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the magazine for TRS-80* users

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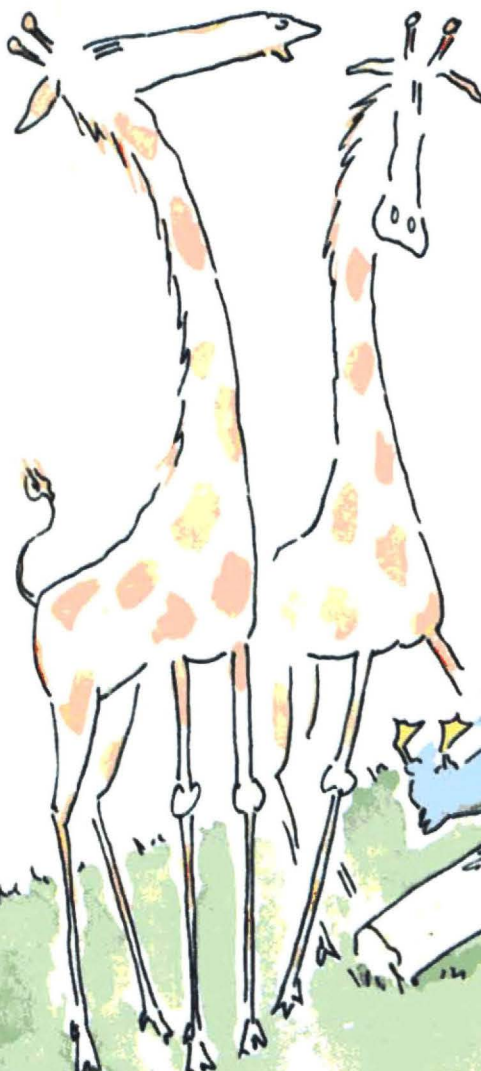
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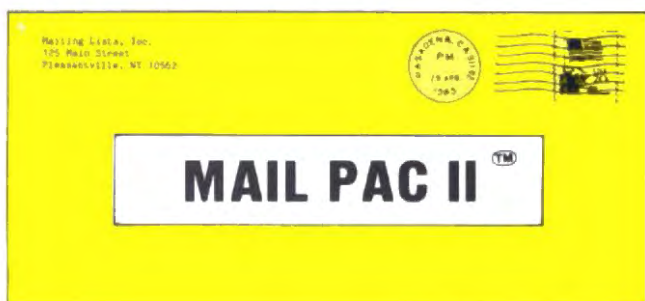
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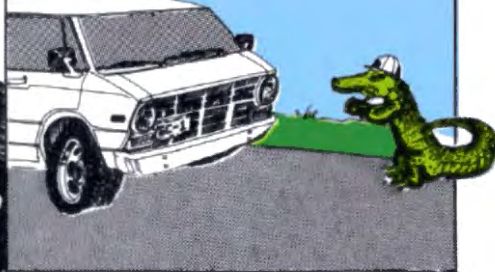
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Cover by Chris Demerest

In a way, I suppose you might say I sold out, but I plead guilty with an explanation. And by the way, if you're interested in joining a fast-rising firm, you could do worse than read on.

It all started this last spring when some chaps from one of the bigger banks called saying that they had a large foreign publisher who was looking to acquire something like my micro publishing empire. I wasn't much interested because I enjoy what I'm doing more than anything else I can imagine. But what would it cost to listen, right?

So they came to visit and looked over our place. I showed them our growth in sales, which has run around 50 percent a year for the last eight years, limited only by all growth being 100 percent self-financed. They mumbled vaguely about \$50 million, which I have to admit got my attention. I'd really never given much thought to what the whole mess might be worth.

The word that I was thinking of selling began to spread and new suitors started calling every few days. The more I talked with these firms, the more I realized that this probably was a good time to merge with a larger firm, to give me the money to invest in some new projects. I never had much of a personal need for money, so selling out for



Green sells out

a big bundle of cash had little attraction.

No, it would be worth merging if I could get the money to start magazines at a faster rate and thus be able to better keep up with the needs of the micro-

computer industry. And I had an idea for a new type of magazine I wanted to try out. If it worked, I'd have a way to get perhaps 50 more like it going, each with expected sales on the order of \$5 million a year or more.

Then there was my idea of a new type of school, a business/technical institute geared to the needs of the 80s. The more I thought about it, the more ideas for new divisions of Wayne Green Inc. came to mind. With some cash available for getting these new businesses and publications going, we could step up our growth enormously. I did some sales projections and I could see us growing to \$1 billion in sales within 10 years, just on the plans already in mind.

As I talked with the firms interested in merging, I found several of them excited about my ideas and plans. I've got a good record of coming up with innovative ideas, so there wasn't much skepticism.

The final choice of merger partner was most difficult. Several large firms put it bluntly: They needed me and I could name my price. Now, I want to tell you, that is fantastic for the ego. I really wasn't into shopping around for the highest offer because the difference between \$50 million and \$100 million is a lot less than the compatibility of the merger. And numbers like that don't mean anything anyway—they're just very big numbers.

On May 22 I signed a preliminary agreement with Pat McGovern. He's the publisher of *Computerworld*, *InfoWorld*, and so on... several times the size of my firm in sales. The date was significant to me because it was eight years to the day from when I called the editor of a small micro newsletter to come up and discuss starting a magazine... and we agreed to give it a try. Five weeks later the first issue of *Byte* went to the printer.

The merger means that we'll be able to do more promotion of our current magazines. It means we'll be able to start more magazines—and I have a bunch of them all planned out. Each magazine is going to require a staff, so we'll be looking for programmers, people for advertising sales, typesetting,

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*8" drive operation requires special cable, 8" double-density requires 3.55MHz CPU speed-up modification or LNW-80 4MHz computer. TRS-80 is a trademark of Tandy Corporation.

REMARKS

graphics arts, circulation, data processing, and so on.

Then there are a number of special projects, such as my planned technical/business college. We're going to need management teams to get these projects going and to run them. Most of this is going to be done in New Hampshire, but eventually we'll be growing in other areas of the country.

If you're interested in getting involved with some exciting new ideas, you should get a letter off to me telling me what you think you might be able to do. I'm looking right now for non-smokers with a history of enthusiasm and the ability to make things happen with a minimum of supervision.

There won't be any astronomical salaries as we start new projects, but we plan to make it well worth the while of those who are the most helpful in starting these new ventures.

For instance, I have a number of products that I'd like to have made in Asia and import for sale here. I've got the

contacts in Asia to handle that end, but I need the people to handle the project from the New Hampshire end—setting up the advertising, importation, and distribution of the products. This should grow into a substantial business by itself.

Why New Hampshire? Well, mostly because this is one of the best places in the country to live. The quality of life is wonderful and the cost of living far less than New York or Silicon Valley. We still don't have any state sales or personal income taxes in New Hampshire. We're in a small town with all of the advantages of a small town. The people are friendly and the crime rate is low.

If you're looking for the chance of a lifetime to get in on some new projects. . . and if you think you can hack it. . . let me know. You're going to have to prove you can get things done. We have no free rides here, just a bunch of enthusiastic people all having the times of their lives working hard and turning out first-rate products. We're working

out of old houses, converted motels and barns, and so on. This is not IBM.

You can be old, young, black, white, red, brown, male, female, undecided, but if you smoke please don't bother me, okay? The air up here is invisible and we want to keep it that way.

The merger means that we have a guarantee of the money we need to move ahead on as many projects as I can find teams to work on. And if we run out of projects to get started, I'll have more. I come up with an idea for a good solid project every few days.

When you think about it, by the time you put my six magazines together with those Pat is already publishing, we're a very strong combination. I think we'll be able to parlay this group into a pilot model of the college of the future, into perhaps an educational satellite television network. . . things like that.

