
,32):PN=PN+1:GOTO120
170 CLS:PRINT"IF YOU DO NOT HAVE EXPERIMENTAL DATA FOR THE MOMEN
TS OF INERTIA, JUST PRESS ENTER, AND APPROXIMATE VALUES WILL BE
USED."
180 INPUT"RADIUS OF BASE OF NOSECONE (IN CM)";RR:AR=3.14159*RR[2
:FORPA=0TOPN:CLS:PRINT"PART BEING INPUT: ";NA$(PA):GOSUB860:NEXT
PA
190 CN=0:ZB=0:MA=0:WB=0:FORPA=0TOPN:CN=CN+CN(PA):ZB=ZB+CN(PA)*
  ZB(PA):MA=MA+MA(PA):WB=WB+WB(PA)*MA(PA):NEXTPA:ZB=ZB/CN:
  WB=WB/MA
200 IL=0:IR=0:FORPA=0TOPN:IL=IL+MA(PA)*(WB-WB(PA))[2+IL(PA):IR=I
R+IR(PA):NEXTPA
210 CLS:INPUT"LONGITUDINAL MOMENT OF INERTIA OF THE WHOLE ROCKET
 (IN GM-CM[2)";IL:INPUT"RADIAL MOMENT OF INERTIA OF THE WHOLE RO
CKET (IN GM-CM[2)";IR
220 D1=(.6125E-3)*AR*CN*(ZB-WB):D2=0:FORPA=0TOPN:D2=D2+CN(PA)*(Z
B(PA)-WB)[2:NEXTPA:D2=D2*AR*.6125E-3
230 CLS:PRINT"THE C.G. IS";WB;"CM BEHIND THE TIP OF THE NOSE":PR
INT"THE C.P. IS";ZB;"CM BEHIND THE TIP OF THE NOSE":PRINT"THE LO
NGITUDINAL MOMENT OF INERTIA IS";IL;"GM-CM[2":PRINT"THE RADIAL M
OMENT OF INERTIA IS";IR;"GM-CM[2"
240 PRINT"THE CORRECTIVE MOMENT COEFFICIENT IS";STR$(D1);"*V[2 D
YNE-CM":PRINT"THE DAMPING MOMENT COEFFICIENT IS";STR$(D2);"*V DY
NE-CM-SEC":PRINT
250 T0=704:B$="PRESS ENTER FOR GRAPHS":GOSUB960
260 CLS
270 GOSUB950:A$=STRING$(10,32)+CHR$(170)+STRING$(10,32):FORI=0TO
13:PRINT@I*64,A$;:PRINT@I*64+22,A$;:NEXTI
280 A$=STRING$(10,176)+CHR$(186)+STRING$(10,176):PRINT@896,A$;"
";A$;:PRINT@967,"X (RADS)";:PRINT@988,"Y (RADS)";:A$=STRING$(10,
32)+CHR$(191)+STRING$(10,32)
290 PRINT@245,"+";:PRINT@53,"Y";:PRINT@255,"X";:GOSUB1000
300 PRINT@491,"NON-ROLLING:";:PRINT@556,"(1) PAST DISTURBANCE";:
PRINT@620,"(2) STEP INPUT";:PRINT@684,"(3) IMPULSE INPUT";:PRINT
@747,"ROLLING:";:PRINT@812,"(4) PAST DISTURBANCE";:PRINT@876,"(5
) STEP INPUT";:PRINT@940,"(6) IMPULSE INPUT";
310 A$=INKEY$:T0=1006:B$="SELECT MODE":GOSUB960
320 IFA$="Q"GOTO1380
330 AA=ASC(A$)-48:IFAA<1ORAA>6GOTO260
340 GOSUB1000:PRINT@491,"INPUT ROCKET VELOCITY";:PRINT@555,"IN C
M/SEC";:II=619:GOSUB870:V=VAL(IN$):GOSUB1000:C1=D1*V[2:C2=D2*V
350 ONAAGOSUB520,800,810,740,800,810
360 IFAA<4,GOSUB530:ELSEGOSUB1280
370 IFMT>30,MT=30                          Note: [ = up arrow
380 MD=0:AY=0:FORT=0TOMTSTEPMT/43                in this listing!
390 GOSUB940
400 AX=ABS(AX):AY=ABS(AY):IFAX>MD,MD=AX
410 IFAY>MD,MD=AY
420 IFAX>.22ORAY>.22MT=T-MT/88:IFT>0,GOTO380:ELSE270
430 NEXTT
440 TS=MT/43:AS=MD/20:PRINT@491,"MAXIMUM DEFLECTION:";:IFMD<=.2,
PRINT@555,MD;"RADIANS";:ELSEPRINT@555,"*****TOO LARGE*****";
450 IFMT<30,PRINT@619,"TIME GRAPHED:";:PRINT@683,MT;"SECONDS";:E
LSEPRINT@619,"***MINIMAL DAMPING***";:PRINT@683,"**30 SECONDS SH
830 T=T+ST:GOSUB940:IFABS(AX-MS/C1)>MD,MD=ABS(AX-MS/C1):GOTO830
840 IFABS(AX-MS/C1)<.05*MDANDST>0ORABS(AX-MS/C1)>.05*MDANDST<0 S
T=-.5*ST:IFABS(ST)>.001,GOTO830:ELSEMT=T:RETURN
850 GOTO830
860 ONTP(PA)+1GOTO1010,1120,1160,1180,1160,1160,1160,1210
870 IN$="":PRINT@II,">";:FG=1
880 TI=10:IFFG=1PRINTCHR$(191);CHR$(24);:ELSEPRINT" ";CHR$(24);:
TI=5
890 A$=INKEY$:IFA$<>""GOTO910
900 TI=TI-1:IFTI<1,FG=1-FG:GOTO880:ELSE890
910 IFASC(A$)>13,IN$=IN$+A$:PRINTA$;:GOTO890
920 IFASC(A$)=13,PRINT" ";:RETURN
930 IFLEN(IN$)>0,IN$=LEFT$(IN$,LEN(IN$)-1):PRINT" ";CHR$(24);CHR
$(8);:GOTO880:ELSE900
940 ONJUGOTO590,650,730,1340
950 A$=CHR$(26)+CHR$(24):PRINT@341,"[";A$;"T";A$;"I";A$;"M";
  A$;"E";:RETURN
960 FG=1
970 TI=60:IFFG=1,PRINT@T0,B$;:ELSEPRINT@T0,STRING$(LEN(B$),32);
  :TI=20
980 A$=INKEY$:IFA$<>""RETURN
990 TI=TI-1:IFTI=0,FG=1-FG:GOTO970:ELSE980
1000 A$=STRING$(21,32):FORI=7TO14:PRINT@I*64+43,A$;:NEXTI:PRINT@
1003,STRING$(20,32);:RETURN
1010 CN(PA)=2
1020 INPUT"LENGTH OF CONE (IN CM)";L
1030 INPUT"DO YOU KNOW THE VOLUME OF THE CONE";A$:IFLEFT$(A$,1)=
"Y"GOTO1110
1040 INPUT"1) CONICAL
2) TANGENT OGIVE
3) PARABLOIDAL
4) ELLIPSOIDAL
   WHICH BEST DESCRIBES THE SHAPE OF THE CONE";A:IFA<1ORA>4GOTO1
040
1050 ZB(PA)=L/3
1060 IFA=1,ZB(PA)=2*L/3
1070 IFA=2,ZB(PA)=.466*L
1080 IFA=3,ZB(PA)=.5*L
1090 INPUT"RADIAL MOMENT OF INERTIA (IN GM-CM[2)";IR(PA):IFIR(PA
)=0,IR(PA)=.35*RR[2
1100 GOTO1170
1110 INPUT"VOLUME OF CONE (IN CM[3)";V:ZB(PA)=L-V/AR:GOTO1090
1120 INPUT"RADIUS OF FORWARD END OF SHOULDER (IN CM)";R1:INPUT"R
ADIUS OF REARWARD END OF SHOULDER (IN CM)";R2:CN(PA)=2*((R2/RR)[
2-(R1/RR)[2)
1130 INPUT"LENGTH OF SHOULDER (IN CM)";L:INPUT"DISTANCE FROM TIP
 OF NOSE TO FORWARD END OF SHOULDER";Z1:ZB(PA)=Z1+L*(2/3-R1*(R1/
R2+1)/3/R2)
1140 INPUT"RADIAL MOMENT OF INERTIA (IN GM-CM[2)";IR(PA):IFIR(PA
)=0,IR(PA)=.5*((R1+R2)/2)[2
1150 GOTO1170
1160 CN(PA)=0:INPUT"RADIAL MOMENT OF INERTIA (IN GM-CM[2)";IR(PA
):IFIR(PA)=0,IR(PA)=.125*AR[2
1170 INPUT"LONGITUDINAL MOMENT OF INERTIA (IN GM-CM[2)";IL(PA):P
RINT"MASS OF ";PT$(TP(PA));" (IN GRAMS)";:INPUTMA(PA):PRINT"DIST
ANCE FROM TIP OF NOSE TO C.G. OF ";PT$(TP(PA));" (IN CM)";:INPUT
```

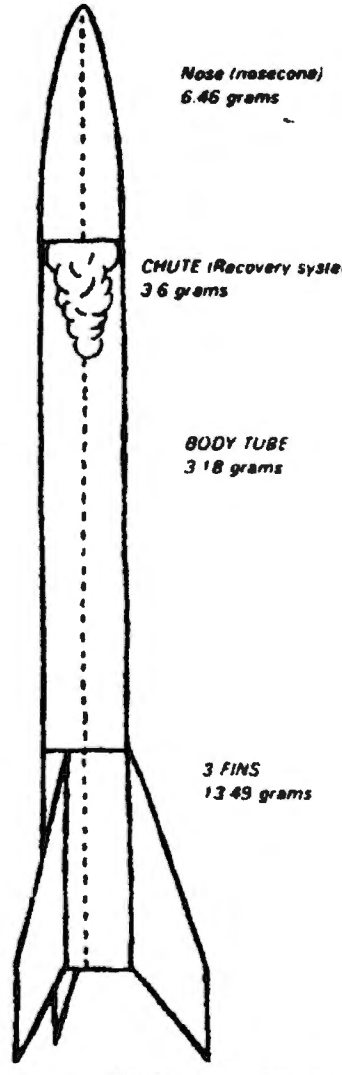
```
OWN**";
460 PRINT@747,B$;:PRINT@811,C$;:PRINT@875,D$;:IF(AA=2ORAA=5)ANDC
1>0,PRINT@939,"DEFLECTION CONVERGES";:PRINT@1003,"TO";MS/C1;"RAD
S";
470 GT=43:FORT=0TOMTSTEPTS:GOSUB940:SET(AX/AS+21,GT):SET(AY/AS+6
5,GT):AX(GT)=AX/AS+106.5:AY(GT)=AY/AS/2+10:GT=GT-1:NEXTT:GT=43
480 G0=GT:PP=PEEK(14591):IFPP=2,RESET(AX(G0),AY(G0)):RESET(42,G0
):RESET(43,G0):GOTO270
490 IFPP=8,GT=GT-1:IFGT<1,GT=1
500 IFPP=16,GT=GT+1:IFGT>43,GT=43
510 RESET(AX(G0),AY(G0)):RESET(42,G0):RESET(43,G0):PRINT@245,"+"
;:PRINT@53,"Y";:PRINT@255,"X";:GOSUB950:SET(AX(GT),AY(GT)):SET(4
2,GT):SET(43,GT):GOTO480
520 MS=0:PRINT@491,"INPUT DEFLECTION IN";:PRINT@555,"YAW IN RADI
ANS AT T=0";:II=619:GOSUB870:X0=VAL(IN$):GOSUB1000:PRINT@491,"IN
PUT ANGULAR";:PRINT@555,"VELOCITY IN YAW IN";:PRINT@619,"RAD/SEC
 AT T=0";:II=683:GOSUB870:XP=VAL(IN$):GOTO1000
530 GOSUB760:D=C2/2/IL:IFW<1E-3,GOTO600
540 JU=1:W=SQR(W):MT=3/D
550 ONAAGOTO560,570,580
560 PH=ATN(X0*W/(D*X0+XP)):A=X0/SIN(PH):RETURN
570 PH=ATN(W/D):A=-MS/C1/SIN(PH):RETURN
580 MS=0:PH=0:A=H/IL/W:RETURN
590 AX=A*EXP(-D*T)*SIN(W*T+PH)+MS/C1:RETURN
600 IFW<-1E-3GOTO660
610 JU=2:ONAAGOTO620,630,640
620 A1=X0:A2=XP+D*X0:GOTO820
630 A1=-MS/C1:A2=-D*A1:GOTO820
640 A1=0:A2=H/IL:GOTO820
650 AX=(A1+A2*T)*EXP(-D*T)+MS/C1:RETURN
660 JU=3:T0=SQR(-W):T1=1/(D-T0):T2=1/(D+T0)
670 ONAAGOTO680,690,700
680 A1=(T1*X0+T1*T2*XP)/(T1-T2):A2=(T2*X0+T1*T2*XP)/(T2-T1):GOTO
710
690 A1=-MS*T1/C1/(T1-T2):A2=MS*T2/C1/(T1-T2):GOTO710
700 A1=H*T1*T2/IL/(T1-T2):A2=-A1
710 IFC1>0GOTO820
720 MT=50:RETURN
730 AX=A1*EXP(-T/T1)+A2*EXP(-T/T2)+MS/C1:RETURN
740 MS=0:PRINT@491,"INPUT X DEFLECTION IN";:PRINT@555,"RADIANS A
T T=0";:II=619:GOSUB870:X0=VAL(IN$):PRINT@497,"Y";:PRINT@II,STRI
NG$(21,32);:GOSUB870:Y0=VAL(IN$):GOSUB1000
750 PRINT@491,"INPUT ANGULAR";:PRINT@555,"VELOCITY OF X DEFL.";:
PRINT@619,"IN RAD/SEC AT T=0";:II=683:GOSUB870:XP=VAL(IN$):PRINT
@567,"Y";:PRINT@II,STRING$(21,32);:GOSUB870:YP=VAL(IN$):GOTO1000

760 W=C1/IL-C2[2/4/IL[2:IFW>1E-3,B$="DAMPING RATIO IS":C$=STR$(C
2/2/SQR(C1*IL)):D$="ROCKET IS STABLE":RETURN
770 IFW>-1E-3,B$="WARNING:":C$="ROCKET IS":D$="CRITICALLY DAMPED
":RETURN
780 IFC1>0,B$="WARNING:":C$="ROCKET IS":D$="OVERDAMPED":RETURN
790 C$="DANGER: UNSTABLE":B$=STRING$(16,42):D$=B$:RETURN
800 PRINT@491,"INPUT YAWING MOMENT";:PRINT@555,"IN DYN-CM FOR T>
=0";:II=619:GOSUB870:MS=VAL(IN$):GOTO1000
810 PRINT@491,"INPUT YAW IMPULSE";:PRINT@555,"IN DYN-CM-SEC AT T
=0";:II=619:GOSUB870:H=VAL(IN$):MS=0:GOTO1000
820 T=0:ST=.1:GOSUB940:MD=ABS(AX-MS/C1)
WB(PA):IR(PA)=IR(PA)*MA(PA):RETURN
1180 INPUT"RADIUS OF FORWARD END OF BOATTAIL (IN CM)";R1:INPUT"R
ADIUS OF REARWARD END OF BOATTAIL (IN CM)";R2:CN(PA)=2*((R2/RR)[
2-(R1/RR)[2)
1190 INPUT"LENGTH OF BOATTAIL (IN CM)";L:INPUT"DISTANCE FROM TIP
 OF NOSE TO FORWARD END OF BOATTAIL (IN CM)";Z1:ZB(PA)=Z1+L/3*(1
+R2*(R2/R1+1)/R1)
1200 GOTO1140
1210 INPUT"NUMBER OF FINS (3 OR 4)";N:IFN<3ORN>4GOTO1210
1220 INPUT"PERPENDICULAR DISTANCE FROM ROOT TO TIP (IN CM)";S:IN
PUT"LENGTH OF ROOT (IN CM)";CR:INPUT"LENGTH OF TIP (IN CM)";CT:I
NPUT"DISTANCE FROM MIDPOINT OF ROOT TO MIDPOINT OF TIP (IN CM)";
GA:GA=S/GA
1230 INPUT"RADIUS OF BODY TUBE AT FIN ASSEMBLY (IN CM)";RT:AA=2*
S/(CR+CT):CN(PA)=(1+RT/(S+RT))*N*AA*((CR+CT)/2/RR)*S/RR/(2+SQR(4
+(AA/GA)[2))
1240 INPUT"DISTANCE FROM TIP OF NOSE TO LEADING EDGE OF ROOT (IN
 CM)";Z1:INPUT"LENGTH OF LEADING EDGE OF FIN (IN CM)";XT:ZB(PA)=
Z1+XT/3*(CR+2*CT)/(CR+CT)+(CR+CT-CR*CT/(CR+CT))/6
1250 INPUT"LATERAL AREA OF SIDE OF ONE FIN (IN CM[2)";AF
1260 INPUT"RADIAL MOMENT OF INERTIA (IN GM-CM[2)";IR(PA):IFIR(PA
)=0,IR(PA)=N*(((S+RT)[3-RT[3)*CR/3-(CR-CT)/4/(S+RT)*((S+RT)[4-RT
[4))/AF
1270 GOTO1170
1280 PRINT@491,"INPUT ROLL RATE";:PRINT@555,"IN RAD/SEC";:II=619
:GOSUB870:WZ=VAL(IN$):GOSUB1000:GOSUB760
1290 JU=4:FF=IR[2*WZ/4/IL[2+C1/IL-C2[2/4/IL[2:FC=SQR(FF/2+SQR(FF
[2+C2[2*IR[2*WZ[2/4/IL[4)/2):W1=-IR*WZ/2/IL:W2=W1-FC:W1=W1+FC:E1
=C2*W1/2/IL/(W1+IR*WZ/2/IL):E2=C2*W2/2/IL/(W2+IR*WZ/2/IL):DC=2*(
E1*E2+W1*W2)-E1[2-E2[2-W1[2-W2[2
1300 ONAA-3GOTO1310,1320,1330
1310 AS=(XP*(E1-E2)+YP*(W1-W2)+X0*(E1*E2+W1*W2-E2[2-W2[2)+Y0*(W1
*E2-W2*E1))/DC:AC=(XP*(W2-W1)+YP*(E1-E2)+X0*(W2*E1-W1*E2)+Y0*(W1
*W2+E1*E2-W2[2-E2[2))/DC:P1=ATN(AS/AC):P2=ATN((X0-AS)/(Y0-AC)):A
1=AS/SIN(P1):A2=(X0-AS)/SIN(P2):GOTO1350
1320 AS=MS*(W2[2+E2[2-W1*W2-E1*E2)/C1/DC:AC=MS*(W1*E2-W2*E1)/C1/
DC:P1=ATN(AS/AC):A1=AS/SIN(P1):AS=-AS-MS/C1:P2=ATN(-AS/AC):A2=AS
/SIN(P2):GOTO1350
1330 AS=H*(E1-E2)/IL/DC:AC=H*(W2-W1)/IL/DC:P1=ATN(AS/AC):A1=AS/S
IN(P1):P2=P1:A2=-A1:GOTO1350
1340 AX=A1*EXP(-E1*T)*SIN(W1*T+P1)+A2*EXP(-E2*T)*SIN(W2*T+P2)+MS
/C1:AY=A1*EXP(-E1*T)*COS(W1*T+P1)+A2*EXP(-E2*T)*COS(W2*T+P2):RET
URN
1350 IFE2>E1,MT=3/E1:ELSEMT=3/E2
1360 IFMT<0,MT=30
1370 RETURN
1380 CLS:PRINT"(Q) TO START OVER
(ENTER) TO CONTINUE":FORPA=0TOPN:PRINT@PA*64+32,"(";CHR$(65+PA);
") ";NA$(PA);" (";PT$(TP(PA));")";:NEXTPA
1390 T0=512:B$="SELECT OPTION":GOSUB960
1400 IFASC(A$)=13,GOTO190
1410 IFA$="Q",RUN
1420 PA=ASC(A$)-65:IFPA<0ORPA>PN,GOSUB980:GOTO1400
1430 CLS:PRINT"PART BEING INPUT: ";NA$(PA):GOSUB860:GOTO1380
1440 II=64:GOSUB1450:IL=X:GOSUB1450:IR=X:GOSUB1450:D1=X:GOSUB145
0:D2=X:GOTO260
1450 CLS:READB$:PRINT"ENTER ";B$:GOSUB870:X=VAL(IN$):RETURN
```

REFERENCE LIST OF VARIABLES used in the MODEL ROCKET PROGRAM

```
  0  80 110/2 130 140 180 190/5 200/3 220/2 270 380/3
     420 460 470 520 580/2 640 710 740 780 810 820 840/2
     930 990 1090 1140 1160/2 1260 1360 1380 1420
  1  110 140 160 330 470 490/3 500 530 540 600 660/2 760
     770 860 870 880 900/3 930 960 970 990/2 1030 1040
     1060 1130 1190/2 1230
  2  180 200 220 340 460 470 480 530 610 760/3 1010 1060
     1070 1090 1120/3 1130 1140/2 1160 1180/3 1230/4 1240
     1290/20 1310/4 1320/2
  3  220/2 530 540 600 660 760 770 1050 1060 1080 1130/2
     1190 1210 1240 1260/3 1300 1350/2
  4  360 760 1040 1210 1230 1260/3 1290/5
  5  460 880
  6  330 1240
  7  1000
  8  50 80 110/2 130 140 490 930
 10  270/2 280/4 470 880
 13  270 910 920 1400
 14  1000
 15  50/8
 16  500 790
 18  150
 19  160
 20  440 970 1000
 21  470 740 750 1000
 22  270
 24  880/2 930 950
 26  110 950
 27  110
 28  160
 30  370/2 450 1360
 32  160 270/2 280/2 740 750 970 1000/2 1380
 42  480 510/2 790
 43  50/2 380 440 470/2 480 500/2 510/2 1000
 48  330
 49  130
 50  720
 53  290 510
 60  970
 64  160 270/2 1000 1380 1440
 65  470 1380 1420
 88  420
100  100
120  160
130  130 140
131  110
150  150
170  110 140 270
176  280/2
186  280
190  1400
191  280 880
245  290 510
255  290 510
260  330 1440
270  420 480
300  40
341  950
1010  860
1040  1040
1090  1110
1110  1030
1120  860
1140  1200
1160  860/4
1170  1100 1150 1270
1180  860
1210  860 1210
1280  360
1310  1300
1320  1300
1330  1300
1340  940
1350  1310 1320 1330
1380  320 1430
1400  1420
1440  100
1450  1440/4
14591  480
  A  100/$2 130/3 130/$ 140 150 160 270/$3 280/$4 310/$
     320/$ 330/$ 560 570 580 590 890/$2 910/$3 920/$ 950/$5
     980/$2 1000/$2 1030/$2 1040/3 1060 1070 1080 1400/$
     1410/$ 1420/$
  A1  620 630/2 640 650 680 690 700/2 730 1310 1320 1330/2
     1340/2
  A2  620 630 640 650 680 690 700 730 1310 1320 1330 1340/2
  AA  330/3 350 360 460/2 550 610 670 1230/3 1300
  AC  1310/3 1320/3 1330/2
  AF  1250 1260
  AR  180 220/2 1110 1160
  AS  440 470/4 1310/5 1320/7 1330/3
  AX  50( 400/4 420 470/2 470( 480( 510(2 590 650 730 820
     830/2 840/2 1340
  AY  50( 380 400/2 410/2 420 470/2 470( 480( 510(2 1340
  B  90/$ 120/$ 250/$ 310/$ 460/$ 760/$ 770/$ 780/$ 790/$2
     970/$2 1390/$ 1450/$2
  C  460/$ 760/$ 770/$ 780/$ 790/$
  C1  340 460/2 570 590 630 650 690/2 710 730 760/2 780
     820 830/2 840/2 1290 1320/3 1340
  C2  340 530 760/2 1290/4
  CN  50( 190/4 190(2 220 220( 1010( 1120( 1160( 1180(
     1230(
  CR  1220 1230/2 1240/5 1260/2
  CT  1220 1230/2 1240/5 1260
  D  460/$ 530 540 560 570 590 620 630 650 660/2 760/$
     770/$ 780/$ 790/$
  D1  220 240 340 1440
  D2  220/5 240 340 1440
  DC  1290 1310/2 1320/2 1330/2
  E  220/2 530 600 760 770
  E1  1290/3 1310/6 1320/2 1330 1340/2 1350/2
  E2  1290/3 1310/8 1320/3 1330 1340/2 1350/2
  FC  1290/3
  FF  1290/3
  FG  870 880 900/2 960 970 990/2
  G0  480/5 510/4
```

```
380  420
480  510
491  300 340 440 520/2 740 750 800 810 1280
497  740
512  1390
514  90
520  350
530  360
555  340 440/2 520/2 740 750 800 810 1280
556  300
560  550
567  750
570  550
580  550
590  940
600  530
619  340 450/2 520/2 740 750 800 810 1280
620  300 610
630  610
640  150 160 610
650  940
660  600
680  670
683  450/2 520 750
684  300
690  670
700  670
704  120 150 250
710  680 690
718  150
730  940
740  350
747  300 460
760  530 1280
800  350/2
810  350/2
811  460
812  300
820  620 630 640 710
830  830 840 850
860  180 1430
870  150 340 520/2 740/2 750/2 800 810 1280 1450
875  460
876  300
890  900 930
893  900 910
896  288
900  930
910  890
939  460
940  300 390 470 820 830
950  270 510
960  100 120 250 310 1390
967  280
970  990
980  130 140 990 1420
988  280
1000 290 340/2 520/2 740 750 800 810 1280
1003 460 1000
1006 310
```



MODEL ROCKET

```
GA   1220/3 1230
GT   470/8 480 490/4 500/4 510/4
B    580 640 700 810 1330/2
I    80/3 110/4 270/4 1000/3
II   150 340 520/2 740/2 750/2 800 810 870 1280 1440
IL   50( 200/3 200( 210 230 530 580 640 700 760/3 1170(
     1290/9 1330/2 1440
IN   150/$ 340/$ 520/$2 740/$2 750/$2 800/$ 810/$ 870/$
     910/$2 930/$4 1280/$ 1450/$
IR   50( 200/3 200( 210 230 1090(3 1140(3 1160(3 1170(2
     1260(3 1290/5 1440
JU   540 610 660 940 1290
L    1020 1050 1060 1070 1080 1110 1130/2 1190/2
MA   50( 190/4 190(2 200( 1170(2
MD   380 400/2 410/2 440/3 820 830/2 840/2
MS   460 520 570 580 590 630 650 690/2 730 740 800 810
     820 830/2 840/2 1320/3 1340
MT   370/2 380/2 420/2 440 450/2 470 540 720 840 1350/2
     1360/2
N    1210/3 1230 1260
NA   50($ 150($2 160($ 180($ 1380($ 1430($
P1   1310/2 1320/2 1330/3 1340/2
P2   1310/2 1320/2 1330 1340/2
PA   180/3 190/8 200/6 220/4 860 1010 1050 1060 1070 1080
     1090/3 1110 1120 1130 1140/3 1160/4 1170/8 1180 1190
     1230 1240 1260/3 1380/6 1420/3 1430
PH   560/2 570/2 580 590
PN   110 140/3 150/3 160/4 180 190 200 220 1380 1420
PP   480/2 490 500
PT   50($ 80($ 110($ 160($ 1170($2 1380($
R1   1120/2 1130/2 1140 1180/2 1190/2
R2   1120/2 1130/2 1140 1180/2 1190/2
RR   180/2 1090 1120/2 1180/2 1230/2
RT   1230/3 1260/5
S    1220/2 1230/3 1260/3
ST   820 830 840/5
T    380 420/2 430 470/2 590/2 650/2 730/2 820 830/2 840
     1340/8
T0   90 120 250 310 660/3 970/2 1390
T1   660 680/5 690/3 700/2 730
T2   660 680/5 690/3 700/2 730
TI   380/2 960/3 970/2 390/3
TP   50( 150( 860( 1170(2 1380(
TS   440 470
V    340/3 1110/2
W    530 540/2 560 570 580 590 600 660 760/2 770
W1   1290/8 1310/6 1320/2 1330 1340/2
W2   1290/5 1310/8 1320/3 1330 1340/2
WB   50( 190/5 190( 200 200( 220/2 230 1170(
WZ   1280 1290/5
X    1440/4 1450
X0   520 560/3 620/2 680/2 740 1310/4
XP   520 560 620 680/2 750 1310/2
XT   1240/2
Y0   740 1310/3
YP   750 1310/2
Z1   1130/2 1190/2 1240/2
ZB   50( 190/5 190( 220 220( 230 1050( 1060( 1070( 1080(
     1110( 1130( 1190( 1240(
```

Seasons Greetings!

A Greeting Card, written by Gini Roni. Level I users change the two "Print At's" in lines 600 and 610.