Pat is much like I am—full of ideas and enthusiasm. I think we're going to really make things hum in the micro-computer field. Care to join us? ■

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PROOF NOTES

The editors look at the issues

Fear of acronyms

The first cliché about computer buffs is that they carry pens in plastic shirt-pocket liners. The second is that they don't speak English.

Pocket-protector jokes belong to engineering, not computing; but the latter charge has some merit. Computer owners are famous for veering into jargon; indeed, anyone exposed to micros for any length of time begins speaking a kind of esoteric shorthand. Liberal arts graduates, taking entry-level positions at *80 Micro*, are initially baffled. Within days, though, they're striding through the office saying "Where's the RS-232 cable for the 4?" and "Anybody got a TRSDOS 1.3 I can back up?"

The advent of the computer age is no excuse for bad or stupid language—even if you have a terminal package and modem, you do not "interface" with people. But, in a magazine like *80*, the use of computer terms and abbreviations is not only appropriate but essential. To help readers who aren't familiar with some micro-oriented acronyms, we're introducing the glossary that appears below.

It's by no means a definitive dictionary. Some mass-market computer magazines pepper their articles with asterisks, referring novices to a comprehensive glossary; we're more technically oriented than that, and decided to take "bit" and "disk" for granted. We may add some words as well as acronyms to the monthly list—"modem" was a strong contender in editorial meetings.

Tell us what you think of the idea. We don't want to insult our readers' intelligence, but we want *80* to be accessible to new TRS-80 fans as well as old ones. If it weren't an even worse cliché than the pocket protector, we'd say we want to be user-friendly. —E.G.

Glossary

ASCII	American Standard Code for Information Interchange. Character code that refers to the computer's internal recognition of letters, numbers, and symbols.	
CP/M	Control Program/Monitor or Control Program for Microcomputers. A disk operating system produced by Digital Research.	
CPU	Central Processing Unit. Computer module that retrieves, decodes, and executes instructions.	
CRT	Cathode Ray Tube. The television tube used to display pictures or characters.	
DIP	Dual In-line Package. A standard integrated circuit package with two rows of pins at 1/10-inch intervals.	
DOS	Disk Operating System,	
		such as DOSPLUS, NEW-DOS80, TRSDOS, and LDOS.
		EPROM Erasable Programmable Read Only Memory. Usually refers to a PROM that can be reused several times. It's erased with ultraviolet light and then programmed with a special PROM programmer.
		K Kilobytes. 1K = 1024 bytes. Used in referring to computer storage capacity.
		RAM Random Access Memory. This is the primary storage area of a computer. The information in RAM is lost when power is disconnected.
		ROM Read Only Memory. This information cannot be changed and is not lost when the power is off.

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When Cornsoft inadvertently sent me a replacement disk instead of a tape, I sent it back and quickly received the tape.

You see, software companies don't mind replacing media, they just don't want you to steal their programs. So use your copy as much as you want, but let's not ruin the chain of software that took so long to build.

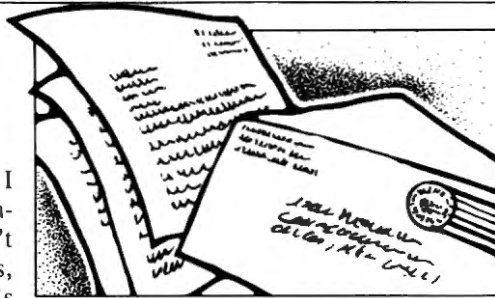
Patrick Kellogg
10030 Heron Ave. N.
White Bear Lake, MN 55110

Author Turned Consumer

Much has been written recently about software piracy, disk copy protection, obtaining version updates, and the like. As a software author and consumer, I have contrasting views on the subject. Today I must put my author hat aside and take the side of the consumer.

For over three years I have been trying to get Radio Shack to do something about a bug in their Model I VisiCalc program. The problem has to do with the @EXP() function, and working around it makes calculating engineering and interest data awkward. Letters and phone calls have had little effect; refraining from future Radio Shack software purchases could constitute a partial loss of my original investment.

Last year I purchased the UltraPX data-base manager from CIE. In Janu-



ary, I ordered the upgrade and was informed that I must return the original to get the upgrade. CIE has since left the software marketplace leaving me with only stripped-down, working copies of the software. That is partly my fault since I failed to make a back-up copy prior to returning the disk.

Now, if some company chooses to pick up the product and offer upgrades, I no longer have the original software as proof of purchase. If someone can put me in touch with retired Col. Charles D. House (U.S. Air Force), author of UltraPX, I'd appreciate it.

Charles E. Burton
1720 S. DeFrame Court
Denver, CO 80228

Interfacing Computers

I think you should print more articles on interfacing computers to outside sources, such as burglar alarms, timers, or computer-controlled switches.

Also, could you give me the address of a Model III user's group or club in my area?

Paul Bukowski
217 Calkins Road
Palmer, MA 01069

You'll find a home-control project in our upcoming November issue. While you're waiting, you can get together with the folks at the Western Massachusetts Computer Club, 134 Breckwood Circle, Springfield, MA 01119.—Eds.

MC68020 Update

I just read with interest a letter from Mark P. Fishman published in your June 1983 Input column (p. 14). He stated that Jim Hawkes' article, "The Model 16," (80 Micro, February 1983, p. 228) contained errors regarding the Motorola MC68020.

Mr. Hawkes was correct in stating

that the 68020 will be a full implementation of the 32-bit architecture, and will indeed have 32 address lines and 32 data lines, not the 24 address lines Mr. Fishman claims.

The Model 16's MC68000 has 24 address lines and a 16-bit data bus. Also, there is no such thing as an MC68032 currently in the works.

In addition to the full 32-bit architecture, the 68020 will have onboard cache, an enhanced instruction set, coprocessor operations, increased speed, and the virtual machine capabilities of the newly introduced 68010. The 68020 will be upward compatible with the 68000, 68008, and 68010.

Joe Jelemensky
MOS Microprocessor Design
Motorola Inc.
3501 Ed Bluestein Blvd.
Austin, TX 78721

Enlarge "Barrier" Display

I enjoyed "Barrier Level II" (Fun House, 80 Micro, May 1983, p. 362), but the invisible maze takes up only a third of the display screen. By enlarging the game screen to display size, I have made the game more difficult and more fun to play.

Try the changes in Program Listing 1 for more action.

Paul S. Marzovilla, Jr.
4602 Barnaby Court
Virginia Beach, VA 23455

Penpals Wanted

I'm a South African computer hobbyist looking for American penpals. I own a Spectrum (to you, a Timex-Sinclair 2000), and read 80 Micro regularly, trying to convert programs to run on my micro.

Werner Bredenhann
94 Gladstone St.
Parow, 7500
Cape Province, South Africa

Penetrator Eased

I bought Penetrator last year and found it to be a great game. My Model I Level II machine has the high-speed clock mod that turns on with an OUT

```
180 FOR X=0 TO 124
200 SET(X,Y+46)
230 FOR Y=0 TO 46
250 SET(X+124,Y)
270 SET(X+124,Y)
320 SET(122,42)
410 IF X$=D$ AND Y+4<43 AND
POINT(X,Y+2)<>-1 THEN Y=Y+4
430 IF X$=R$ AND X+4<126 AND
POINT(X+2,Y)<>-1 THEN X=X+4
450 IF X=122 AND Y=42 GOTO 470
```

Program Listing 1. Changes to enlarge the Barrier screen.