```
10 CLS
20 'WRITTEN BY GINI RONI, FEDERAL WAY WASHINGTON, WHILE IN
   INTRODUCTORY COMPUTER PROGRAMMING AT BELLARMINE PREP
   SCHOOL - 1978
30 PRINTTAB(25);"YULE-TIDE"
40 FOR J=1 TO 1000:NEXT J:CLS
50 FOR X=43 TO 71:SET(X,47):NEXT
60 FOR X=46 TO 68:SET(X,30):NEXT
70 FOR X=51 TO 63:SET(X,21):SET(X,4):NEXT
80 FOR X=42 TO 72:SET(X,12):NEXT
90 FOR Y=35 TO 42:SET(33,Y):SET(34,Y):SET(80,Y):SET(81,Y):NEXT
100 FOR Y=26 TO 31:SET(41,Y):SET(42,Y):SET(72,Y):SET(73,Y):NEXT
110 FOR Y=15 TO 18:SET(45,Y):SET(46,Y):SET(68,Y):SET(69,Y):NEXT
120 FOR Y=4 TO 11:SET(50,Y):SET(51,Y):SET(63,Y):SET(64,Y):NEXT
130 FOR J=1 TO 6
140 READ X,Y:SET(X,Y):SET(X+15,Y)
150 NEXT J
160 DATA 49,13,50,13,49,20,50,20,49,22,50,22
170 FOR J=1 TO 6
180 READ X,Y:SET(X,Y): SET(X+19,Y)
190 NEXT J
200 DATA 47,14,48,14,47,19,48,19,47,23,48,23
210 FOR J=1 TO 2
220 READ X,Y:SET(X,Y): SET(X+23,Y)
230 NEXT J
240 DATA 45,24,46,24
250 FOR J=1 TO 2
260 READ X,Y:SET (X,Y): SET(X+27,Y)
270 NEXT J
280 DATA 43,25,44,25
290  FOR Z=1 TO 3
300 READ X,Y:SET(X,Y): SET(X+26,Y)
310 NEXT Z
320 DATA 43,31,44,31,45,31
330 FOR M=1 TO 2
340  READ X,Y
350 SET(X,Y): SET(X,Y+2): SET(X,Y+4): SET(X,Y+6): SET(X,Y+8)
360 SET(X,Y+10): SET(X,Y+12)
370 NEXT M
380 DATA 57,25,58,25
390 FOR N=1 TO 4
400 READ X,Y:SET(X,Y):SET(X+35,Y)
410 NEXT N
420 DATA 39,32,40,32,39,45,40,45
430  FOR S=1 TO 4
440 READ X,Y:SET(X,Y):SET(X+39,Y)
450 NEXT S
460 DATA 37,33,38,33,37,44,38,44
470 X=35:SET(X,34):SET(X+1,43):SET(X+1,34):SET(X,43):
   SET(X+43,34):SET(X+43,43)
480 X=41:Y=46:SET(X,Y):SET(X+1,Y):SET(X+31,Y):SET(X+32,Y)
490 FOR X=51 TO 63:SET(X,10):NEXT
500 X=56:Y=15
510 FOR B=1 TO 15
520  RESET(X,Y):RESET(X+2,Y)
530  FOR C=1 TO 100:NEXTC
540  SET(X,Y):SET(X+2,Y)
550 FOR C=1 TO 100:NEXT
560 NEXT B
570 SET(52,19): SET(54,19): SET(56,19): SET(58,19): SET(60,19)
580 SET(62,19): SET(49,16): SET(65,16): SET(50,17): SET(64,17)
590 SET(63,18): SET(51,18)
600 PRINT @365,"SEASONS GREETINGS";
610 PRINT@432,"FROM 80-U.S.";
620 GOTO620
```

For Level I 4K and UP

BUSINESS COMPUTING

John Strader, CPA, Business Editor

The new Model II TRS 80 recently arrived at the Radio Shack store I made several tests and comparisons between the old and new models:

The first thing was to compare the speed of the two machines. I entered the following code

10FORI=1TO10000.NEXT

The Model II took 9 seconds and the Model I took 22 seconds to complete the entire loop. I then tried the following:

10 FORI=1TO10000:PRINTI NEXT

This took approximately 5 minutes on the Model I and 6 minutes on the Model II. The input/output speed to the video display is apparently slower than Model I or else the 24 line display in Model II takes longer to complete. In almost all applications it appears that the Model II will be significantly faster, except for programs which consist principally of printing long lists of items on the video display. The disk I/O appears considerably faster on the Model II; however, I didn't run timing comparisons.

While at the store I also looked at the Line Printer III. For those of you who have a large volume of printing work to perform, this is definitely the machine. The line length can't be varied as in the Line Printer I, but you can change the print size to Heading Print Size through software.

Generally, I was impressed with both the new printer and computer. The Model II disk operating system and BASIC interpreter have many new and enhanced commands in the system. It has many of the features now found in NEWDOS, plus some communications commands only found in VTOS 3.0 or special comm packages. Baud rates can be controlled through software; the only thing that disappointed me was the elimination of the PEEK and POKE statements in the Mod II BASIC.

Hopefully, Radio Shack will decide to provide on-site repair when the Model II user base expands. A hard disk, and a Data Base Management system would help the business user tremendously.

Radio Shack's new Payroll Program appears to be a much improved system over the initial business software they had released. I have not used it; if any readers have, we would like to hear from them. For that matter, we would like comments from readers on any business software they are using.

In response to several requests, here is my own equipment, and my experience with the TRS-80 in my own business. I currently have the following hardware:

32K system with Electric Pencil Upper/Lower case modification.
2 Disk drives
TRS-80 Line Printer I with Tractor feed
TrendData 1000 Selectric.

I started out with the Radio Shack DOS, however I had so many problems with the disk operating software, it was almost impossible to operate. After obtaining NEWDOS and a buffered cable, it became a very good system with almost no problems. I am familiar with and would recommend the following software:

The Electric Pencil; it works well and is easy to use.

The Racet Computes software is good and has worked well for me.

CURRENTLY AVAILABLE BUSINESS SOFTWARE

Galactic Software Mail/File List System

Review by M Schmidt

There are Mail Programs, and then there are mail programs. Some do some of the things you would like them to, others do more or less.

It is refreshing to find one that just about does it all, and - puts future obsolesence out of the picture. For example, what are you going to do when the United States goes to that 10 or 11 digit ZIP code? And what if they decide to make it an alphanumeric ZIP? You probably are already fielding your Random File for every last byte, and couldn't possibly cram in another 6 bytes without re-structuring the whole system.

The Galactic Software MAIL/FILE LIST has already taken this into consideration by allowing for an eleven digit, alphanumeric ZIP code field, which incidenatlly, can be used for names of foreign countries which have no ZIPs.

Some of the other features of this sophisticated mail package are:

The entire file is under constant sort; both by name and ZIP code. Each entry is sorted into the system as it is entered with an average wait of 6 to 10 seconds, even with a 600 item file.

Retrieval is alphabetic order or ZIP order, plus any of 6 other criteria - plus up to 19 codes at once or any combination of these.

Thousands of sublists can be transparently available, internal to any list, with individual entries residing on only one or on several of these sublists, but existing as only one entry.

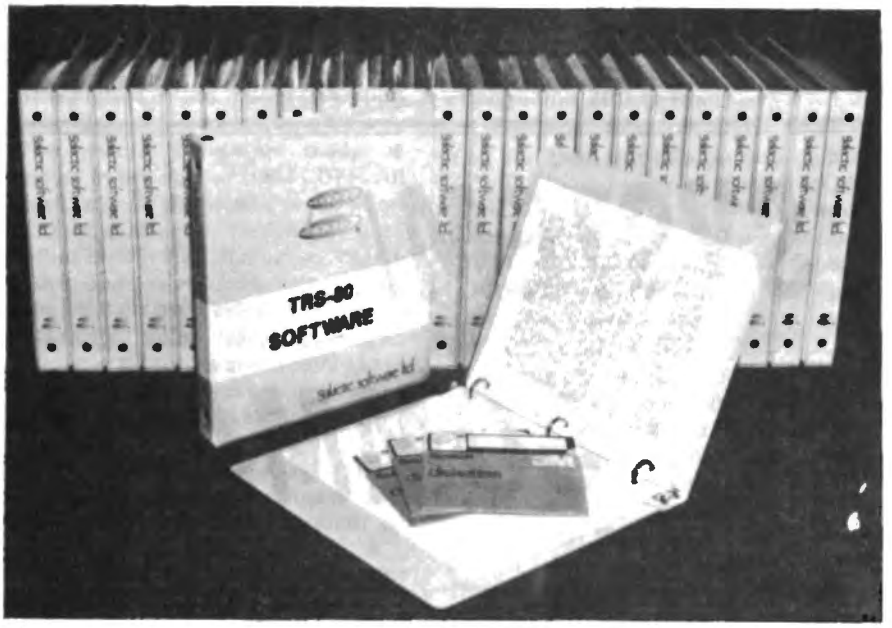
Two standard label formats and two standard directory formats are supported, plus a unique user formatted output which allows the user to set up his own output format. These user formatted outputs are one of the main reasons for the superior versatility of the system. You get the output you want in the order and grouping you want.

When printing labels, ZIP code changes are identified on a separate label between these changes. A final label is printed showing the total number of items printed. The system is set up to print one-up standard labels, and it will automatically accomodate mixed 3 and 4 line labels without getting out of sync.

A "Message" line is supported and is system inserted under some conditions and user placeable as desired. This can be used for "RESIDENT", "ADDRESS CORRECTION REQUESTED", "SERVICE MANAGER" etc.

Subscription expiration and renewal notice sublists are simple to control and update with this system. It could be used as a collection agency's debtor file.

It has automatic name rotate, so



that "Smith John" is printed as "John Smith".

Complete, foolproof and simple editing is supported throughout the program. Extensive error trapping and operator monitoring assures that the system will not act on improper user inputs.

The MAIL program supports 600 names per non-system disk, 300 per system disk. Files generated with this system are compatible with other Galactic Software Business packages. It comes complete with "user oriented" documentation, on diskette, for which registered owners receive updates.

The Galactic Software MAIL/FILE LIST SYSTEM is available for $99.00 complete. They are located at 11520 North Port Washington Road (Dept M), Mequon, WI 53092. (A Model II TRS-80 Mail/File is now in the final stages of checkout and field testing.) ●

SYSTEM/ COMMAND

Phil Pilgrim, Discovery Bay Software Co. Port Townsend, WA

The 7th in a series on Machine Language Applications

KEYBOARD MACROS

Pre-define sequences, which can be called by a single key!

For Model I, Level II 16K & DOS 32K and 48K

Have you ever keyed in a long sequence of DATA statements and wondered if your patience would survive the tedium? ("Thats D-A-T-A...Let's see, where was I on that sheet? 352, 75, 80...Yeah, here it is...80, 47, ..Why didn't they put a comma on the numeric keypad? .. 35, 17, 183, 50 .. Oops! Too far!.. Five items per line max -- gotta make it look neat ...X- X- ENTER. Now D-A-T-A again...") Or how about the time you ran off that Startrek program for the club? ("If ! have to type CSAVE"S" again.. SN ERROR? What?!.. Oh, CSAVR.. C-S-A-V-E.. Glad I don't do this for a living!") You get the picture.

Repetitive keying is boring, exasperating and, as a result, error-prone. "Why," you might ask, "can't the computer do the repetitive stuff, while I, the intelligent but easily-bored human, supply the rest?" 'Thought you'd never ask! Let's talk about keyboard macros.

What is a keyboard macro? In its simplest terms it is a predefined character pattern which can be invoked in a single keystroke. The patterns we will be dealing with contain regular characters and two special control characters: "%", the macro pause and "&", the macro repeat. Suppose, for example, a keyboard macro were assigned to the SHIFT-0 key and that the macro consisted of the string "RUN ENTER". Then, every time we typed a SHIFT-0 in command mode, whatever program was around would start running.

The "%" control character works as follows: During macro invocation (i.e., when the macro is being "played out"), if a "%" is encountered, the macro will stop and the keyboard will be reactivated. At this point we can type anything we want, until we hit ENTER. Then the macro takes over again and continues until it's played out or until another control character is encountered. As an example, suppose we had a macro consisting of "A$(%)=". When we hit SHIFT-0, we would get "A(" and a pause. Now we type "5 ENTER" and the macro continues, ")=" and stops. Here we type "736". The net result is "A(5)=736". It's nothing more than filling in the blanks.

The "&" control character causes the macro to go back to the beginning and start over. If used, it should be the last character in a macro definition (because everything after it would be ignored). An example of its application is the following macro: "CLOAD?%

ENTER &". We could use this to verify a whole stack of tapes, without twice having to type "CLOAD?". Upon hitting SHIFT-0, the computer types "CLOAD?" and waits. We get the next tape cued up and hit ENTER. The computer then encounters the ENTER in the macro and sends it to complete the CLOAD? command, and execution begins. After the tape is verified, the macro is *still* in control, at which point it encounters the "&". This causes it to restart, and it plays out "CLOAD?" again and waits. We cue up another tape, hit ENTER and on it goes. How to escape this endless loop? Just hit BREAK.

So much for invocation. How is one defined? With the program presented here (KEYMAC), you just hit SHIFT-ENTER, and a "->" will be displayed on the screen. Now type in the macro, ENTER's and all, up to 64 characters. (Corrections may be made using the "<-" key.) When finished, hit SHIFT—ENTER again, and a "<-" will be displayed. Now, whenever you hit SHIFT-0, the macro will be invoked.

Examining the program itself, we see that KEYMAC loads into high memory. The START block links it into the keyboard calling sequence and clears the macro buffer, MACBUF. From there it jumps into BASIC (*back to DOS READY if you are using this in Disk Basic).* Now, whenever the keyboard is called, KEYMAC responds. How it responds depends on which of four modes it is in.

The first (regular) mode is handled by the program segment REGKEY. It calls the old keyboard routine (through KBD), looking for either a SHIFT-0 or a SHIFT-ENTER. Finding neither, it simply returns the character supplied by KBD. Upon detecting a SHIFT-0, it enters the macro invocation mode; on a SHIFT-ENTER, the macro definition mode.

The macro definition mode is handled in the segment MACDEF. All it does is stuff characters typed in on the keyboard into MACBUF, until another SHIFT-ENTER is encountered. At this point it returns, and further keyboard calls are fielded by REGKEY.

MACKEY takes care of macro invocation. It returns characters out of MACBUF one at a time until all have been used, the BREAK key is struck, or a control character is encountered. In the first two cases, the mode is then switched back to regular and subsequent calls are handled by REGKEY. Encountering a "&", MACKEY simply resets the buffer pointer (PTR) back to the beginning of MACBUF and returns. No mode change takes place. Should a "%" come up, MACKEY switches to the user submode, and future keyboard calls are fielded by USRKEY.

All USRKEY does is get characters from KBD and return them until ENTER is hit. Then the mode is changed back to macro invocation and MACKEY resumes its role.

To use KEYMAC, key it as shown into the Editor/Assembler, make a SYSTEM tape, and bring up BASIC. For MEMORY SIZE? enter 32496 (or with 32K enter 48880 using ORG 0BEF0H; with 48K, 65264 using ORG 0FEF0H.) Load the SYSTEM tape and type /ENTER to execute the start block. BASIC and KEYMAC will now be READY.

Disk users who have EDTASM on disk can use the origins shown above, along with the appropriate memory size. In addition, when re-assembling at the new origin, change line 200 to read:

JP 402DH ;RETURN TO DOS

You can then put this on disk as a /CMD file and execute it from DOS READY by typing KEYMAC, and when DOS READY re-appears, BASIC, MEMORY SIZE, FILES etc.

A couple of macros you might find useful are the following:

DATA %,%,%,%,% ENTER &

This macro, in conjunction with BASIC's AUTO line numbering will let you enter a whole string of DATA statements, typing nothing but the values themselves, each followed by ENTER.

FORI=1 TO 10000:NEXT:CSAVE"X" ENTER %&

This is a tape duplication macro containing a delay loop for recording on tapes with leaders. Once invoked, all you have to do is hit ENTER when each tape is ready to record.

The possibilities go on, but it is necessary to end with a caveat. There are two macros which will usually fail:

1) Any macro invoked during data INPUT which contains an ENTER not followed by a "%", and

2) Any macro containing BASIC commands separataed by colons and containing an ENTER not followed by a "%".

The reason for failure is that BASIC, when executing a sequence of commands, also polls the keyboard for a BREAK. This polling will devour an invoked macro in nothing flat, until a "%" is encountered.

So experiment. You are sure to come up with many useful and time-saving keyboard macros. ●

```
7EF0            00100          ORG     7EF0H          ;MEM SIZE=32496
7EF0 2A1640     00110 START    LD      HL,(4016H)     ;LINK INTO KBD SEQUENCE
7EF3 22B97F     00120          LD      (KBD+1),HL     ;       .
7EF6 210C7F     00130          LD      HL,KEYMAC      ;       .
7EF9 221640     00140          LD      (4016H),HL     ;       .
7EFC 21BF7F     00150          LD      HL,MACBUF      ;CLEAR MACRO BUFFER
7EFF 3600       00160          LD      (HL),0         ;       .
7F01 11C07F     00170          LD      DE,MACBUF+1    ;       .
7F04 013F00     00180          LD      BC,63          ;       .
7F07 EDB0       00190          LDIR                   ;       .
7F09 C3191A     00200          JP      1A19H          ;RETURN TO BASIC
7F0C 3ABB7F     00210 KEYMAC   LD      A,(MODE)       ;GET MODE
7F0F B7         00220          OR      A              ;IS IT ZERO?
7F10 2848       00230          JR      Z,REGKEY       ;  YES:REGULAR MODE
7F12 3D         00240          DEC     A              ;IS IT ONE?
7F13 2811       00250          JR      Z,MACKEY       ;  YES:MACRO INVOCATION
7F15 CDB87F     00260 USRKEY   CALL    KBD            ;USER SUBMODE: GET CHAR.
7F18 FE01       00270          CP      1              ;BREAK KEY?
7F1A 2831       00280          JR      Z,MACEND       ;  YES:EXIT MACRO
7F1C FE0D       00290          CP      13             ;ENTER?
7F1E C0         00300          RET     NZ             ;  NO:RETURN CHAR. TYPED
```