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```
MEM SIZE? <ENTER>
R/S L2 BASIC
READY
>SYSTEM <ENTER>

*? P <ENTER>

*? <BREAK>
OUT 254,1: DEFINTX: FOR X=17408
TO 32766:IFPEEK(X)=211 AND PEEK(X+1)
=254 THEN POKE X,0:POKE X+1,0: NEXTX:
OUT254,0 ELSE NEXTX: OUT254,0<ENTER>

>SYSTEM <ENTER>

*?/ <ENTER>
```

Program Listing 2. Changes that make Penetrator a more difficult game to play.

254,1 command. Since Penetrator includes this instruction in its code, the high-speed mod is turned on when the program runs and the game becomes very difficult to play.

Now when I want to play Penetrator, I type in Program Listing 2. The line PEEKs at locations from 17408 (the start of the program) to 32767 (the end of the program), and looks for the instruction OUT (FE), A. This outputs byte 1 to the port 254 (FEH). When it finds that opcode, it replaces it with NOPs.

*Javier Henderson
Av. Belgrano 2449 #5
Piso Dept. C
1096 Buenos Aires,
Argentina*

drives. Program Listing 4 is written for a 16K, cassette-based Model III.

*Henry P. Amelung
1205 Juniper Drive
Alamogordo, NM 88310*

Spool It

I find the Spool command very helpful in making electrical job estimates on my Model II. I save the printouts for future reference, or to ensure that accurate specifications go to my supply houses. This spool file is sequential, and the sorting operation is done only once.

From TRSDOS, type SPOOL ON and press the enter key. Type SPOOL N,F=(file name), (drive number) and press the enter key. Then type and enter

BASIC -F:3, RUN(file name). All LPRINT statements go to the spool file.

Once the file is saved, get into Basic and type SYSTEM and press the enter key to return to TRSDOS. To close the spool file until you want to print it, type SPOOL OFF and press the enter key.

To print the spool file from TRSDOS, type and enter SPOOL ON, and then SPOOL P,F=(file name),K. The letter K saves the spool file for future use. Once the spool file is printed, close it again.

To see the file on screen before you print it, load TRSDOS and enter FORMS D, then DUAL ON.

This routes the spool file from the printer to the CRT. Return from TRSDOS to the printer by typing and entering DUAL OFF, and then FORMS.

While the spool file is printing, you can enter Basic and do other work. I use the library commands Forms D, Dual On, Dual Off, and Forms to check LPRINTs on the CRT.

*Wright's Electric
405 East Bates St.
Hebron, IN 46341*

Safe Landing

I have made changes to my article "Jet Bomber" (80 Micro, May 1983, p. 298). One reader was frustrated because the plane crashes when it flies too close to the mountain top. The changes in

LPRINT Hints

I want to thank Jerry Lindsly for his article, "Drivers and DCBs," in your June 1983 issue. I recently purchased a 16K, cassette-based Model III. Until yesterday, I was unable to interface programs containing LPRINT statements to either my video screen or my printer at my one-key entry command. His identification of the DCB addresses for video and printer output were most helpful.

While that program lets you output programs containing LPRINT statements to the CRT, printer, or both, I prefer to use a five-line program at the beginning of my programs (which I update and print out daily).

This way, I can update my program, check it on my CRT for accuracy, and then print it. I do all of this without changing any LPRINT statements to Print commands. Program Listing 3 works on a 48K Model I with dual

```
10 INPUT"DO YOU WISH TO OUTPUT TO VIDEO OR PRINTER (V OR
P) ",Q$
20 IF Q$="P" THEN 50
30 POKE 16422,88:POKE 16423,4
40 GOTO 60
50 POKE 16422,0:POKE 16423,255
60 LPRINT
```

Program Listing 3. This lets you output programs with LPRINT statements to the CRT or printer for a 48K Model I.

```
10 INPUT"DO YOU WISH TO OUTPUT TO VIDEO OR PRINTER (V OR
P) ",Q$
20 IF Q$="P" THEN 50
30 POKE 16421,7:POKE 16422,115:POKE 16423,4
40 GO TO 60
50 POKE 16421,6:POKE 16422,194:POKE 16423,3
60 LPRINT
```

Program Listing 4. This lets you output programs with LPRINT statements to the CRT or printer for a 16K cassette-based Model III.

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```
325 PO=15700:PC=32
470 PP=P1-A*64:POKE PO,PC:PC=PEEK(PP):IF PC<>32 AND (PC AND
15) THEN GOSUB 570:FOR X=1 TO 300:NEXT:GOTO 640 ELSE POKE
PP, 94:PO=PP-1:RETURN
```

Program Listing 5. Allows lower bombing runs for Jet Bomber.

Program Listing 5 allow lower bombing runs.

The odd logical expression is not a typographical error; rather, it's bit manipulation via Basic.

*Thomas H. Rogers, Jr.
10820 E. Maxwell
Spokane, WA 99206*

"Paintbrush" Graphics

Several MX-80 owners with Grafrax Plus have written me concerning problems with the listings in my article "The Printer as a Paintbrush" (80 Micro, May 1983, p. 218 and June 1983, p. 282).

When I wrote the article, Grafrax Plus was not yet available. The listings published are correct for Grafrax 80, but Grafrax Plus owners need to use 4 bytes to initialize each printer's graphics mode.

The first 2 bytes must be CHR\$(27) and either K or L, depending on whether you want the 480 or 960 mode. The next 2 bytes tell the MX-80 how many graphics bytes the program will send. It is the second of these 2 "count" bytes that causes problems.

With Grafrax 80, that second byte is treated as a zero if it is 255. This is handy for Model I since it can't LPRINT a zero byte. However, Grafrax Plus interprets the byte in modulo 8 arithmetic. Hence, Grafrax Plus perceives a 255 byte as a 7.

This error occurs several times in those listings; line 70 of Program Listing 1b (May 1983, p. 219) is an example. Change CHR\$(255) to CHR\$(8) for the line to run with Grafrax Plus. In modulo 8 arithmetic, this line is interpreted as zero so the program works. Grafrax Plus owners should make this change in each listing wherever they initialize the printer for graphics.

*Mike Keller
13423 Desert Hills NE
Albuquerque, NM 87111*

Copy-Wrong

I'm writing to express my dismay

over the direction your editorials have taken lately. You recently accepted ads from WittSoft for a product made to copy another company's copyrighted software. This program is in the same class as burglar tools. They are even using a name that we have been using since last November for our ham radio program.

I could go along with accepting their ad, but writing a review of the product is going too far. In the review you sound like you are condoning the use of this product. Do you realize that sales of Model III programs have decreased measurably since last November? This is due to the number of downloads and clubs where people make illegal copies of software.

I went to a computer show in San Francisco and everyone that stopped by our booth told us how much they enjoy Cyborg. It's interesting that you can sell 10 copies of a program in a city and 100 people tell you how much they like it.

Many firms have stopped making TRS-80 software, including Big Five, Med Systems, and Soft Sector Marketing. Others, like Adventure International, are slowing down production of TRS-80 software. Why? Because there isn't a good return for the amount of work necessary to make a good program.

By promoting this product you are actually encouraging Kim Watt, probably the best software author writing for the TRS-80, to start writing for some other computer, like the IBM Personal Computer.

My two favorite authors have stopped writing software for the Model I/III. PowerSoft is writing SuperUtility for the IBM. You seem to be helping to ensure that only mediocre software is produced for the TRS-80.

Radio Shack has promoted good software at a fair price. What other system has its manufacturer selling a word processor or an excellent data base for around \$100? TRS-80 owners have come to expect free software, and with this attitude they're hurting themselves.

Computer Shack has some excellent products. At last count we had 20 different software packages—this could be the largest of any company publishing TRS-80 software. We take out three to five pages of advertising in every issue of 80 Micro, and so far you have reviewed one of our products.

*Gordon Monnier
Computer Shack
Pontiac, MI 48054*

Many people would like us to pass judgement in the name of our readers on various types of software. But that is not our role. We exist as an information source, and we will not censor any material because someone has a vested interest in seeing that material censored.

We deemed that WittSoft's program, Super Duper, would interest a large number of our readers. Publishing a review of the program in no way implies that we endorse pirating Super Utility Plus, any more than publishing a liquor ad would mean that we condone drunk driving.

We remain strongly opposed to software piracy. But editorial censorship would be the easy way out. It would create a fantasy that piracy no longer existed, and would do nothing to stop it.

Finally, any software company that abandons the TRS-80 because of piracy is deluding itself if it thinks that life is easier anywhere else. Piracy is not restricted to the TRS-80, but is an industry-wide problem.—Eds.

Column Changes

I typed Program Listing 3 of the MiniCalc program by John Corbani, (80 Micro, May 1983, p. 140). His program is great, but I could only get five columns across a page. My changes eliminate the extra alpha column headings.

Line 470 contains the code to set an Epson printer to 132 characters per inch, and the reference to number of columns in line 110 is changed from 14 to 15. Line 475 sets unidirectional printing and checks for number of columns.

If there are eight or fewer columns, set Q to 1 and drop to line 480. If there are more than eight, set Q to 9 and go to line 476 to print the first eight columns. Then go to line 480 to print the rest. Line 490 keeps the underline length correct.

With these changes you can print the

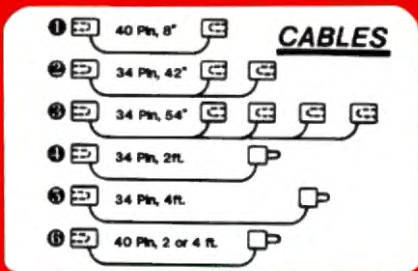
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GREEN SCREEN WARNING

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

- Several are just a flat piece of standard colored Lucite. The green tint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.
 - Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobbly film gives it a poor appearance.
 - One optical filter is in fact plain acrylic sheening.
 - False claim: A few pretend to "reduce glare" in fact their flat and shiny surfaces (both film and Lucite type) ADD their own reflections to the screen.
 - A few laugh: One ad claims to "reduce screen contrast". Sorry gentleman but it's just the opposite. One of the Green Screen's major benefits is to increase the contrast between the text and the background.
 - Drawbacks: Most are using adhesive strips to fasten their screen to the monitor. This method makes it awkward to remove for necessary periodical cleaning. All (except ours) are flat. Light pens will not work reliably because of the big gap between the screen and the tube. Many companies have been manufacturing video filters for years. We are not the first (some think they are), but we have done our homework and we think we manufacture the best Green Screen. Here is why:
 - It fits right onto the picture tube like a skin because it is the only **CURVED** screen **MOLDED** exactly to the picture tube curvature. It is Cut precisely to cover the exposed area of the picture tube. The fit is such that the static electricity is sufficient to keep it in place! We also include some invisible reusable tape for a more secure fastening.
 - The filter material that we use is just right, not too dark nor too light. The result is a really eye pleasing display. We are so sure that you will never take your Green screen off that we offer an unconditional money back guarantee. Try our Green Screen for 14 days. If for any reason you are not delighted with it, return it for a prompt refund.
- A last word: We think that companies like ours, who are selling mainly by mail should list their street address and a phone number (for questions and orders) accept CODs, not every one likes to send checks to a PO box! For the convenience of charging their purchase to major credit cards. How come we are the only green screen people doing it? Order your **ALPHA GREEN SCREEN** today! \$12.50



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full 16 columns by 26 rows on one sheet of standard-sized paper.

*Howard Potvin
2527 Los Padres Drive
Rowland Heights, CA 91748*

Design or Detail?

When I read the June cover, "Software Construction: How to Build a Better Program," I expected to find articles dealing with overall program design and structure. Instead I found articles whose emphasis was on low-level detail. I think your readers need to learn more about proper program design, not tricks and shortcuts. I'm afraid that by stressing these tricks, our new generation of programmers will be no better off than the pioneers of the 1950s.

The solution lies in weaning these people from Basic and Assembly languages; if any languages encourage bad programming practices, it is these two. I feel that no one should stay with Basic for more than a month. Give them that month and then force them on to higher-level languages. Advanced Basic programming is a myth. You should encourage articles with well-designed and well-implemented programs written in C, Pascal, Fortran, or Modula-2.

*Edward D. Pirroni
1619 Coach Drive
Grand Rapids, MI 49501*

ERROR Trap

John Ratzlaff's Prometheus 5 Hard Disk System review (*80 Micro*, August 1983, p. 50) states that DOSPLUS 4.0 is included with the system at no extra charge. Since the review appeared, Computex has changed its policy. DOSPLUS 4.0 is no longer included with the system, but Prometheus 5's price has dropped from \$1,495 to \$1,295.

In *80 Micro's* Buyer's Guide to CoCo Utilities (July 1983, p. 212) the address for A. M. Hearn Software was inadvertently omitted. It is 602 South 48th St., Philadelphia, PA 19143.

Micro-Design

Micro-Design offers a floppy disk system for the Model I. It is a plug-compatible, 40-track, 5 1/4-inch disk drive. Its average access time (track-to-track and data-transfer rates) are the same as those listed by other manufacturers. These figures are derived by the manufacturer of the drive mechanism and change little from drive to drive.

For the Model III computer, Micro-Design offers three floppy disk systems:

the MDX-6A, MDX-6B, and MDX-6C. All three include the MDX-6 floppy disk controller that handles both 5 1/4- and 8-inch disk drives. They also include all hardware and cabling required for the internally mounted disk drives.

The difference between these systems lies in the disk drives supplied. The MDX-6A offers 40-track, single-sided, double-density 5 1/4-inch drives with a storage capacity of 250K. The first drive MDX-6A upgrade costs \$399, and the second internal drive \$189.95.

The MDX-6B upgrade offers 40-track, double-sided disk drives with a capacity of 500K. The first drive upgrade costs \$474, and the second \$274.

The MDX-6C upgrade system lets you add four internal slim-line disk drives. These 40-track, 5 1/4-inch, double-sided drives offer 500K of memory. Special added features ensure reliable, trouble-free operation. The first MDX-6C upgrade costs \$495, additional drives cost \$295. A total system offers the user 2 megabytes of unformatted, internally-mounted storage.

Micro-Design offers a one-year warranty, and a 24-hour repair or replace policy on all upgrades. All of these upgrades are compatible with the new Model 4, as well.