```
7F1F 3E01     00310          LD      A,1             ;  YES:RETURN TO MACRO
7F21 32BB7F   00320          LD      (MODE),A        ;CHANGE MODE TO 1
7F24 AF       00330          XOR     A               ;RETURN NULL CHARACTER
7F25 C9       00340          RET                     ;       .
7F26 CDB87F   00350 MACKEY   CALL    KBD             ;MACRO INVOCATION: CK KBD
7F29 FE01     00360          CP      1               ;BREAK KEY HIT?
7F2B 2820     00370          JR      Z,MACEND        ;  YES:EXIT MACRO
7F2D 2ABC7F   00380          LD      HL,(PTR)        ;GET PTR TO NEXT CHAR.
7F30 7E       00390          LD      A,(HL)          ;GET NEXT CHAR.
7F31 B7       00400          OR      A               ;ZERO (END OF MACRO)?
7F32 2819     00410          JR      Z,MACEND        ;  YES:EXIT MACRO
7F34 3C       00420          INC     A               ;0FFH (END OF BUFFER)?
7F35 2816     00430          JR      Z,MACEND        ;  YES:EXIT MACRO
7F37 3D       00440          DEC     A               ;RESTORE CHARACTER
7F38 23       00450          INC     HL              ;POINT TO NEXT CHAR.
7F39 22BC7F   00460          LD      (PTR),HL        ;SAVE PTR.
7F3C FE25     00470          CP      '%'             ;USR VARIABLE?
7F3E 2007     00480          JR      NZ,NOUSR        ;  NO: SKIP MODE CHANGE
7F40 3E02     00490          LD      A,2             ;  YES: CHG TO USR MODE
7F42 32BB7F   00500          LD      (MODE),A        ;       .
7F45 AF       00510          XOR     A               ;RETURN NULL CHARACTER
7F46 C9       00520          RET                     ;       .
7F47 FE26     00530 NOUSR    CP      '&'             ;MACRO REPEAT?
7F49 C0       00540          RET     NZ              ;  NO: RETURN CHARACTER
7F4A AF       00550          XOR     A               ;  YES: RETURN NULL CHAR.
7F4B 1806     00560          JR      MACREP          ;       .
7F4D 4F       00570 MACEND   LD      C,A             ;SAVE CHAR. IN C
7F4E AF       00580          XOR     A               ;CHANGE TO REGULAR MODE
7F4F 32BB7F   00590          LD      (MODE),A        ;       .
7F52 79       00600          LD      A,C             ;RESTORE CHAR. FROM C
7F53 21BF7F   00610 MACREP   LD      HL,MACBUF       ;RESTORE MACRO PTR.
7F56 22BC7F   00620          LD      (PTR),HL        ;       .
7F59 C9       00630          RET                     ;AND RETURN
7F5A CDB87F   00640 REGKEY   CALL    KBD             ;REGULAR MODE: GET CHAR.
7F5D 4F       00650          LD      C,A             ;SAVE IT IN C
7F5E 3A8038   00660          LD      A,(3880H)       ;SHIFT KEY DOWN?
7F61 B7       00670          OR      A               ;       .
7F62 79       00680          LD      A,C             ;(RESTORE CHAR. FROM C)
7F63 C8       00690          RET     Z               :  NO: RETURN CHAR.
7F64 FE0D     00700          CP      13              ;SHIFT ENTER?
7F66 280A     00710          JR      Z,MACDEF        ;  YES: BEGIN MACRO DEF.
7F68 FE20     00720          CP      ' '             ;SHIFT 0?
7F6A C0       00730          RET     NZ              ;  NO: RETURN CHARACTER
7F6B 3E01     00740          LD      A,1             ;  YES: MACRO INVOKE MODE
7F6D 32BB7F   00750          LD      (MODE),A        ;       .
7F70 AF       00760          XOR     A               ;RETURN NULL CHARACTER
7F71 C9       00770          RET                     ;       .
7F72 3E5E     00780 MACDEF   LD      A,94            ;BEGIN MACRO DEFINITION
7F74 CD3300   00790          CALL    0033H           ;PRINT RIGHT ARROW
7F77 21BF7F   00800          LD      HL,MACBUF       ;GET PTR TO MACRO BUFFER
7F7A 22BC7F   00810          LD      (PTR),HL        ;SAVE IT
7F7D E5       00820 NEXTCH   PUSH    HL              ;GET CHAR. FROM KBD
7F7E CDB87F   00830          CALL    KBD             ;       .
7F81 E1       00840          POP     HL              ;       .
7F82 B7       00850          OR      A               ;NULL?
7F83 28F8     00860          JR      Z,NEXTCH        ;  YES: TRY AGAIN
7F85 FE0D     00870          CP      13              ;ENTER?
7F87 2015     00880          JR      NZ,KEYOK        ;  NO: REGULAR KEY
7F89 3A8038   00890          LD      A,(3880H)       ;  YES: SHIFTED?
7F8C B7       00900          OR      A               ;       .
7F8D 3E0D     00910          LD      A,13            ;       .
7F8F 280D     00920          JR      Z,KEYOK         ;  NO: REGULAR ENTER
7F91 7E       00930          LD      A,(HL)          ;CHECK FOR END OF BUFFER
7F92 3C       00940          INC     A               ;IS IT?
7F93 2802     00950          JR      Z,DEFOUT        ;  YES: FORGET IT
7F95 AF       00960          XOR     A               ;  NO: SET MACRO END
```

```
7F96 77        00970          LD      (HL),A          ;       .
7F97 3E5D      00980 DEFOUT   LD      A,93            ;PRINT LEFT ARROW
7F99 CD3300    00990          CALL    0033H           ;       .
7F9C AF        01000          XOR     A               ;RETURN NULL CHARACTER
7F9D C9        01010          RET                     ;       .
7F9E FE08      01020 KEYOK    CP      8               ;IS CHAR. A BACKSPACE?
7FA0 2007      01030          JR      NZ,PUTBUF       ;  NO: PUT IT IN BUFFER
7FA2 2B        01040          DEC     HL              ;  YES: BACKUP POINTER
7FA3 BE        01050          CP      (HL)            ;BACKED UP TOO FAR?
7FA4 280F      01060          JR      Z,MOVFWD        ;  YES: FORGET IT
7FA6 2B        01070          DEC     HL              ;  NO: DECREMENT AGAIN
7FA7 1807      01080          JR      KEYVID          ;BACKSPACE DISPLAY
7FA9 4F        01090 PUTBUF   LD      C,A             ;SAVE CHAR. IN C
7FAA 7E        01100          LD      A,(HL)          ;CHECK FOR END OF BUFFER
7FAB 3C        01110          INC     A               ;IS IT?
7FAC 28CF      01120          JR      Z,NEXTCH        ;  YES: IGNORE CHAR.
7FAE 79        01130          LD      A,C             ;RESOTRE CHAR. FROM C
7FAF 77        01140          LD      (HL),A          ;PUT INTO BUFFER
7FB0 E5        01150 KEYVID   PUSH    HL              ;DISPLAY CHARACTER
7FB1 CD3300    01160          CALL    0033H           ;       .
7FB4 E1        01170          POP     HL              ;       .
7FB5 23        01180 MOVFWD   INC     HL              ;BUMP POINTER
7FB6 18C5      01190          JR      NEXTCH          ;BACK FOR ANOTHER CHAR.
7FB8 C30000    01200 KBD      JP      $-$             ;GET CHAR. FROM KEYBOARD
7FBB 00        01210 MODE     DEFB    0               ;START IN REGULAR MODE
7FBC BF7F      01220 PTR      DEFW    MACBUF          ;POINTS TO MACRO BUFFER
7FBE 08        01230          DEFB    8               ;BLOCKS THE BACKSPACE
0040           01240 MACBUF   DEFS    64              ;MACRO BUFFER
7FFF FF        01250          DEFB    0FFH            ;END MARKER FOR BUFFER
7EF0           01260          END     START           ;AUTOSTARTS AT START
00000 TOTAL ERRORS
```

The Source

T R Dettmann

Tie into this computer net and get information on Cars, Consumer affairs, Energy Saving, Wines. Real Estate and more!

The TRS-80 has made unprecedented computing power available for home and small business use. This has allowed the repetitive accounting jobs to be given to a mechanical servant that can follow our instructions without problems. But it isn't enough.

A microcomputer in the home or office can be a real aid, but to realize its full potential, we need to have more than the microcomputer can do alone, we need time sharing.

Time sharing has been around for a number of years. In fact, time sharing services are going through a boom period. Locally, many small computer users are using the services of bank computers, time sharing services, and university computer centers.

Using local services makes large computer power available for complex applications. But most such computers are real for special purpose uses. Time sharing services often specialize in a particular market such as construction or CPA's, Universities are primarily educational institutions and so their software reflects that specialization, and we know what banks specialize in.

The small business or home computer user has far different needs from the large user. Some of the dreams of Science Fiction writers for such users have included Electronic Mail, the ability to order goods and materials from your home, the ability to plan a trip from home including making plane, train and car reservations.

Would you like these capabilities and more, then you might like the SOURCE.

WHAT IS THE SOURCE?

Telecommunications Corporation of America (TCA for short) of McLean, VA is making available their PRIME computer system over a nationwide computer network known as TELENET.

The combination of TELENET, which has connections in 191 cities, and the SOURCE is a one-two punch of computing power that is available to most potential users for a local phone call. From my location in Kirkland, WA, I can make a local phone call and be on-line with the McLean, VA computer.

To get on the SOURCE here in my area, I call the local TELENET number and ask it to connect the circuit for the SOURCE. Then, when asked by the SOURCE ("DIALCOM PRIMESHARING"), I give my ID code which is a combination of an account number and password. Once I am recognized by the system, I am ready to take advantage of the 2000 or so programs available.

WHAT'S AVAILABLE?

There is obviously too little space here to list every program available on the SOURCE, but there are some major programs and groupings of programs that will give you the flavor of the uses to which you can put the system.

First, Electronic Mail. The SOURCE gives you several options. MAIL is a system that allows you to send short letters to other users if you know their account numbers (there is a directory of users that can be searched to give you the names and numbers of other users. Since you put yourself on the directory, it only has those names that are interested in talking.).

Even more fun to use is the CHAT system which allows you to TALK to other users through the system. If you set up a time to meet someone through the MAIL system, you can CHAT from one side of the country to the other for your normal connect charges.

VOICEGRAM allows you to call a toll free phone number from anywhere in the United States and get messages into the SOURCE MAIL over the phone without a terminal. An example might be an executive whose secretary is using the SOURCE might phone in a message for her and be sure she will get it when she logs on.

DATAPOST, which was not operational at the time of this writing, is billed as a real mail system which will allow you to type a letter into the SOURCE and have it delivered the next day, anywhere in the United States.

DATA BASES

Mail can be nice, but my major reason for signing up with the SOURCE was for access to the most sophisticated data base system available to the general public for this kind of money.

What would you like to see, today's feature stories from United Press International? Or how about last week's? Would you like to find out what CARTER had to say last week about ENERGY? The UPI data base makes this information available to you directly in your home. You can search the data base with keywords for stories of interest. It is even possible to search for combinations of keywords.

The UPI can be searched in General, Business, or Sports categories. The New York Times data base is also available as well as such business oriented data bases as Bond, Commodity, Futures, and Stock information.

You can get information from the SOURCE on Cars, Consumer affairs, Energy Saving, Wines and Real Estate. More data bases are being connected as time goes on. The TCA has continuing plans for expansion so that over the years, more and more resources will become available.

APPLICATIONS PROGRAMS

The power of the SOURCE is expanded considerably by the applications programs available to the user. For example, the businessman has available such programs as Payroll, Accounts Receivable, Accounts Payable, General Ledger, and many more.

The programmer will find FORTRAN, BASIC, COBOL, RPG or Assembly Language. PASCAL as well as other languages are possibilities for the future. Statistical Processing can be done using SPSS, the Statistical Package for the Social Sciences, a powerful but simple package for advanced statistical processing.

Data Base management can be done with the powerful MIDAS data base manager. Create your own library catalog for your personal books, create an index of articles from your magazines, keep your phone list or your mail list. Any or all of these are possible applications.

Educational programs presently available include language drills, student aid information, and grade school level drills. You can also make use of a powerful text editor to write programs, letters, etc.

SERVICES

As if it wasn't enough to have all the capabilities we have already covered, you can also join a travel club that allows you to review airline schedules, make air, hotel, or car reservations, and be eligible for money saving packages and discount arrangements.

If you are moving to another area, you can list your home for sale with the real estate data base. You can also use your credit card to buy such things as stereos, computers, and other goods through the system.

A system of personal finance programs are available to balance your checkbook and you can use the

MAIL system to maintain a personal calendar with reminders for birthdays, etc., which will come out on the appropriate date.

EVALUATION

I have been on the system for a little over a month as of this writing. In that time I have made a determined effort to try as much as I could. In that effort, I found some things particularly handy.

After doing a keyword search of the user directory, I found 31 users with TRS-80's who had listed themselves on the directory. I have since made contact with some of them through the MAIL and have found help for some work I am doing with Solar Heating as well as information about programs and experiences that other users have had.

The MAIL system has made it possible to contact other people around the nation with similar interests and share what we have gained individually. The NEWS data bases have made research on current information much easier since I can do a Keyword search and thereby locate only those articles that interest me. Once, doing a demonstration I searched the UPI for a day for the Keyword SEX and turned up two articles!

Overall, I have found myself coming back over and over again to the SOURCE for information and usually coming back satisfied. I can truely say I am impressed

The cost of the system is also low by comparison with similar services. The SOURCE has a one time connect charge of $100.00 (dumb terminal connection) and a normal use charge of $2.75 per hour between 6 in the evening and 7 in the morning, and $15.00 per hour during normal daytime hours. There is a minimum charge of $0.10 per terminal session and $5.00 per month as well as a storage charge of $0.033 per 2048 character block per day of disk storage in use.

For comparison, a local University computing center in the area charges $8.80 per hour connect charges for off campus users and $0.036 per block disk storage with a $0.15 minimum terminal charge. Some local time sharing services have minimum monthly charges of $100 or more and I recently met a doctor who pays over $800 per month to a time sharing service for his accounting functions.

WHAT DO YOU NEED?

In order to connect to the SOURCE, you need a MODEM, an RS-232, and a TERMINAL program for your TRS-80. The Radio Shack terminal program works well, but it is a strictly "Dumb" terminal program. In other words, it allows you to talk to the computer and get messages back, but you can not print them, or save them on disk, nor can you send material you have written on your TRS-80.

Several programs are available to make your TRS-80 a "Smart" terminal so you can prepare information on your system, store it locally on disk, transmit it while on line, and recover output to your disk or printer.

Once connected, you have to be careful to properly use "Control" codes (shift down arrow + letter on Radio Shack's TERM program). In particular, it seems that Radio Shack's TERM program insists that you press each combination of keys for each letter you need (kind of like repeating an INKEY$ function.).

Knowing what I now know, would I connect again? To that the answer is: Yes. I am looking for future expansion, more data bases, and a realization of one of the dreams of the Science Fiction writers: Electronic Information Service in the home.

WANT MORE INFORMATION?

If you need more information, write the Telecommunications Corp of America, 1616 Anderson Road, McLean, VA 22102 or call toll free 1-800-336-3330.

If you get on the system, MAIL me a letter or call for a CHAT. I'm TCC024.

A *Simple* BASIC (NO hardware) UPPER/lower CASE MOD

Here is a simple BASIC program to give you UPPER/lower case without hardware modification. Attach it to the beginning of your letter writing or text editing program. No, you don't see lower case on the screen, but your printer will now print in upper/lower case.

The original No-Hardware lowercase article appeared in the Jul-Aug 79 issue of 80-US. Much of the difficulty in adapting that machine language program from 16K Level II to Disk systems was due to line 190, which returns to BASIC. To use it in a 32 or 48K Disk system, re-origin the program, determine the new memory size, and change line 190 from: 190 JP 1A19H ;RETURN TO BASIC to: 190 JP 402DH ;RETURN TO DOS. When you assemble the program with the new origin and the corrected line 190, create a /CMD file on disk which can be called from DOS READY.

Leo Christopherson

In the July-August 79 issue of 80-US Phil Pilgrim, in his SYSTEM/COMMAND column, showed us his beautiful UPPER/lower case software routine. Much of that routine is involved with placing a small graphics character just before a shifted letter on the screen so the operator will be able to see which letters have been shifted. However, you may find this to be a mixed blessing since, even though this character does not show up on the hard copy printing, it does take up space on the screen and can somewhat confuse one's judgement about line lengths.

Here is a "string packing" version of the third portion of Phil's program which will reverse the shift of the alphabetic characters during an "LPRINT" but will not affect the screen display.

The actual twenty-one Z-80 commands are:

PUSH,AF LDA,C CPN 32D CPN 123D CCF JRC 8D CPN 97D JRC 4D LDA,C XOR 32D LDC,A POP,AF JP NOP NOP

When these commands are written as DECIMAL numerals for the DATA statements to follow, we have: 24b,121,246,32,254,123,63,56,8,254,97,56,4, 121,238,32,79,241,195.

The two NOPs from the above are left out now. They represent an address which will be POKEd in later.

The BASIC routine would be placed in your program as follows:

```
20 UL$="....................."(21 decimal points)
21 U1=PEEK(VARPTR(UL$)+1):
    U2=PEEK(VARPTR(UL$)+2)
22 U0=U2*256+U1
23 DATA 245,121,246,32,254,123,63,56,8,
    254
24 DATA 97,56,4,121,238,32,79,241,195
25 RESTORE:FORN=0TO18:READD:
    POKEU0+N,D:NEXTN
26 POKEU0+19,PEEK(16422):
    POKEU0+20,PEEK(16423)
27 POKE16422,U1:POKE16423,U2
28 DELETE 21-28
```

To use the above, any other software driver routine for the printer would be entered before the program is "RUN" so that the locations 16422 and 16433 will be the correct LPRINT address. The above line 20 will become part of the BASIC program. As the program is "RUN" the first time, lines 21 through 28 are DELETED to avoid problems when the program is run again while still in the machine. Also, remember the LPRINT vector now will point to the start of UL$ in line 20. If the program is "NEWed" and another is loaded, LPRINT will still look for the start of UL$ which won't be there. To avoid a crash when you change to a different program, the machine should be powered up again to restore the original contents of locations 16422 and 16423.

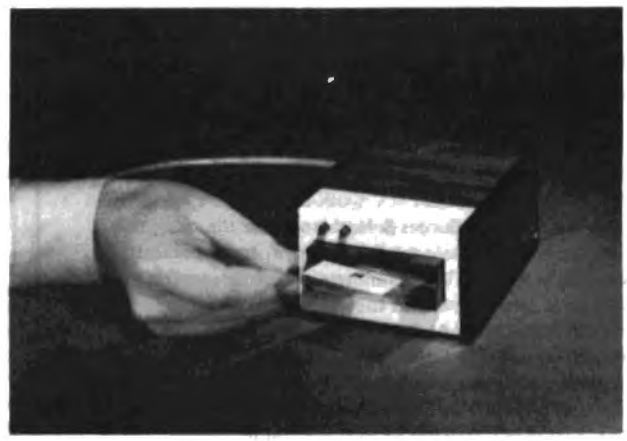
Note that if you change these line numbers to make this routine fit your program better, and if you use DOS, be sure that what is shown here as line 20 will still be rather near the beginning of your program. The advantage gained in string packing is that since this routine is located in the keyboard part of RAM, it will work in both Level II and DOS BASIC without special addressing problems.

IMPORTANT

As you may probably know, NEWDOS+ will not allow a lowercase (shifted) character to slip by. It changes all shifted characters to uppercase. The reason for this is because people were using lowercase for filenames and passwords, and then were unable to access their programs since the TRS-80 displays uppercase. Unfortunately, this causes some problems with programs (like this one). To disable this function in NEWDOS or NEWDOS+, simply POKE 21004,0. To enable it, POKE 21004,32. NEWDOS users may add this statement to the end of line 22 above, i.e.,

22 U0=U2*256+U1:***POKE21004,0*** ●

USER REPORT
The Exatron Stringy Floppy



The Exatron Stringy Floppy

Michael Keller, Solon, ME
(With further enlightenment provided by Leo Christopherson)

One of the real problems for 4 and 16K Level II TRS-80 users is the audio cassette. Storage and transfer of programs and data is at best slow and at its worst, you begin to doubt your sanity in buying such a beast.

Until recently, the only available options were "byte boxes" (DC Ma Meters), to aid in evaluating the input level, or floppy disks with their attendant cost (about $800 including expansion interface). Happily there has emerged a third alternative that loads a program nearly 15 times faster than cassette (7200 vs 500 baud), costs about $250. and, at least in my limited experience, *always* saves and loads a program first time around.

Sound too good to be true? The Exatron Stringy Floppy for the TRS-80 from the Exatron Corp. Santa Clara, CA is all of that and more.

The ESF(Exatron Stringy Floppy) is a well detailed, finished product being produced by a firm that gives a substantial impression of friendliness and support for users, with a 30 day unconditional money back guarantee, a one year warranty and a toll free number for any problems or additional information.

Physically, the ESF consists of a drive module, a flat cable for connection to the keyboard expansion port and a small sealed unit power supply. Exatron also sells an adaptor called a Bus-Ex which allows multiple access to the expansion port so that printer you have been thinking about can also be connected without problems.

Exatron has utilized digital quality magnetic tape, wound as a continuous loop within a miniature cartridge, called a *wafer*. These are about 1½ x 2½ x 3/16" in size and are available in 5, 10, 20, 50 and 75 foot lengths. As an example, a 16K program essentially fills a 20 foot tape and *loads in 24 seconds*. Since the tape is an endless loop, rewinding is obviated and worst case search and load time for a 16K program on a 50 foot wafer is only 60 seconds: not bad for a tape puller! That same 50 foot tape also has over half the storage capacity (48K) as does Radio Shack's non-DOS containing disk.

Controlling functions for the ESF are contained in the on-board electronics in an EPROM which overlays in the reserved memory area between 3000H and 37DDH in the TRS-80. It is also my understanding that as upgrading of the control program of EPROM is made by the company, the unit can be returned for upgrade or they will allow the user to insert the new EPROM in the field.

The ESF user manual (mine is a preliminary), is a real gem. As a Laboratory Manager, I have read many manuals for equipment of all kinds and prices; this is one of the most professionally done for clarity and completeness. In comparison, I recently bought a disk drive for our lab TRS-80 and received not even a scrap of paper. The manual covers general description, installation and checkout, operations with BASIC, assembly language operations, care and maintenance, and theory of operation with schematics.

USING THE ESF

Exatron has provided for user certification of tape integrity in a manner somewhat similar to disk: A continuous digital pattern is written onto a new tape and then verified. Saving a BASIC program on wafer is similar to cassette in that the command is @SAVE X, where X=1 to 9, but the files must be sequential. Another nice feature is that after each save the ESF automatically cycles and verifies the contents of the save.

The unit is virtually self checking and error messages are displayed if needed. Using @LOAD could produce PARITY ERROR or CHECKSUM ERROR: one or more bits did not load correctly. When using @SAVE the

wafer is automatically checked for the presence of a reflective sticker which when removed produces a WRITE PROTECTED error if you try and save on that wafer. One other message you can run into is TAPE TOO SHORT: The tape is full.

Actually, the only fault that I feel the unit has is in handling data files - it dosen't. That is not to say that the capability isn't there; under the section on assembly language programming one of the assembly language subroutines accessable is a "write data". To use it you must be able to load the HL register as a pointer to the first byte, load the BC register with the number of bytes to be saved and then CALL 3006H. In all fairness however, I understand that data handling is being addressed by Exatron, and an update is emanent.

In summary, if you spend more time with your TRS-80 than an occasional game of Star-Trek and you can't afford, or don't want, the hassle of disk, then Exatron's Stringy Floppy is for you. ●

The way Mr Keller has it set up.

ANOTHER VIEW

(In which Leo Christopherson adds his view of the Exatron Stringy Floppy to those alreay presented by Mr Keller.)

The ESF is a reliable, efficient, and surprisingly modestly priced digital tape machine which, through personal experience, I can wholeheartedly recommend to any TRS-80 user.

I have used a 3.2 version of the ESF now for a few months and have already found it to be indispensable. It has been called on many times while I was working up my latest program, and it has performed flawlessly every time.

I would like to add a few comments about the additional features of the 3.2 version as compared to the 3.1 version.

● One can @SAVEn, @LOADn, and @NEWn, with n up to 99 now rather than just 9.

● Machine language programs may be @SAVED and @LOADED.

For example, @SAVE3,32650,110 will save as file 3, the machine language program starting at absolute memory address 32650 and having a length of 110 bytes. To get the program back from tape, power up and memory protect at 32650, then after calling in the ESF, execute @LOAD3. One can also cause an auto-start into the machine language routine. Just save it as @SAVE3,32650,110,32650 The last 32650 is the auto starting address. These machine language routines can be intermixed on tapes with BASIC programs. And another excellent feature is that the command @LOADn can be used in a BASIC program as in (line)20 @LOAD3. I have this feature included in the BASIC text editor I use. To use the program, I memory protect at 32620, then execute SYSTEM, /12345 (to activate the ESF), then @LOAD1. This loads the BASIC 8K program into memory. Then when RUN is executed, and @LOAD2 in line 20 of the BASIC program causes the machine language routines with the TRS232 interface software and the upper/lower case modification to be loaded at 32620, after which the BASIC program continues.

● One can now "overlay" programs in BASIC. For example, the command @LOAD1, from the keyboard could bring in a data collecting program. Then later, with all the data in, the program will route itself to a line with the command @LOAD2. This @LOAD2 will load a new BASIC program, lets say the data processing program. It will be placed over the first program but *without* affecting variables, arrays or strings. (Except where they were defined directly in program #1, such as: 100 A$="12345". This string's address points to a byte in line 100 of the original program and that string would probably be written over by the new program). So, one would want the first program which is loaded to be the longest so that later overlays would not write up into the memory where variable, array and string addresses were set up by program #1

● Another new feature of value to many users is the ability to "chain in" up to 15 more tape drives. The original ESF unit with the controlling ROM is the #0 drive. Any other drive unit may be addressed easily. @#3SAVE4 would save a program as file #4 on the drive #3 (assuming you have at least #0-3 drives, of course.)

● It appears that saving and recovering data is possible with the 3.2 ESF. A software tape is needed and it was not available to me. With it the following commands are made useable: @OPENn, @WA,B(3),C$,etc (for writing data), @RA,B(3),C$,etc (for reading data), and @CLOSEn.

Well now, with all this taken into account, along with its price, I'd say this little mind boggling machine is just about the best add-on around for the TRS-80! ●

Notes on BASIC

Here is a Disk Basic method for making titles. Using the Define Function (DEFFN) command in a program, we define the function:

```
DEFFN HRD$(A$,N) = STRING$(64,61)+
  STRING$(32-N/2,32)+A$+CHR$(13)
  +STRING$(64,61)
```

Then, by using CLS:PRINT FNHDR$("TEST",4), we get:

```
================================================
                      TEST
================================================
```

at the top of the display.

Note that this routine must be used *inside* a BASIC program, since DEFFN will cause an ILLEGAL DIRECT error in command mode. Also be sure to CLEAR enough space for strings.

INKEY$ routines can be used to provide discrimination between types of data input. As an example, the routine below inputs only numbers. It does that by making sure that input characters have a range in ASCII value from 48 (number 0) to 57 (number 9). Any character not in the allowed range is rejected. Only ASCII value 13, the ENTER key, will terminate the input routine.

```
500 REM NUMBER INPUT
510 IN$=""
520 C$=INKEY$:IFC$=""THEN520
530 IFASC(C$)=13THEN IN=VAL(IN$):RETURN
540 IFASC(C$)=8THEN IF LEN(IN$)X0THEN
    PRINTC$;:IN$=LEFT$(IN$,LEN(IN$)-1):
    GOTO520ELSE520
550 IF(ASC(C$)> =48)AND(ASC(C$) <=57)THEN
    PRINTC$;:IN$=IN$+C$:GOTO520ELSE520
```

Note ASCII 48 is number 0, ASCII 57 is number 9, so this checks to see that the key pressed is between 0 and 9 before it is added to the string. In this way the IN$ will have only numbers and no letters.

Many programming systems have a common storage area where you can store variables to pass from one program to another. This allows you to transfer variables without disk accesses in the middle of a program. This type of operation makes your program execute faster.

In TRS-80 BASIC, this capability is not provided, but you can take advantage of the memory protect feature of the system to create your own common storage area. This can be done on Level II, Disk Basic, or Model II Basic.

The idea behind the technique is to protect some high memory, then use POKEs to store values there and PEEKs to bring them back. On a single POKE, this is obviously limited to a maximum of 255 (the largest number you can store in one 8 bit byte).

In order to get more range in variables, you can take 2 bytes and store an integer between them by the following:

```
450 REM N IS THE NUMBER TO STORE
460 N1=INT(N/256):N2=N-256*N1
470 POKE (M),N1:POKE(M+1),N2
```

To recover the variable N in another program, simply peek for it as follows:

```
480 REM RECONSTRUCT N
490 N=PEEK(M)*256+PEEK(M+1)
```

In both examples, M is the memory location at which to store the variable (it may be negative if greater than 32767.)

Do you need and ASCII decimal converted to HEX? Why bother with writing a routine to do it when you can let your LEVEL II ROM take care of it? If the HL register points to an ASCII decimal, then a call to 1E5AH returns with HEX in the DE register and HL pointing to the first non-decimal

---

Oh where, oh where is that editor? A call to 2E64H with a binary line number in the DE register pair will throw you into the edit mode on that line.

Returning to a BASIC program from a machine language program is a non-trivial problem in outguessing the designers of the interpreter. But they made it easy. Load HL with the location of a colon on a line before an executable statement or with the 00H that terminates the line, then call 1D1E and watch your BASIC program go.

If you should need to know what line is being processed, location 40A2H contains that line number.

You can use the PEEK functions to check the keyboard to get full repeating keyboard functions from BASIC if you are willing to sacrifice a little speed in order to get repeating keys. (Assembly language is faster, but I'll leave that technique to Phil Pilgrim). A great many things can be learned by running the following program:

```
10 REM BASIC KEYBOARD
20 CLS
30 PRINT@0,"PEEK(14337)=";PEEK(14337)
40 PRINT@64,"PEEK(14338)=";PEEK(14338)
50 PRINT@128,"PEEK(14340)=";PEEK(14340)
60 PRINT@192,"PEEK(14344)=";PEEK(14344)
70 PRINT@256,"PEEK(14352)=";PEEK(14352)
80 PRINT@320,"PEEK(14368)=";PEEK(14368)
90 PRINT@384,"PEEK(14400)=",PEEK(14400)
100 PRINT@448,"PEEK(14464)=";PEEK(14464)
110 PRINT@40,"CHARACTER: ":INKEY$
120 GOTO 30
```

This program will allow you to look at the values returned by the keys and combinations of keys when you press them. The keyboard fits in memory from 14337 to 14464. Eight locations are coded one bit for each key pressed. A good example is the response of location 14400 when an arrow key is pressed. The left arrow gives 32, right arrow 64, up arrow 8 and down arrow 16. Checking PEEK(14400) for these values will allow you to use the arrows as you want. Try keyboard decoding with PEEK statements alone. You will find it slow, but in some cases useful. A good example of a possible use is where you want to be able to repeat the entry on a particular key without removing your finger or you want to create special codes (pressing both right and left arrow gives 96).

A Cassette Library

For 16K Level II
Roger Amidon, Arlington, VA

This program was designed to maintain directories of cassette programs, with specific cassette numbers and index values maintained. The files are maintained in original entry order, but will list entries also in alphabetic sequence, or cassette/index order *without sorts*.

This program uses a technique called "chaining", a much discussed method, but never with a practical example. This program could easily maintain mailing lists, paper routes, or other multiple sequence lists without much change except to entry headings and listing titles. The restriction is that the entire file must fit into memory.

BREAKDOWN BY OPTION

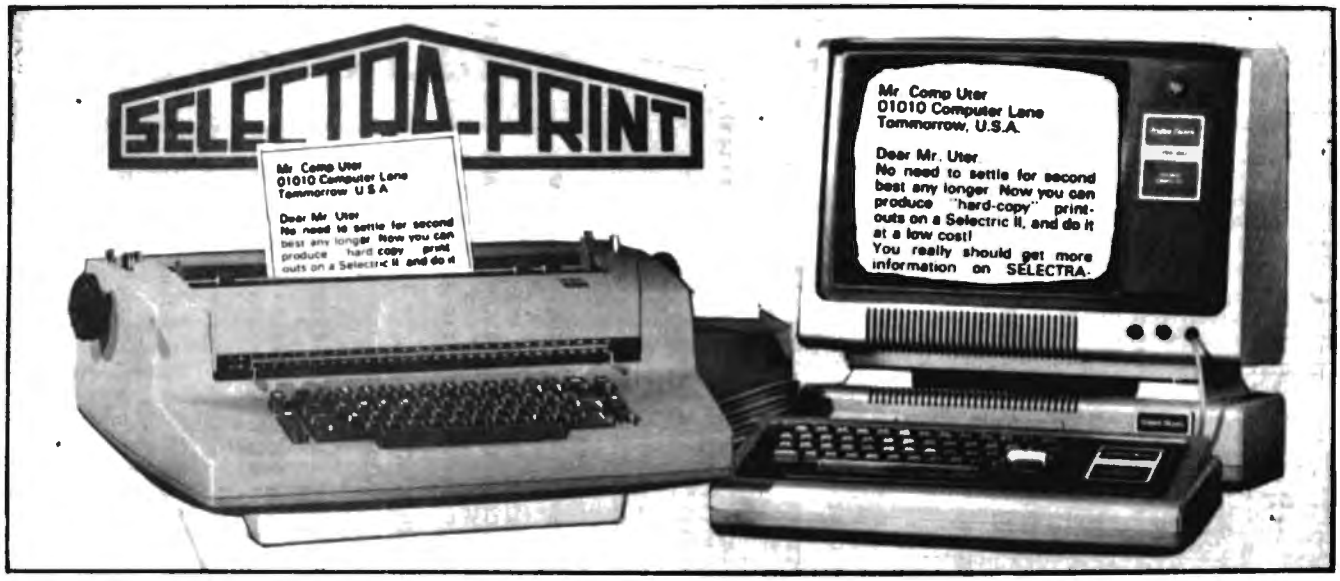
1. First, a warning. If a file is already in memory, a warning is issued: "* * WARNING * * file already in core (memory) will be ruined. To continue, enter 'Ignore'". Anything other than the word ignore will cause a return to the option list. "Ignore" causes a prompt to ready the cassette for playback. As tape is loaded, the library name and "update cycle"(#of times the file has been updated) is printed to the screen. Also, each program name in the file and the order in which it was entered is displayed as it loads.
2. Lists library name, update cycle, then *all* programs (name, cassette #, index #, and copies at that index) in the order in which they were entered into the file. Listing is one screen-full at a time, and the user is told when the end of the list has been reached.
3. This is where the actual entries are made. You are asked for name, cassette number (assigned by user; *DO NOT USE 0!*), tape index # (the number in the little window on the recorder), and number of copies at that index. You are then given the sequence number of that entry, and the option of making more entries or returning to the option list.
4. This is used to delete a name from the file. Simply enter the name of the program you wish deleted, and the program will search and destroy. If the program you enter is not found, you will be so informed and given the option to either try again or return to the option list. The search routine starts at the bottom (last entry) and works it's way toward the first entry, thereby making corrections of multiple entries simple and direct.
5. This gives a list of all entries by cassette number. The list is given in the order: cassette number, index number, file (name), and number of copies. The listing is only one screen-full at a time (same as option 2).
6. Same as option 2, except that programs are listed alphabetically by program name.
7. To save the file to tape. File number and sequence number are displayed on the screen as the tape is saved.
8. The same warning parameters as in option 1 apply. If you get past that, this initializes the file and all counters. Also has provision for making a name for the file.

GENERAL NOTES

Everything is printed in 32 character mode. The re-entry vector is "GOTO 20" in case you should bomb. This will keep you from destroying your data and the counters. ●