*Michael B. Shapiro
Micro-Design
6301 Manchaca Road, Suite J
Austin, TX 78745*

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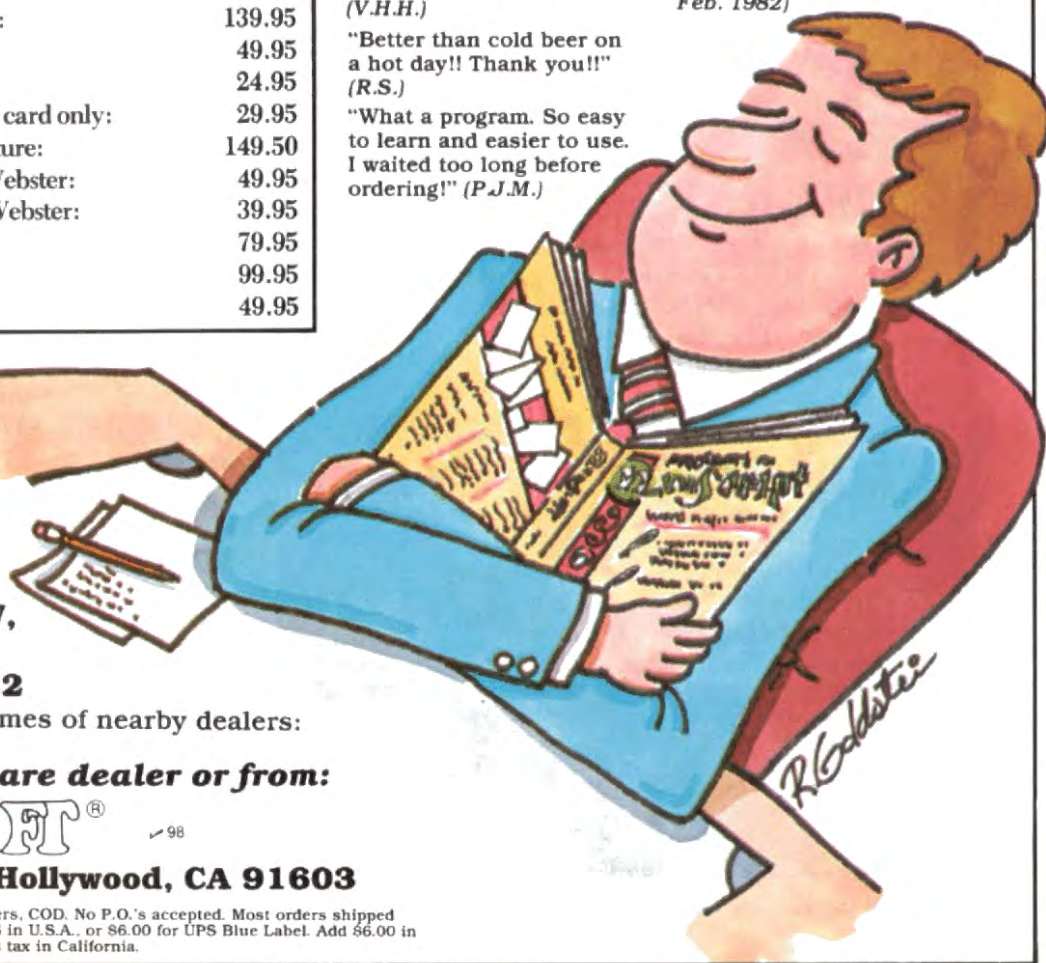
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"... ongoing support second to none, with superb documentation." (80 U.S. Journal, Feb. 1982)



Is Archbold Missing?

I'm told that there was a speed-up kit offered by Exatron for the Model I that no longer is available, but that there's a similar kit called "Archbold Speed-up Kit" that does the same thing. The problem is that I've been unable to locate a source for the Archbold. Can someone help me?

*M.S. Yellin
1877 Morgan Ave.
Claremont, CA 91711*

Ad-Ware Anyone?

I'm looking for advertising software for my Model III. Does anyone know where I can buy such software?

*Nick Lambesis
4531 North 16th St.
Phoenix, AZ 85016*

I Need a Patch

Can anyone tell me where I can obtain a patch program for lowercase characters that works with the Model I Electric Pencil cassette version?

*George Sanquenetti
1439 South 3rd St.
Clinton, IN 47842*

Model III Utility Needed

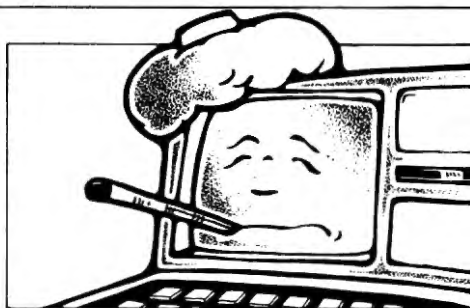
I need a utility for my Model III that lists the variables used in a program in one column and the line numbers as they appear in another. Can someone help me?

*Richard Compton
1635 Oramas Road
Santa Barbara, CA 93103*

Program to Print

I'm looking for a Model III program to print graphics (lettering, sketches, designs, and so forth) on an IDS 440G printer. Can someone advise me?

*Jan Lanoue
125 Irving St.
P.O. Box 2154
Framingham, MA 01701*



Looking for answers

Do You Know?

Does anyone know how to embed hexadecimal code in Color Scripsit? One of our customers wants to receive ASCII text files via modem and typeset them without using the keyboard.

So far we have been unable to find any information on this accomplishment for the Color Computer.

*Harley L. Smith
Athol Daily News
225 Exchange St.
Athol, MA 01331*

Stumped with Pascal

I'm a reasonably capable Basic Programmer, but Pascal has me stumped. Is there a magazine, newsletter, or book for Alcor Pascal beginners?

Also, does anyone have source code programs that they would like to swap?

*Robert Athanasiou, M.D.
13 Lawnridge Ave.
Albany, NY 12208*

Losing Control

Can someone supply a patch that will allow me to change the Scripsit control key?

*E.J. Jennings
299 Ridgewood Ave.
Glen Ridge, NJ 07028*

Expecting Too Much?

Our library is looking for a printer that is compatible with both the Model III and the Apple II Plus, that can handle card stock for library catalog cards, that prints in condensed format with extended lowercase letters, that is able to cut stencils, and that is capable of reversing to make second columns. Can someone help us?

*Diane D. Kester
Eastern Wayne Junior High
Route 10, Box 28
Goldsboro, NC 27530*

How?

How is it possible to reduce both amplitude and frequency through the cassette port? Also, what happened to EDF, and how can I acquire a copy of this program? If anyone has a copy of EDF I'm willing to pay photocopying and mailing costs for it.

*Rick Sayre
4922 Cozad Way
Stockton, CA 95212*

Back to School

Can someone tell me where I can get information on classes on the west coast for the TRS-80? I'm looking for a course that's two weeks long and that has hands-on use of the TRS-80 with instruction involving compatible software packages.

*Craig Horton
2352 Delta Waters Road
Medford, OR 97501*

Lend a Hand!

I have a Model I with a version G board. The level II ROMs are on a separate board and recently became disconnected from the ribbon cable. I need a diagram that shows what line goes to what hole on the circuit board. Can someone lend a helping hand?

*John Coleman
811 Piedmont Ave.
Atlanta, GA 30308*

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Another Line

A line is missing in Program Listing 6 of Mare-Anne Jarvella's Model 100 article, "The Final Notice" (July 1983, p. 176). Insert the following line to make the program work: 60 H=0:F=0:C=0:T=0:RESTORE.—Eds.

Division Problems

Several lines need to be added to Adam Wells' program listing for "Math Countdown" (February 1983, p. 160). In order to divide, you need to add the following lines:

```
256 GOSUB 270:INPUT "Now, what would
you like to practice";Q:O
N Q GOSUB 285,510,580,645,690
645 CLS
646 PRINT@10*64+30,SH$
647 FORI=1TO10
648 PRINT@64*12+15,11-1
690 PRINT CHR$(28):END
```

—Eds.

"...diode CR2"?

We inadvertently left out part of the text to Richard Esposito's "40K Color Basic" article (May 1983, p. 212). The first sentence on p. 214 should read "You could install a switch in line with diode CR2." Sorry about that.—Eds.



A Traveling Error

Beve Woodbury's Model 100 article, "Traveling Expenses" (July 1983, p. 171), contained several errors. The program listing to set up the travel expense file was omitted. It should read as follows:

```
10 OPEN"RAM:EXPFIL.DO"
FOROUTPUTAS
20 PRINT#1,"0"
30 CLOSE:END
```

You also have to make several changes to Program Listing 3. First, add line 190:

```
190 :F=0
```

Next, change line 420 to:

```
420 PRINT#2,Z;"",N;"",C;"",Y;"",X:
GOTO30
```

Finally, remove the semicolon after in-

put lines 260, 280, 300, 320, 350, 370, and 390. We apologize for these errors—Eds.

Don't Be Teed-Off!

I had trouble getting Michael Parks' "Tee-Off" program to run correctly (April 1983, p. 108). The program listing gets in trouble in a few places where it should be using single-precision arithmetic instead of integer arithmetic. To fix this problem, remove the DEFINT A-Z from line 10. Also, in Victor Albino's "Billy and the Electric Troll" (May 1983, p. 320), the second graphic in line 160 should be changed to read CHR\$(177).

William Eccles
5939 East Quartz Mountain Road
Scottsdale, AZ 85253

A Debug on Debug

The weather forecast program written by Anthony Perri (Feedback Loop, January 1983, p. 400) is correct as originally published and should not be changed as per the May 1983 Debug letter from Rea Plowman (p. 26). For information from the author on how to correctly use this program, see this month's Feedback Loop.—Eds.

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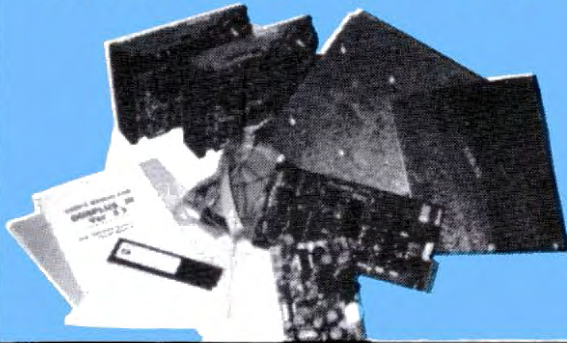
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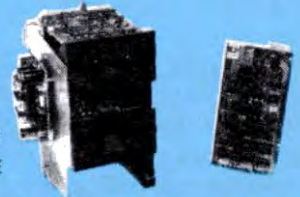
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TRS-80s have three different kinds of random-access memory (RAM): 1K of keyboard memory, which I discussed last month; 1K of screen memory (between 3C00 and 3FFF hexadecimal (hex)) that holds the value of each screen position; and 4K, 16K, 32K, or 48K of user memory from 4000 hex to the highest accessible address of the system.

User RAM is further subdivided. One section of memory (4000-42E8 hex on the Model I, 4000-43E8 hex on the Model III) is set aside for system use. Filled with pointers, temporary values, and buffers, this area of RAM is generally not available to Basic programmers. However, many specific values in this low memory are invaluable if you can include machine-language routines in your Basic programs.

The first 21 bytes in low memory, 4000-4014 hex, contain seven restart vectors. A restart (or RST) is a special Z80 machine-language instruction that uses 1 byte to force a call to one of eight addresses in page-zero memory. The Z80 RSTs save time and programming space by calling often-used subroutines at addresses 00, 08, 10, 18, 20, 28, 30, and 38 hex.

You can't write too many useful sub-



Using restart vectors

routines in the 8 bytes allowed for each restart; therefore, each restart address contains a jump instruction (JP) to another part of memory. In the TRS-80, all RSTs except RST 00 hex force a jump to a unique, 3-byte instruction near the beginning of low memory. In

low memory, each RST instruction meets another JP command to either an address in ROM or, when a DOS is active, to some address in the RAM used by DOS. (In tape-based systems, RST 28 hex and 30 hex encounter a return instruction; the code for RST 38 hex is different for the Models I and III).

The RST instructions jump from page-zero ROM to low memory RAM, and then back to ROM so the computer can modify or redefine each restart. Most disk operating systems redefine or modify at least some restarts, but some complex machine-language utilities completely redefine the restarts.

How can this information help you? Well, you can use some restarts to simplify your own machine-language routines, and you can modify one to add an extra command to Basic.

Normal Restart Functions

RST 00 hex, as explained above, forces a system reset in the same manner as a JP 0000 hex does. Other than as a short method to end a program, this RST has little use in machine-language programming.

RST 08 hex tests for a match between the byte pointed to by HL and the byte following the RST 08 hex instruction. If the test fails, the routine forces a JP to Basic's Syntax Error routine. Otherwise, HL is incremented to point to the next non-space character, and control returns. RST 08 hex checks necessary syntax, such as closing parentheses, and has some limited value for mixed-language programmers.

RST 10 hex retrieves the next non-space character from the string pointed to by HL. The character is loaded into the A register and the carry flag is set or cleared to show the range of the character. This restart provides an interesting method of adding new commands to Basic (see below).

RST 18 hex compares the value in register pairs DE and HL, and sets the status flags accordingly. Though the routine is simple to write, using RST 18 hex considerably shortens many data-handling programs.

RST 20 hex tests the type (integer, single, double, or string) of the current variable. It sets the status flags and loads a value into the A register to indicate the variable type. The variable

Program Listing 1. Frame routine.

```

00100 ;*****
00110 ;*
00120 ;* FRAME Routine -- defines a new
00130 ;* Basic command verb, FRAME, which
00140 ;* creates a border of CHR$(191)
00150 ;* around the video screen.
00160 ;*
00170 ;*****
00180 ;
00190 ;
1D78 00200 EXIT EQU 1D78H ;SEE TEXT
00210 ;
7000 00220 ORG 7000H ;DOESN'T NEED TO CHANGE
7000 2198FF 00230 LOAD LD HL,FRAME ;HL=> FRAME ROUTINE
7003 220440 00240 LD (4004H),HL ;NEW RST10H VECTOR
7006 C32D40 00250 JP 402DH ;EXIT TO DOS READY
00260 ;
00270 ;NOTE -- On tape systems, change line 250 to jump back
00280 ; to Basic: JP 1A19H
00290 ;
00300 ; -- The next ORG assembles FRAME to the top of 48K RAM.
00310 ; Change to match your system's memory size and
00320 ; requirements.
00330 ;
FF98 00340 ORG 0FF98H ;SEE NOTE ABOVE
FF98 E3 00350 FRAME EX (SP),HL ;SET UP FOR TEST
FF99 7D 00360 LD A,L ;TEST LSB OF CALLING ADDR
FF9A FE5B 00370 CP 5BH ;IS IT RIGHT?
FF9C 2003 00380 JR NZ,NO ;GO IF NOT
FF9E 7C 00390 LD A,H ;NOW TEST MSB
FF9F FE1D 00400 CP 1DH ;IS IT RIGHT?
FFA1 E3 00410 NO EX (SP),HL ;RESTORE STACK & HL
FFA2 C2781D 00420 JP NZ,EXIT ;GO IF WRONG CALL
00430 ;
00440 ;RST 10H was called from 1D5BH -- now test for FRAME
00450 ;
FFA5 CD781D 00460 CALL 1D78H ;GET NEXT CHAR. IN A
    
```

Listing 1 continued

MICRO-DESIGN

If you don't know the number, you should.