```
10  CLEAR 500:DIM BK$(50),CAS%(50),LBK%(50),NBK%(50),IDX%(50),
    LDX%(50),NDX%(50),CPY%(50)
20  CLS:PRINT CHR$(23)
30  PRINT"R W AMIDON":PRINT"WELTON SYSTEMS - 04/25/79"
40  PRINT"5436 N 21 ST":PRINT"ARLINGTON, VA  22205":PRINT
50  PRINT"ALL RIGHTS RESERVED.";PRINT
60  INPUT"'ENTER' TO CONTINUE.";C$
70  CLS: PRINT CHR$(23)
80  GOSUB 1600
90  IF NM$ ="" THEN 110 ELSE PRINT TAB(4)"DIRECTORY NAME: ";NM$
100 PRINT TAB(6)"UPDATE CYCLE #";CY%
110 PRINT:PRINT"FUNCTION - - - - - - ENTER":PRINT
120 Q%=-32768
130 PRINT"LOAD FILE FROM TAPE  . 1"
140 PRINT"LIST DIRECTORY . . . . 2"
150 PRINT"ADD ENTRY  . . . . . . 3"
160 PRINT"DELETE ENTRY . . . . . 4"
170 PRINT"LIST BY CASSETTE . . . 5"
180 PRINT"LIST BY NAME . . . . . 6"
190 PRINT"DUMP FILE TO TAPE  . . 7"
200 INPUT"INITIALIZE DIRECTORY . 8";Q%
210 IF Q%<9 AND Q%>=1 THEN GOTO 230 ELSE INPUT
    "**INVALID ENTRY** RETRY.";Q%
220 GOTO 210
230 ON Q% GOTO 240,390,540,860,1130,1370,1220,1460
240 CLS:PRINT CHR$(23)
250 GOSUB 1600
260 PRINT TAB(6)"LOAD FILE FROM TAPE":PRINT
270 GOSUB 1500
280 INPUT"READY CASSETTE IN PLAY MODE.   HIT ENTER WHEN READY";C
290 INPUT #-1,NM$,CY%,CNT%
300 PRINT "LIBRARY NAME: ";NM$,"LAST UPDATE CYCLE #";CY%
310 CY%=CY%+1
320 FOR I%=1 TO CNT%
330 INPUT #-1,BK$(I%),LBK%(I%),NBK%(I%),CAS%(I%),IDX%(I%),
    LDX%(I%),NDX%(I%),CPY%(I%)
340 PRINT@ 512, I%;BK$(I%);"      "
350 NEXT I%
360 PRINT "FILE LOAD COMPLETE"
370 INPUT "HIT ENTER TO CONTINUE.";C
380 GOTO 70
390 CLS:PRINT CHR$(23):GOSUB 1600
400 PRINT TAB(8)"LIST DIRECTORY":PRINT:GOSUB 420
410 GOTO 460
420 IF CNT%<>0 THEN 450 ELSE PRINT"* * NO FILE TO LIST * *":PRINT
430 INPUT"HIT ENTER TO CONTINUE";C
440 GOTO 70
450 PRINT "LIBRARY NAME: ";NM$,"UPDATE CYCLE #";CY%:PRINT:RETURN
460 I%=1:J%=7
470 PRINT"FILE    ";"CASSETTE ";"INDEX  ";"# COPIES  "
480 IF I%>CNT% THEN 520
490 PRINT BK$(I%);TAB(9)CAS%(I%);TAB(16)IDX%(I%);TAB(26)CPY%(I%)
500 I%=I%+1:IFI%>CNT% THEN 520
510 J%=J%+1:IF J%<15 THEN 490ELSE J%=1:INPUT C:GOTO 470
520 INPUT"* END OF LISTING *";C
530 GOTO 70
540 CLS:PRINT CHR$(23)
550 GOSUB 1600
560 PRINT TAB(10)"ADD ENTRY":PRINT
570 IF NM$<>"" THEN 600 ELSE PRINT "* * NO FILE TO ADD TO!! * *"
```

```
580 INPUT"HIT ENTER TO CONTINUE";C
590 GOTO 70
600 CNT%=CNT%+1:I%=CNT%
610 C%=-32767:CAS%(I%)=C%:IDX%(I%)=C%:CPY%=C%
620 INPUT"ENTER ENTRY NAME.";BK$(I%)
630 IF BK$(I%)="" THEN 620
640 INPUT"ENTER CASSETTE NUMBER.";CAS%(I%)
650 IF CAS%(I%)=C% THEN 640
660 INPUT"ENTER TAPE INDEX NUMBER.";IDX%(I%)
670 IF IDX%(I%)=C% THEN 660
680 INPUT"ENTER # COPIES AT THIS INDEX";CPY%(I%)
690 IF CPY%(I%)=C% THEN 680
700 LBK%(I%)=0:NBK%(I%)=0:LDX%(I%)=0:NDX%(I%)=0
710 IF NBK%(0)<>0 THEN 720 ELSE NBK%(0)=I%:NDX%(0)=I%:LBK%(I%)=
  0:LDX%(I%)=0:GOTO 810
720 NW$=LEFT$(BK$(I%),6):J%=NBK%(0)
730 OLD$=LEFT$(BK$(J%),6)
740 IF NW$>=OLD$ THEN 760 ELSE LBK%(I%)=LBK%(J%):NBK%(I%)=
  J%:LBK%(J%)=I%:K%=LBK%(I%):NBK%(K%)=I%
750 GOTO 770
760 IF NBK%(J%)<>0 THEN J%=NBK%(J%):GOTO 730 ELSE NBK%(J%)=
   I%:LBK%(I%)=J%
770 NW#=CAS%(I%)*100000+IDX%(I%):J%=NDX%(0)
780 OLD#=CAS%(J%)*100000+IDX%(J%)
790 IF NW#>=OLD# THEN 800 ELSE LDX%(I%)=LDX%(J%):NDX%(I%)=J%:
  LDX%(J%)=I%:K%=LDX%(I%):NDX%(K%)=I%:GOTO 810
800 IF NDX%(J%)<>0 THEN J%=NDX%(J%):GOTO 780 ELSE NDX%(J%)=I%:
  LDX%(I%)=J%
810 PRINT"ENTRY #";CNT%;"ADDED"
820 C$=""
830 INPUT "ENTER 'C' FOR NEXT FILE ADD.";C$
840 IF C$="C" THEN 540 ELSE 70
850 GOTO 850
860 CLS:PRINT CHR$(23)
870 GOSUB 1600
880 PRINT TAB(8)"DELETE ENTRY":PRINT
890 IF CNT%>0 THEN 910 ELSE PRINT "* * NOTHING TO DELETE!! * *"
900 GOTO 580
910 C$="":INPUT"ENTER ENTRY NAME.";C$
920 NW$=LEFT$(C$,6):J%=NBK%(0)
930 OLD$=LEFT$(BK$(J%),6)
940 IF NW$=OLD$ THEN 990
950 IF NW$>OLD$ THEN 970 ELSE INPUT
   "ENTRY NOT FOUND. TYPE 'R' TO RETRY.";C$
960 IF C$="R" THEN 910 ELSE 70
970 IF NBK%(J%)=0 THEN 980 ELSE J%=NBK%(J%): GOTO 930
980 OLD$="":NW$="":GOTO 950
990 IF CNT%=1 THEN CNT%=0:NBK%(0)=0:NDX%(0)=0:GOTO 1090
1000 I%=LBK%(J%):NBK%(I%)=NBK%(J%):I%=NBK%(J%):LBK%(I%)=LBK%(J%)
1010 I%=LDX%(J%):NDX%(I%)=NDX%(J%):I%=NDX%(J%):LDX%(I%)=LDX%(J%)
1020 IF J%=CNT% THEN CNT%=CNT%-1:GOTO 1090
1030 I%=J%+1:BK$(J%)=BK$(I%):CAS%(J%)=CAS%(I%):CPY%(J%)=CPY%(J%)
1040 IDX%(J%)=IDX%(I%):NBK%(J%)=NBK%(I%):NDX%(J%)=NDX%(I%)
1050 LBK%(J%)=LBK%(I%):LDX%(J%)=LDX%(I%)
1060 K%=LBK%(J%):NBK%(K%)=J%:K%=LDX%(J%):NDX%(K%)=J%
1070 K%=NBK%(J%):LBK%(K%)=J%:K%=NDX%(J%):LDX%(K%)=J%
1080 J%=J%+1:IF J%<CNT% THEN 1030 ELSE CNT%=CNT%-1
1090 PRINT"ENTRY : ";OLD$;" DELETED."
1100 INPUT"HIT ENTER TO CONTINUE.";C$
1110 GOTO 70
1120 Q%=10:GOTO 210
1130 CLS:PRINT CHR$(23):GOSUB 1600
1140 PRINT TAB(4)" LIST BY CASSETTE":PRINT:GOSUB 420
1150 I%=NDX%(0):J%=7
1160 PRINT"CASSETTE ";"INDEX  ";"FILE     ";"# COPIES "
1170 PRINT TAB(2)CAS%(I%);TAB(10)IDX%(I%);TAB(16)BK$(I%);
  TAB(27)CPY%(I%)
1180 IF NDX%(I%)=0 THEN 1200
1190 I%=NDX%(I%):J%=J%+1:IF J%<15 THEN 1170 ELSE J%=1:INPUT C:
   GOTO 1160
1200 INPUT"* END OF LISTING *";C
1210 GOTO 70
1220 CLS:PRINT CHR$(23)
1230 GOSUB 1600
1240 PRINT TAB(6)"DUMP FILE TO TAPE":PRINT
1250 IF CNT% <> 0 THEN 1280 ELSE PRINT"* * NO FILE TO DUMP * *"
1260 INPUT"HIT ENTER TO CONTINUE.";C
1270 GOTO 70
1280 INPUT"READY CASSETTE IN RECORD MODE.  HIT ENTER WHEN READY";C
1290 PRINT #-1,NM$,CY%,CNT%
1300 FOR I%=1 TO CNT%
1310 PRINT #-1,BK$(I%),LBK%(I%),NBK%(I%),CAS%(I%),IDX%(I%),
   LDX%(I%),NDX%(I%),CPY%(I%)
1320 PRINT@ 512, I%;BK$(I%);"          "
1330 NEXT I%
1340 PRINT "FILE DUMP COMPLETE."
1350 INPUT "HIT ENTER TO CONTINUE.";C
1360 GOTO 70
1370 CLS:PRINT CHR$(23):GOSUB 1600
1380 PRINT TAB(6)"LIST BY ENTRY NAME":PRINT:GOSUB 420
1390 I%=NBK%(0):J%=7
1400 PRINT"FILE     ";"CASSETTE ";"INDEX  ""# COPIES"
1410 PRINT BK$(I%);TAB(10)CAS%(I%);TAB(18)IDX%(I%);TAB(27)CPY%(I%)
1420 IF NBK%(I%)=0 THEN 1440
1430 I%=NBK%(I%):J%=J%+1:IF J%<15 THEN 1410 ELSE J%=1:INPUT C:
   GOTO 1400
1440 INPUT"* END OF LISTING *";C
1450 GOTO 70
1460 CLS: PRINT CHR$(23)
1470 GOSUB 1600
1480 PRINT TAB(5)"INITIALIZE DIRECTORY":PRINT:GOSUB 1500
1490 GOTO 1560
1500 IF NM$="" THEN 1550 ELSE PRINT TAB(5)"* * WARNING * *"
1510 PRINT:PRINT"FILE IN CORE WILL BE RUINED."
1520 I$=""
1530 PRINT"TO CONTINUE INITIALIZATION":INPUT"ENTER 'IGNORE'";I$
1540 IF I$="IGNORE" THEN 1550 ELSE 70
1550 NM$="NONAME":CNT%=0: PRINT@256,CHR$(31);:RETURN
1560 INPUT"ENTER DIRECTORY NAME";NM$
1570 CY%=1:PRINT"DIRECTORY NAME: ";NM$, "UPDATE CYCLE #";CY%
1580 INPUT"ENTER TO CONTUNUE";C
1590 GOTO 70
1600 PRINT"+ CASSETTE LIBRARY DIRECTORY +":RETURN
1610 GOTO 1610
```



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A TRS-80 TERMINAL

Louis C Graue
Bowling Green, OH

For Level II 16K and UP

I teach mathematics at a university and like to make programs available to students on the DEC 20 system to help them learn. I have a TRS-80 at home and wanted to be able to enter programs there in comfort, rather than spend hours in the computer center. I purchased a Pennywhistle modem, and figured out how to make the TRS-80 act just like a DEC terminal.

This took quite a bit of experimenting and study to finally get the system working properly. I first tried to do it mostly with software. This worked very well at 110 baud, but at 300 baud when the text reached the bottom of the screen, scrolling took too much time and some characters were missed. I then modified the program so that scrolling was avoided by jumping back to the top. This worked very well and in fact was easier to read since the lines never jumped as they do when scrolling. However, my goal was to have the terminal perform exactly the same as those at the University. The resulting program and circuit follow.

Using a UART (Universal Asynchronous Receiver Transmitter) makes the programming simple. All you have to do is pick a port to check the DATA READY, pin 19 on the UART, and another for DATA IN and DATA OUT. The easiest port to decode is FF, but that has already been reserved for the cassette. I found it easiest to decode ports FC and FD. DATA READY is checked through port FD and FC is used for DATA IN and DATA OUT.

Calling subroutine 2BH scans the keyboard for key closure and returns its HEX value in the A register. Subroutine 33H displays the contents of the A register on the screen. To get a cursor, I had to turn it on by putting 5FH in 4022H. The DEC system returns both a line feed and a carriage return and the 33H routine does both on each of these inputs. So, to avoid double spacing, I had to screen out OAF. The TRS-80 uses the backspace to delete and sends out 08H. The DEC system requires a 7FH to delete, so the program changes the 08 to a 7F before sending it out.

That is all there is to the program. To obtain control data you need to press the shift key and the down arrow and hold them down while pressing a third key. For example, Control C is shift-down arrow-C and Control O is shift-down arrow-O. Escape is obtained by pressing the shift key and the up arrow.

The parts, less the power supply, connectors and case, cost less than ten dollars. I obtained the UART at a hamfest for five dollars, sent to a mail order house for the RS-232 driver and receiver chips (1488 and 1489), and got the rest at Radio Shack. My circuit is pressently on a Heathkit breadboard which contains a power supply. It works perfectly with wires all over the place, so layout must not be critical.

Notice that the parallel inputs and outputs of the UART are tied together. Pins of the UART not listed in the figure are left unconnected. Just three wires run to the modem. I used an RS-232 connector to match that on the Pennywhistle. Pin 1 of the 1489 goes to pin 3 of the connector, pin 3 of the 1488 goes to pin 2 of the connector, and circuit ground goes to pin 1.

To connect the circuit to the TRS-80 you need an AMP P/N 88103 40 pin edge card connector. Since there are 19 connections a 20 wire ribbon cable is needed. The pin numbers and connections are as follows: 12-out, 18-D4, 19-IN, 20-D7, 22-D1, 24-D6, 25-A0, 26-D3, 27-A1, 28-D5, 29-GND, 30-D0, 31-A4, 32-D2, 34-A3, 35-A5, 36-A7, 37-GND, 38-A6, 40-A2.

I used two ground connections just to use the extra wire. Looking into the rear of the keyboard the pins on the board are numbered with 1 on the top left, 2 is below it, 3 is next on top, etc. Mark the top of your connector so you won't plug it in wrong.

The parts are labeled in the figure by using only the last two digits of its full number. Since two 74LS02 chips were needed the second has a subscript 2. The full part numbers and pins for ground and power not shown in the figure are as follows:

UART	TR 1602A
74LS02	+5 pin 14, GND 7
74LS04	+5 pin 14, GND 7
74LS30	+5 pin 14, GND 7
74LS367	+5 pin 16, GND 8
1488	+12 pin 14, -12 pin 1, GND on 7
1489	+5 pin 14, GND 7

I wish to express my thanks to Ray Diedrichs, a graduate student in computer science, for many helpful discussions concerning this project.

●

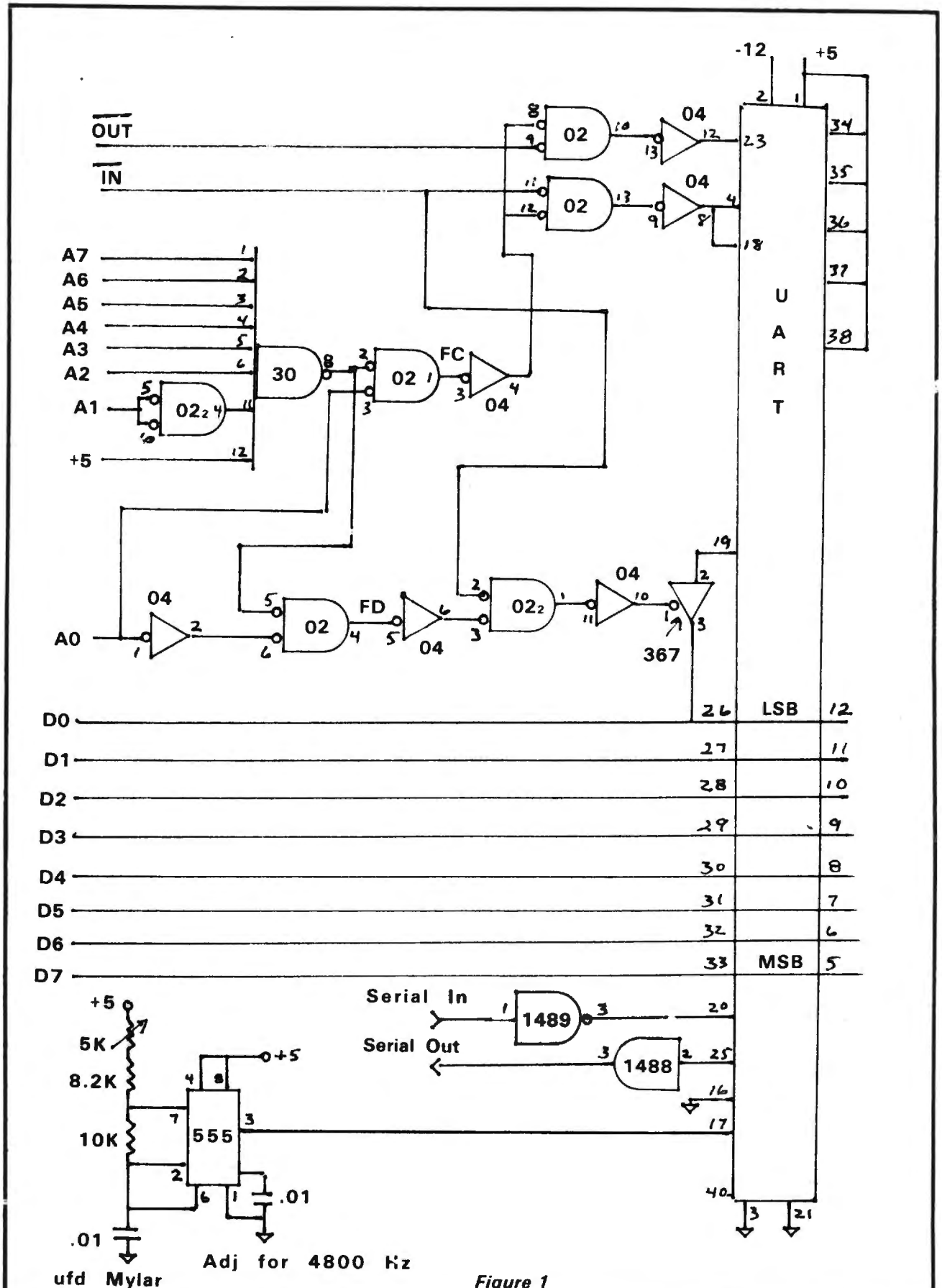
-12
+5
OUT
IN
02
04
U
A
R
T
A7
A6
A5
A4
A3
A2
A1
+5
30
FC
FD
A0
367
D0
D1
D2
D3
D4
D5
D6
D7
LSB
MSB
Serial In
Serial Out
1489
1488
5K
8.2K
10K
555
.01
ufd Mylar
Adj for 4800 Hz

Figure 1