1-800-531-5002

Listing 1 continued

```

FFA8 FE46 00470 CP 'F' ;IS IT AN F?
FFAA 2004 00480 JR Z,YES ;GO IF YES
FFAC 2B 00490 NO2 DEC HL ;ELSE FIX POINTER
FFAD C3781D 00500 JP EXIT ;AND GO
00510 ;
00520 ; Current command begins with an 'F' -- Test to see if it
00530 ; is a LET statement.
FFB0 E5 00540 YES PUSH HL ;SAVE HL POINTER
FFB1 CD781D 00550 YES10 CALL 1D78H ;GET NEXT CHAR.
FFB4 FE3A 00560 CP 3AH ;IS CHAR. A ":" ?
FFB6 280B 00570 JR Z,YES20 ;GO IF YES
FFB8 FE00 00580 CP 00H ;IS CHAR. 00H ?
FFBA 2807 00590 JR Z,YES20 ;GO IF YES
FFBC FED5 00600 CP 0D5H ;IS CHAR. A "=" ?
FFBE 20F1 00610 JR NZ,YES10 ;GET NEXT CHAR. IF NOT
FFC0 E1 00620 POP HL ;ELSE RESTORE POINTER
FFC1 18E9 00630 JR NO2 ;AND GO BACK TO BASIC
00640 ;
00650 ; 'F' is not part of a LET statement -- now check syntax
00660 ;
FFC3 E1 00670 YES20 POP HL ;HL==>"F"
FFC4 23 00680 INC HL ;BUMP ONCE
FFC5 CF 00690 RST 00H ;CHECK FOR R
FFC6 52 00700 DEFB 'R'
FFC7 CF 00710 RST 00H ;CHECK FOR A
FFC8 41 00720 DEFB 'A'
FFC9 CF 00730 RST 00H ;CHECK FOR M
FFCA 4D 00740 DEFB 'M'
FFCB CF 00750 RST 00H ;CHECK FOR E
FFCC 45 00760 DEFB 'E'
FFCD E5 00770 PUSH HL ;SAVE POINTER
00780 ;
00790 ;Correct syntax -- FRAME -- has been found
00800 ;
FFCE 21003C 00810 LD HL,3C00H ;HL==> TOP OF SCREEN
FFD1 CDEBFF 00820 CALL HORIZ ;PRINT TOP LINE
FFD4 21C03F 00830 LD HL,3FC0H ;HL==>BEG. OF BOTTOM LINE
FFD7 CDEBFF 00840 CALL HORIZ ;PRINT BOTTOM LINE
FFDA 21003C 00850 LD HL,3C00H ;HL==> TOP OF SCREEN
FFDD CDF4FF 00860 CALL VERT ;PRINT LEFT SIDE
FFE0 213F3C 00870 LD HL,3C3FH ;HL==>TOP RIGHT CORNER
FFE3 CDF4FF 00880 CALL VERT ;PRINT RIGHT SIDE
FFE6 E1 00890 POP HL ;GET ORIGINAL POINTER
FFE7 2B 00900 DEC HL ;CORRECT IT
FFE8 C3781D 00910 JP EXIT ;RETURN TO BASIC
00920 ;
FFEB 3EBF 00930 HORIZ LD A,0BFH ;A=CHR$(191)
FFED 0640 00940 LD B,40H ;B=# OF LINES
FFEF 77 00950 HORIZ LD (HL),A ;PUT ON SCREEN
FFF0 23 00960 INC HL ;BUMP POINTER
FFF1 10FC 00970 DJNZ HORIZ ;GO UNTIL DONE
FFF3 C9 00980 RET ;THEN RETURN
00990 ;
FFF4 3EBF 01000 VERT LD A,0BFH ;A=CHR$(191)
FFF6 0610 01010 LD B,10H ;B=# OF LINES
FFF8 114000 01020 LD DE,40H ;DE=LINE OFFSET
FFFB 77 01030 VE10 LD (HL),A ;PUT ON SCREEN
FFFC 19 01040 ADD HL,DE ;HL==> NEXT LINE
FFFD 10FC 01050 DJNZ VE10 ;GO UNTIL DONE
FFFF C9 01060 RET ;THEN RETURN
01070 ;
7000 01080 END LOAD
000000 TOTAL ERRORS

```

Restart	Jump Address	Normal Function
RST 00 hex	(none)	System reset (identical to power on).
RST 08 hex	4000 hex	Compare value pointed to by HL to that immediately following the RST instruction.
RST 10 hex	4003 hex	Examine the next symbol pointed to by HL.
RST 18 hex	4006 hex	Compare DE to HL and set the zero and carry flags accordingly.
RST 20 hex	4009 hex	Test the type of the current variable.
RST 28 hex	400C hex	Reserved for DOS use—normally a DOS function call.
RST 30 hex	400F hex	Reserved for DOS use—normally for invoking Debug.
RST 38 hex	(varies)	Entry point for all maskable interrupts.

Table 1. The Restart patch points.

must have been previously moved to a special buffer in low memory.

RST 28 hex and RST 30 hex are reserved for use by DOS. RST 28 hex is generally used as a DOS request call (for example, a request for a specific DOS overlay). RST 30 hex loads and executes Debug.

RST 38 hex is the system entry point for all maskable interrupts. For one method of changing interrupt processing, see the article I wrote with Jean Durbin, "Computer Security with a Credit Card," *80 Micro*, March 1983, p. 74.

Using the Restarts

As an example of how to use restart vectors, this month's demonstration program defines a new Basic command, Frame, which creates a border of CHR\$(191)s around the video screen. Though not complete (this routine only works in the 64-character display mode and doesn't handle cursor placement), Frame demonstrates how you can write new command verbs.

The Frame routine is shown in Program Listing 1. The definition of Exit in line 200 is critical. The value shown is correct for Models I and III tape systems, for all versions of Model I TRSDOS and NEWDOS and for all Model III versions of TRSDOS. If you use a different DOS, go to Disk Basic and enter the following command:

```
? PEEK(&H4004); PEEK(&H4005)
```

If 120 and 29 appear, Exit is correct as it is. If different numbers appear, change the value of Exit in line 200 to match the current address in bytes 4004 and 4005 hex.

The key to defining a new Basic command verb is RST 10 hex. Basic starts execution of every statement at 1D5A hex with a RST 10 hex instruction. ROM address 10 hex is the instruction JP 4003 hex. Normally, 4003 hex contains the instruction JP 1D78 hex. Because 4003 hex is in RAM, you can change it to any value you like.

The Load portion of this month's routine (lines 220-250) alters the normal address at 4003 hex so every RST 10 hex instruction results in a jump to Frame. Since Load is only used during initialization, you can place it anywhere in memory. You don't need to protect it.