```
                00100 ;TRS-80 TERMINAL BY K8TT (9/1/79)
 4A00           00110         ORG     4A00H
 4A00 3E5F      00120         LD      A,05FH  ;TURN ON CURSOR
 4A02 322240    00130         LD      (4022H),A
 4A05 CD2B00    00140 KEYSCN  CALL    02BH    ;CHECK KEYBOARD
 4A08 B7        00150         OR      A
 4A09 2807      00160         JR      Z,INPUT
 4A0B FE08      00170         CP      08H     ;DELETE KEY?
 4A0D CC254A    00180         CALL    Z,DEL
 4A10 D3FC      00190         OUT     (0FCH),A        ;SEND
 4A12 DBFD      00200 INPUT   IN      A,(0FDH)        ;DATA READY?
 4A14 CB47      00210         BIT     0,A
 4A16 28ED      00220         JR      Z,KEYSCN
 4A18 DBFC      00230         IN      A,(0FCH)        ;INPUT DATA
 4A1A E67F      00240         AND     07FH    ;STRIP PARITY
 4A1C FE0A      00250         CP      0AH     ;AVOID DOUBLE LF
 4A1E 28F2      00260         JR      Z,INPUT
 4A20 CD3300    00270         CALL    033H    ;PRINT ON CRT
 4A23 18E0      00280         JR      KEYSCN
 4A25 3E7F      00290 DEL     LD      A,07FH
 4A27 C9        00300         RET
 4A00           00310         END     4A00H
 00000 TOTAL ERRORS
```

Figure 2

Talked about at NCC '79, the Cover Feature of the August '79 CREATIVE COMPUTING, highly rated by COMPUTER CASSETTE Magazine and others, ADVENTURE by Scott Adams has rapidly become a classic. Each ADVENTURE is a 16K machine language program designed for you, the Armchair Adventurer! See for yourself what everyone is talking about by ordering one of our seven different Adventure tapes today from our many fine dealers, or order directly from:

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View from the Top of the Stack

By Jim Crocker

The 8th in a Series

What's a T-BUG anyway?

In this issue, we will depart slightly from what we have been doing, and pick up any beginners with a discussion of T-BUG. Before we begin though, here are some answers to the projects from last issue.

The first problem was to develop a routine which will add or subtract n, where n is greater than zero or less than 255, to all video display locations. Assume you enter the routine with the value of n in the A register and if B=0 you add n, if B does not equal zero, you subtract n.

A solution is in Figure 1. You could call this technique "mid-program modification". First, save the contents of the A register ('N') in the C register. Then load the A register with the B register and set the flags. Then load the A with 86H, which is the machine code for ADD A,(HL). Then, if the B register was not zero (the flags are still set from before), add another 10H. This turns the instruction into a SUB (HL). In either case, store what is now a legal instruction at the address called ADDSUB, and proceed onwards. With this out of the way, load the HL with the starting address of video memory, load the A register with the C register (n), and add or subtract as required. Storing the result back in (HL) completes the individual operation. Then to get the rest of the screen, INCrement the HL, and check to see if the H is equal to 40, as this will only happen when all of video memory has been checked, it can then loop back, depending upon the results.

The second problem was to develop a routine to add the data stored in n.

```
0000 4F          00100 CNGVID   LD      C,A
0001 78          00110          LD      A,B
0002 B7          00120          OR      A
0003 3E86        00130          LD      A,86H
0005 2802        00140          JR      Z,ADD
0007 C610        00150          ADD     A,10H
0009 321000      00160 ADD      LD      (ADDSUB),A
000C 21003C      00170          LD      HL,3C00H
000F 79          00180 LP1      LD      A,C
0010 00          00190 ADDSUB   NOP
0011 77          00200          LD      (HL),A
0012 23          00210          INC     HL
0013 7C          00220          LD      A,H
0014 FE40        00230          CP      40H
0016 20F7        00240          JR      NZ,LP1
0018 C9          00250          RET
0000             00260          END
00000 TOTAL ERRORS
```

Figure 1

where n is greater than 0 and less than 65535, in consecutive memory locations. Pass n to the routine in BC, the starting memory location in DE and return the sum in the HL. Ignore any overflow.

See a possible solution in Figure 2. While it may not be the most glamorous way to do it, it does get the job done. The only thing really worth mention in this program is the unique way to synthesize a LD HL,(HL) instruction which is between lines 140 and 180. Of course, we had to trade the DE and HL registers first, but the interesting thing is the technique, not the semantics.

The last project was to use the IX register to develop a method to convert ASCII code to any other code. Passing the ASCII code to the routine in C and returning the corresponding code in A.

This program (Figure 3) also uses the "mid-program modification", although in a much simpler way. As you recall, all indexed instructions use the form LD R,IX+DISP. What this program does is to get the displacement from the C and put it in place of the DISP. Of course, the table (which we put at 5000H) must be in the same order as the data you want to exchange, but that is a relatively simple matter to arrange.

T-BUG

With that out of the way, we can get on with a discourse on T-BUG, starting with a little history. Back in the time of "stone knives and bearskins" (about 5 years ago), computers were characterized by row upon row of flashing lights. (While it is true that one of the primary functions was to impress the boss that you really *did* have something wrong, and playing *Star Trek* was the only way to fix it, there was a second reason.) Each row of lights represented one of the computer's internal registers. The machine could be halted, and a good technician could tell what was going on by looking at the lights on the front

```
0000 AF        00100          XOR     A
0001 67        00110          LD      H,A
0002 6F        00120          LD      L,A
0003 EB        00130 AGN      EX      DE,HL
0004 7E        00140          LD      A,(HL)
0005 23        00150          INC     HL
0006 E5        00160          PUSH    HL
0007 66        00170          LD      H,(HL)
0008 6F        00180          LD      L,A
0009 EB        00190          EX      DE,HL
000A 19        00200          ADD     HL,DE
000B D1        00210          POP     DE
000C 13        00220          INC     DE
000D 0B        00230          DEC     BC
000E 78        00240          LD      A,B
000F B1        00250          OR      C
0010 20F1      00260          JR      NZ,AGN
0012 C9        00270          RET
0000           00280          END
00000 TOTAL ERRORS
```

Figure 2

```
0000 DD210050  00100          LD      IX,5000H
0004 79        00110          LD      A,C
0005 320A00    00120          LD      (DISP+2),A
0008 DD7E00    00130 DISP     LD      A,(IX+0)
000B C9        00140          RET
0000           00150          END
00000 TOTAL ERRORS
```

Figure3

panel. Unfortunately, as computers became more complex, the number of internal registers grew to a point where flashing lights were very impressive, but really rather unreasonable. (The Singer-Link GP-4 computer had 3 registers, the Z-80 chip has 22).

From this was born the concept of the MONITOR. It allowed the programmer to stop the program long enough to see what was going on, without going blind and crazy simultaneously, trying to figure out what 208 lights were trying to tell him. T-BUG is a monitor program (for those of you who were trying to decipher where all this was leading to). It was designed specifically for the Z-80, and is one of the least expensive ways to unlock the wonders of machine language.

USING T-BUG

T-BUG can be purchased at your local Radio Shack. Loading instructions are included for both Level I and Level II. The question, once you get it loaded, is: What am I going to do with it? Well, the most logical place to start is to look at some memory locations. To do this, type M XXXX, where XXXX is the hexidecimal address of the memory you wish to see. A look at 3C20 should result in your screen showing you: M3C20 20 (provided you cleared the screen before loading), as 20 is a space, and 3C20 is within the boundries of video RAM. You can look at any address this way, and you should really play around with it some until you feel confident it won't bite. Note that just hitting the ENTER key will print the next address and the contents thereof on the next line. To escape from this mode (back to the # prompt), just hit the X key.

Comfortable? Good, then let us move on. The next most logical place to go is to modify some memory. Get back to the display address 3C20. (M 3C20). To modify that address, simply type in the new value you want to be there. Try changing 3C20 to 30. Lo and behold, on the top line a 0 appears. By now, the T-BUG area (the first 16 columns) should look like this:

```
# M 3C20 20 30
3C21 20
```

The monitor automatically scrolls down one line, and advances to the next address. You can type anything you want by simply entering the ASCII in the appropriate addresses of video RAM. Note however, that if you should happen to wander into the T-BUG area by accident, your message could be messed up by T-BUG's scrolling. The ASCII codes are included on the inside back cover of the Micro-Reference Manual, which is included in the T BUG package.

Moving right along, we can now go on to something a little more productive. Remember that one of the reasons for a monitor program is so that you can stop the computer to see what is going on? To do this requires a couple of steps, which we will address in reverse order. When you stop a program, usually you want to know what is in each of the registers. To do this with T-BUG, get back to the prompt (type 'X') and then type an R. All of the Z-80 registers are printed on the screen for you to see. The values of these registers are stored in RAM so that you can get in and modify the n just like any other address. The addresses are different for Level I and Level II, so refer to your manual for them. Note that the Memory Refresh register (R) and the Interrupt Vector register (I), are rather conspicuous in their absence. The refresh register really has no practical value to the user other than for pseudo-random number generation, and the interrupt register is only used for really heavy programs using interrupts, so they were left out. We haven't really missed them.

The other half of the process of stopping the program is the Breakpoint command. Invoked by B XXXX, where XXXX is again the address, this command takes 3 bytes of RAM and changes them to a jump into the T-BUG. The previous contents of these addresses are saved for future reference. Because of the way a Breakpoint command works, it cannot be used in ROM (If you want to prove to yourself that Read-Only-Memory really is read only, try to modify ROM by using the M command, and then go back and look at the address you just tried to change. Level I ROM is from C000 to 0FFF, Level II is from 0000 to 2FFF). Now, back to the subject. The most reasonable way to explain the use of the Breakpoint is to show how to use it. Type in the following program using the M function:

TYPE IN	MEANING
5000 3E 5001 00	LD A,0
5002 06 5003 00	LD B,0
5004 0E 5005 00	LD C,0

Then use X to get back to the prompt. To set the Breakpoint, simply type B 5006. From now until you restore the old contents of addresses 5006-5008, every time the program counter gets to 5006, you will enter T-BUG (unless you change the addresses using M).

Now comes the classic question: "How do I get there from here?" This is where the Jump and Go commands come in handy. The Jump command is used when you want to go to a specific

address. It is not unlike BASIC's GOTO. All of the registers are loaded from the storage area, and program control is handed over to the program starting at the address you specify. To get to the program we just wrote, type J 5000. As soon as you type the last number, the jump is executed, so it's a good idea to be careful. To cancel this command before you type the last character, use the X. Once you have typed the last character though, "what is done is done".

The Go command is just a little bit different. This command also is similar to the GOTO in BASIC, except that program execution begins at the address which is stored in the address reserved for the Program Counter (PC) register. This function is most commonly used to resume from a Breakpoint command, since you will already know what the PC is (or was). To modify the PC so you can use the G command, simply modify the corresponding memory addresses.

Now, to fall back and re-group: If you have been keeping up (and haven't fallen asleep), you have a very short program which starts at address 5000. You also have a Breakpoint set for address 5006. So what are we waiting for? Get back to the prompt, and type J 5000.

So what? (you may ask). The thing just came back with another #! That is because the program has already run, and the Breakpoint has returned you to T-BUG. If you don't believe it, type R. The A, B and C registers should all have zero's in them, and the PC should have 5006. Congratulations, you have just written and executed a machine language program!

Was that a resounding yawn? You think it isn't worth all the hassle just to do essentially nothing? Well then, let's do something really interesting. Type in the following program, starting at 5000:

TYPE IN	MEANING
3E 20	LD A,20H
01 00 04	LD BC,400H
21 00 3C	LD HL,3C00H
11 01 3C	LD DE,3C01H
77	LD (HL),A
ED B0	LDIR
3C	INC A
C2 00 50	JP NZ,5002H

And then place a Breakpoint at the next address. Do a Jump to 5000, and watch! Take that, you hecklers!

Now that the fun part is over, let's get down to the real meat of the issue. Since we already have a program in memory, let's see how the Breakpoint is *really* used. First things first, we Fix the old Breakpoint with: (what else?) The Fix command. This returns the 3 byte Breakpoint instruction to what it was before. Then put a new Breakpoint at 500E and Jump to 5000. This should clear the screen, and return you to T-BUG. Looking at the registers using the R command will give you the intermediate register values. This is the method used to debug programs.

The last function of the T-BUG is the cassette input/output (I/O). Using T-BUG, you can save programs you have written out to cassette, and load others in from cassette. The format is different for Level I and II again, so use the manual for specifics. Just don't lose your brilliant idea because you forgot to dump it to tape (like we do). Get into the habit of dumping almost everything you do, no matter how trivial it may seem. At some time in the future you may find a way to add it to another routine, or in itself, it may give you the inspiration for the "program to end all programs".

The two manuals provided with T-BUG are among the most handy you can possess. The HEX code listings in the back are worth their weight in Einsteinium. ●

Review

COMPUTER PROGRAMMING FOR THE COMPLETE IDIOT

Donald McCunn
Review by M Schmidt

More people are turning to personal computers to relieve themselves of the drudgery of repetitive paperwork chores and mathematical calculations. The two main questions these people face as they enter the realm of micro-computers are: 1) Will the computer perform the tasks I need it to do? and 2) Can I program it? "Computer Programming for the Complete Idiot" provides the answers to these questions.

In an easy flowing, non-technical style this book describes the BASIC programming language. This BASIC language consists of 24 key words and 10 essential routines which are combined in various ways to create a wide variety of different programs. While other books in this field stop at describing how the computer reacts to these words and routines, "Computer Programming for the Complete Idiot" is the first book to show how to combine them to create a meaningful program that achieves a specific task.

This book starts by showing how the basic operating and programming procedures control the computer. It goes on to describe a program format that may be used to structure the BASIC language into a useful program. A Payroll Program is used as an example to illustrate how the programming format works. The individual segments of this program are designed to be tried out on the computer as they are being developed so that the function of each part of the program may be viewed. The final section of the book describes how to use this program format to create original programs that meet the specific needs of the user.

The author, Donald McCunn, is an adult education teacher at San Francisco Community College. He has created original programs to run his own business as well as helped others to do the same. He is the author of the popular "How to Make Sewing Patterns" which demystifies this technical field for the average reader.

"Computer Programming for the Complete Idiot" may be ordered through bookstores or directly from Design Enterprises of SF, PO Box 27677, San Francisco, CA, 94127 by sending $5.95 for the book plus $1.00 for shipping and handling. ●

MICROSOSM I

Review by C Brown

MICROCOSM I
Basics & Beyond Inc
Amawalk, NY 10501

The MICROCOSM I is a set of two tapes in a "book" package for the Level II 16K TRS-80. Thirty different programs are included in the package for a total price of $19.95.

About half of the package is devoted to games and the rest includes simple drill problem routines for spelling and math, or routines useful for the home. For most of the programs, the graphics can be rated as fair, but some are quite interesting. A sample of the programs included:

Country-Guess - A fine program. It is impressive in its incorporation of information. The computer continues to ask questions about a country and will identify which one you have selected. I found it very hard to stump the machine, but no directions are given to either add or change the program when countries change.

Home Insurance - Interesting. The computer will estimate the amount of insurance you should have for your home. It was very accurate for my own home, but is not intended to be a replacement for an insurance agent.

Driver - Fast action simulation of driving a car. Much like the games machine at many fun houses. Takes no thinking, just reflex action.

Divisor - A simple game that has you select a number or the divisors of a number. The computer then selects and highest sum wins. Could be some help in aiding children practice division, but not meant to be a tutorial.

16K Memory Test - Checks each register using POKES and PEEKS to see if they are reliable.

Atlantis & South Pole - These are two rather lengthy programs in the style of Hamurabi. In Atlantis, you are the ruler trying to save the continent. In South Pole you are heading up an expedition and trying to get to the pole first. Both programs take a while to play and winning is possible. No graphics.

This is a good package, and for the price it is exceptional. One objection was noted when loading the programs. The programs are stored very close to each other on the tapes, and you have to set the recorder rather carefully to be able to load them. ●

MATH-PAK-1

Edu-Ware
Review by J Crocker

Although it is almost impossible to make basic math interesting to youngsters, MATH-PAK-1 manages to do so with a flair. Aimed at elementary school students, this program takes advantage of certain Level II BASIC functions to make math practice both fun and easy.

Actually four separate programs (addition, subtraction, multiplicaton and division) on one tape, MATH-PAK-1 is an excellent program to drill students on their basic math skills without the associated boredom.

The program desired is selected using the CLOAD "FILENAME" command. Each program begins with a simple set of instructions for its use, written in easy to read 32 character size. Each program allows the student to vary the problems to his or her individual skill level. For example, the addition package allows the user to select difficulty factor (2-6), number of addends (2-4), and whether or not they want the computer to figure the remainder.

The student is given ten problems per set, and is informed of an error and rewarded for accuracy by name. At the end of each set, if the score is 90% or better, the student is allowed to play a short game, the difficulty of which is also determined by the difficulty factor selected at the beginning of the set. After the game, the student is given the option of either trying another set, loading another program or simply stopping.

MATH-PAK-1 is one of the more sophisticated packages of its type, and if it had been around when I was in school, perhaps I wouldn't have to use 3 calculators and a computer to keep my checkbook straight. I can recommend it to the parents of all school-age children.

MATH-PAK-1 is available from EDU-WARE, PO Box 336, Maynard, MA 01754 for $14.95, complete with documentation booklet for TRS-80 16K Level II and up. ●

CP/M ——————For the TRS-80

T R Dettmann, Associate Editor

A First Look at what it is like.

Several years ago, Digital Equipment Corp (DEC to its lovers) invented CP/M in answer to the need for a "Standard Operating System". This system was based on their popular Operating Systems for their Minicomputer lines.

Since its introduction, CP/M has truly become a standard. More software is available for CP/M than for other systems. What's more, CP/M is used on many types of microcomputers, so it means that techniques are being developed on all types of computers to run under CP/M.

Where does this leave the TRS-80 user? Can we truly use this other software? Is it better than TRSDOS? Is it compatible with TRSDOS? Let's see what the system is and then try to answer some of these questions.

THE CP/M SYSTEM

CP/M has a set of general routines to handle disk operations and command processing. The BDOS (loaded at 4205H in the TRS-80 system) handles all disk file operations. This is the **B**asic **D**isk **O**peratıng **S**ystem. The **C**onsole **C**ommand **P**rocessor (CCP) handles command control at the DOS level with commands such as DIR for directories, REN for rename, ERA for erase, SAVE, and TYPE. In addition the CCP handles processing of utility routines which execute separately from the CCP.

Utilities (both supplied and user routines) are assembled to run at 4300H. Among those supplied with the system are PIP, the Peripheral Interchange Program; ED, the system Editor; LOAD, a utility to load HEX files for execution; and DDT the Dynamic De-Bug.

Using the System

Users of other DEC systems (particularly the PDP series processors) will be familiar with many of the principles of the CP/M system as well as many of the conventions. But even non-DEC users will find that CP/M is easy to learn and use.

On power up in CP/M, the system comes up directly in DOS with a prompt which indicates the present default disk. The system prompt looks like this:

A >

Commands given refer to disk A (the first disk, equivalent to drive 0). A command of:

A > B (ENTER)

changes the default disk to B (which is equivalent to drive 1 on TRSDOS). Reference can also be made to any other disk, by including the disk in the file reference:

B > A;TEMP

File extensions can be added by giving a period and a 3 letter file extension. For example, TEMP.BAS for a Basic program, TEMP.BAK for a backup file, or TEMP.DAT for a data file.

The conventions, while different from TRSDOS, are not difficult to learn. They give you a large amount of Flexibility. For example, if you use the PIP program, you can transfer a file anywhere you want it to go or add files together. The command:

PIP B:TERM.BAS=A:TERM1.BAS,A:TERM2.BAS

will make a file TERM.BAS on disk B by first copying TERM1.BAS to that file, then TERM2.BAS.

CP/M also gives you the ability to refer to a large number of files with the same designation. You can do a listing of the drive for a given file name and find all of the files with that name, and any extensions by referring to the file by its file name and using a "wild-card" option for the extension. An example of this type of reference is as follows:

A > DIR TERM.*

This command will list all programs with the name

TERM and *any* file extension. Similarily, the command:

A > DIR *.BAS

will make a directory listing of all files of *any* name with the extention BAS so you can make a directory listing of particular types of programs or programs of a particular name. This is called an "ambiguous file reference".

A second type of ambiguous file reference using the character "?" allows you to replace an individual letter in a file name and work with all files with the rest of the letters matched. The command:

A > DIR T???.BAS

will print a directory listing of all files which start with "T" and have four letters and the extention BAS.

The Software Bus

CP/M has been called the "Software Bus", the software side of standardization. It certainly does that, but standardization can have its drawbacks. For example, CP/M *is* standard to CP/M systems, but it is not compatible with TRSDOS.

Let's say you have been creating files (like this text file) with a TRSDOS program. You have generated a disk file with the information and now want to use it with a program under the CP/M operating system. No luck. CP/M formatted files cannot be read with TRSDOS and TRSDOS files cannot be read with CP/M (not without some work on the Assembly Language Level with the primitive disk access structures).

If you have already generated a large applications library under TRSDOS, or you want to use MicroSoft BASIC, you might as well stick with your present system. If you are developing new applications, or you want to make use of already existing applications programs, then CP/M gives you a wide selection.

But can you just drop down to the local Computer Store and buy a disk with an assembled program? No, it dosen't work that way. On normal systems, CP/M starts at location 0000H, and the TPA starts at 0100H. Therefore, in order to make use of a program, you generally must have the source code that you can assemble and execute. Even if you can buy a CP/M disk with source code on it, it still must be read in the TRS-80 disk drive.

The disk drive limitation is not unique to the TRS-80, but it is frustrating. For example, NORTH STAR 5¼" floppies are hard sectored and not compatible. So you have to be careful or you won't have anything for your money.

To get CP/M programs, a good source is the CP/M User's Group. Cybernetics, Inc 8041 Newman Ave., Suite 208, Huntington Beach, CA 92647, makes available a series of 77 disks at $7.50 per disk with a large number of programs including interpreters, applications, languages, etc.

CP/M software for the TRS-80 is also available from other software houses, but it is necessary to be sure that it is TRS-80 compatible. •

The *STATUS of 80-U.S. BACK issues*

Nov-Dec 78, Vol 1 #2 ——— Few
(Few means about 100)
Jan-Feb 79, Vol 2 #1 ——— Fewer
Mar-Apr 79, Vol 2 #2 ——— Fewer Yet
May-Jun 79, Vol 2 #3 ——— Scarce
(Unless you want one with 2 pages out of order)
Jul-Aug 79, Vol 2 #4 ——— Abundant
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80-U.S. Software

Now available in many Computer Stores across the country!

107 Owl Tree - by James Talley $9.95

Can you fill the OWL-TREE with Owls by shooting out the BATS? Easy? Careful, when you shoot a BAT it scares away OWLS! A super challenge, with great animated graphics and SOUND!

109 The Great Race - by Scott Carpenter $9.95

Try to finish this 600 mile race before your opponents, or before they stop you with flat tires, wrecks etc. Patterened after a popular board game, the computer plays too, (unless it dosen't like the name you give it!). Outstanding graphics, with real life-like car sounds!

111 Lying Chimps - by Roy Groth $9.95

The old game of "I doubt it" or "Liar", only you play with four chimps who love to cheat! Excellent animated graphics with SOUND.

113 Concentration - by Richard Taylor $9.95

The game of Concentration on your TRS-80! The prizes change places with each game. Win the Tandy Corp, or maybe a 48K TRS-80 (or a bad check!). With excellent SOUND effects.

110 Scramble - by Richard Taylor $9.95

A word guessing game for two players. Use the words in the computer or enter your own for your opponent. Excellent scoring routine, with SOUND. If you wait too long, you lose points.

103 Snake Eggs w/sound - by Leo Christopherson $14.95

This version of "21" has talking snakes, who argue with each other. Try to avoid "scrambled eggs", they lose!

117 Function Grapher/Bluffit - by Roy Groth $9.95

FUNCTION GRAPHER: A new math program which allows you to graph a math function, then compress, expand, and find the root using 6 different methods! From 80-US, Nov 79 issue, also on this tape from the Mar 79 issue, BLUFFIT, a card game of bluff and counter-bluff.

116 Psych/Lifeboat $9.95

From 80-US in May 79, Psych is the program which tells you if you are Analytical or Intuitive, and to what degree. Provides for screen or printer output. LIFEBOAT, from the Jul 79 issue, is a game of survival.

Please order by number using the order form in the centerfold. All programs are on cassette and run in 16K Level II or above. Note: Beewary, Android w/sound, Snake Egg w/sound and Lifetwo w/sound do not run reliably when transferred to disk using DOS 2.2, they do function OK with 2.0, 2.1 and NEWDOS. All others work with most current DOS, including 2.2.

108 TRS-80 OPERA - by Richard Taylor $9.95

A SOUND extravaganza! Hear the William Tell Overture in intricate detail and clear sound (that's the theme from the Lone Ranger, remember?). Contains four other excellent operatic selections. The SOUND is superb!

112 Challenge - by Richard Taylor $9.95

Guess the hidden phrase, but if you guess vowels wrong you lose 10 points! Use the phrases in the program, or enter your own. Careful! The short ones are the hardest! With fast graphics and SOUNDS to match.For 2 players

106 Beewary w/sound - by Leo Christopherson $14.95

Brilliant graphics and fantastic sound enhance this challenging game matching a persistent Bee with a cunning Spider in a duel to the death! Leo has done it again.

104 Lifetwo w/sound by Leo Christopherson $14.95

Conway's game of Life at an astounding 100 generations per minute! Plus Leo's "talking" animated creatures playing the "Battle of Life" in one 16K L2 program.

114 Space Battle - by R Papo $14.95

A super speed "Trek" type game, said to be one of the best so far.

101 Original Android Nim - by Leo Christopherson $9.95

The Original TRS-80 animated graphics game. This is the one that started it all. It does not have sound, but has been the most popular animated game to date!

105 Cubes - by Leo Christopherson $9.95

Gives the solution to "Instant Insanity" ® or numbered blocks. Watch the computer try all the possible combinations.

115 Biorythm 1 & 2 $9.95

Two Biorythm games (published in Nov 78 80-US), one with actual day-by-day data including day of week, the other a graphic display of all three curves on the screen at one time. Includes "day of week" and "days between dates" functions.

102 Android Nim w/sound - by Leo Christopherson $14.95

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