At line 350, a number of tests begin. First, the address on the top of the sack



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```

1 *****
2 *
3 *   Demonstration program for   *
4 *   FRAME routine -- execute   *
5 *   and protect FRAME before   *
6 *   entering Basic (disk systems) *
7 *   or before running this program *
8 *
9 *****
10 '
11 '
100 CLS
110 FOR I= 2 TO 13
120   PRINT @ I*64+I*3, "THIS IS A FRAME-UP";
130 NEXT I
140 FRAME
150 GOTO 150

```

Program Listing 2. Demonstration of Frame routine.

is examined to find the return address after RST 10 hex execution. Numerous ROM, DOS, and Disk Basic routines use RST 10 hex. Let the Frame routine interface only if RST 10 hex is called from 1D5A hex (if the return address is 1D5B hex). If the return address is anything else, all registers except AF are restored, and control is returned to the normal RST 10 hex routine (lines 350-420).

Line 460 calls the ROM routine at 1D78 hex to get the next character in the current Basic line into the A register. Another test checks to see if that character is an F. If it isn't, control returns to Basic to interpret the line normally.

If an F is found at the beginning of the Basic statement, it can either be the first letter of Frame or part of a variable definition (for example, F= 10). If it is a variable definition, or LET statement, the variable name is followed by =. Lines 540-630 perform a search for = occurring before the end of the statement. If it isn't found, control drops through to line 670.

The last series of tests starts at line 670. First, the pointer that Basic maintains to keep track of its location in the statement is incremented past the F of Frame. Then, four RST 08 hex instructions test for the correct spelling of Frame. If any test fails, a syntax error is reported and control returns to Basic's normal command level.

If all tests succeed, the HL registers are saved and control finally passes to line 810, where the actual frame around the screen is drawn. Finally, in line 890, the HL pointer is restored and corrected, and control returns to normal Basic operation.

You need to observe several precautions when defining new Basic commands:

- Until your program completes its preliminary tests, preserve all registers except AF. Several routines use RST 10 hex, some of which may expect certain values to be in certain registers.

- Error-trap the new command completely. Every possible syntax error should be accounted for and your program must be able to recover from program errors like syntax and type mismatch.

- The value returned in HL is critical. The normal RST 10 hex routine increments HL before it picks up the next character. Therefore, you should be sure that, when your new command has finished executing, HL points to the last character of the new command. Basic can then determine if the following character is an end-of-line marker (00 hex), a multiple statement separator (:), or something that causes a syntax error. The easiest way to preserve HL is to Push it on the stack when it points past the last character in your command, then Pop and Decrement it before returning to Basic.

Using Frame

Program Listing 2 demonstrates Frame in action. From either DOS READY or by using the System command, execute Frame. Then protect it in high memory (with a disk system, protect it before going to Basic). Finally, enter and run Listing 2.

If you have modified your DOS to include the Restore patch I explained in my June column (p. 24) Frame will not operate. Both routines use the RST 10 hex vector to change Basic. You will have to load Basic, then load Frame into protected high memory, and use Debug to set the correct address in 4004 hex and 4005 hex. Better yet, try Frame with an unmodified version of your DOS.

One final warning: If you write a new verb, make sure it doesn't contain any of Basic's reserved words. If it does, your command is stored in memory partly tokenized. For example, Store would be kept in memory as S T D3H E, because the Basic word Or is tokenized as 0D3 hex. Your computer manual contains a list of reserved words.

Mixing Languages on the Model 4

As soon as I am familiar with the Model 4, I will devote at least a part of a column to discussing which Model III techniques will work with the Model 4, which won't, and why. If any of you have specific suggestions or questions, pass them along and I'll try to answer them as soon as I can. In the meantime, I am looking forward to the excitement of exploring the possibilities and limitations of a new machine. ■

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I'll never make it as a businessman. I don't do well when confronted with a page full of numbers because I'm slow to spot trends or unusual relationships in numerical data.

However, I readily understand graphs. I'm much more comfortable when I see data plotted; then I can start to make decisions based on the information at hand.

My contribution to this month's business issue is a Color Computer graphics aid for comparing spending rates with budgetary limitations. The program incorporates ideas useful in other applications, makes good use of the CoCo's graphics capabilities, and fulfills a real need.

Suppose you have a budget that has to last for a given length of time. It could be a monthly household budget, a bank account to see a student through a school year, or (my own application) an annual budget for a research and development project.

As you spend the money, you need to know whether or not your funds will last through the time you originally planned.

At the least, you'll want to compare your spending rate to a constant rate that would deplete your resources precisely at the end of the budgeted time period.

You probably want to do more, though. How about using the computer to extrapolate your spending pattern to the end of the budget period, so you can see where your present spending habits lead you? This lets you visualize the effects of changing your spending rate.

I had such a program in mind when I set out to write Expgraph. It proved to be a happy experience: I have a program that meets my needs, and I've used a few favorite routines along the way.

Features of Expgraph

I designed Expgraph (see Program



Graphics for maintaining your budget

Listing) to take as much of the load off the user as possible while retaining a fair

amount of flexibility. The program prepares graphs using reports of dollars spent as of specified dates.

The data represents either period costs (how much you spent between April 1 and May 1) or cumulative costs (how much you spent between the first of the year and the end of January, February, and so on). I receive both kinds of reports in my own work.

In principle, you could graft Expgraph onto other programs; at the least, you could make it read other programs' data files. For this column's purposes, I've incorporated expense information as a cluster of data statements at the end of Expgraph.

As written, the program is equally at home with disk or cassette systems, but it does require Extended Color Basic.

Notice that I haven't entered the data (month, day, year, expenditure) in

Program Listing. Expgraph.

```

1 *****
2 *
3 *   EXPENDITURE GRAPHING *
4 *   PROGRAM *
5 *
6 *   SCOTT L. NORMAN *
7 *
8 *   MAY, 1983 *
9 *
10 *****
99 '
100 GOTO 200
110 '
111 ***** JULIAN DATE ROUTINE *****
120 Y=Y+1900
130 JD=367*Y-INT(7*(Y+INT((M+9)/12))/4)+INT(275*M/9)+D
140 RETURN
198 '
199 ***** GRAPHICS CHARACTERS *****
200 NRS(1)="BM+2,-4E2D6BR4"
205 NRS(2)="BM+1,-5E1R2F1D1L1G3D1R4BR3"
220 NRS(5)="BM+1,-1F1R2E1U1H1L3U3R5BR3BD6"
245 NRS(8)="BM+6,-1U4H1L2G1D4F1R2BR4"
250 DLS="BM+1,-1F1R2E1H4E1R2F1BL2BU1D8BU1BR5"
298 '
299 ***** MAIN PROGRAM *****
300 CLS: PRINT@5,"BUDGET COMPARISON GRAPH"
310 PRINT:PRINT" THIS PROGRAM WILL PLOT ACTUALEXPENDITURES AND
GIVE YOU TWO OPTIONS FOR EXTRAPOLATING THE SPENDING RATE TO
THE END OF THE YEAR.
320 PRINT:INPUT" WHEN DID THE FISCAL YEAR BE- GIN (MM,DD,YY FO
RMAT)";M,D,Y
330 GOSUB 120
340 J0=JD
350 PRINT:PRINT" ENTER YOUR TOTAL BUDGET FOR THE YEAR. DO NO
T USE COMMAS IN THIS NUMBER."
360 INPUT BG
368 '
369 *** AUTO-SCALING ROUTINE **
370 D=BG/10;J=D/1E7;E=INT(LOG(D)/2.3026)
380 F=D/10^E;V=10
390 IF F<SQR(50) THEN V=5
400 IF F<SQR(10) THEN V=2
410 IF F<SQR(2) THEN V=1
    
```

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Listing continued

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THE COLOR KEY

chronological order. Expgraph contains a sorting routine that obviates this protocol.

Also, there is nothing magical about monthly data. The information could represent any interval; in fact, the intervals could vary for a single report. I did make one assumption, though: The budget period covers one year. This sets the scale for the graph's horizontal (time) axis.

The vertical axis is another story. I've enjoyed the opportunity this project has given me to dust off a few favorite sub-routines, including one that automatically scales graphs.

Remember the agonies of trying to fit data onto graph paper? It always seems to be divided into the wrong number of sections.

This program incorporates a routine to guarantee that the graph's major divisions represent usable numbers: multiples of two, five, or 10. Furthermore, the total budget figure (supplied by the user at run time) lands in the uppermost division. So whatever your data range, you always use the full video screen.

I formatted the graph using only those elements I find useful. The budget figure appears as a circle on the right edge of the plot, and a straight line connects it to the origin. This represents the constant spending rate that consumes all funds at the year's end. The program plots the user's data as smaller circles connected by straight line segments.

Two methods of extrapolation are available. Expgraph could calculate the average spending rate for the entire period your data covers and plot a straight line at that rate from the origin to the year's end.

You can also specify that the program continue the most recent rate (the rate you spent money in the last interval for which you have data). This alternative shows the effect of any recent changes in spending patterns.

The program does not restrict you to one of these methods. The keyboard polling routine lets you ask for both plots on the same graph, one after the other.

Dissecting the Code

The Program Listing contains a commented version of Expgraph. Stripped of the REMs, the program occupies a little less than 4K, so it's feasible to re-number it and incorporate it into a more

Listing continued

```
420 C=V*10^E:G=0
430 IF J>(G+1) THEN G=G+1
440 H=INT(BG/C)+1
450 IF (ABS(BG/C+1-H))<J THEN H=H-1
460 MX=C*H: SF=MX/150
470 NI=H-G
498 '
499 '** MENU & DATE/$ ARRAY **
500 CLS:PRINT:PRINT" TO GET THE PROPER GRAPH, INDICATE WHE
THER THE DATA REPRESENT"
510 PRINT:PRINT TAB(5)"(1) PERIOD COSTS, OR"
520 PRINT:PRINT TAB(5)"(2) CUMULATIVE COSTS"
530 PRINT:PRINT" AFTER THE GRAPH IS DRAWN, PRESS THE 'M' KEY FOR
THE EXTRAPOLA- TION OPTIONS MENU."
540 PRINT: INPUT" TYPE-OF-DATA SELECTION";MC
550 IF MC<1 OR MC>2 THEN 500
560 READ M:IF M=0 THEN 600
570 N=N+1:'ARRAY SIZE COUNTER
580 READ D,Y,A
590 GOTO 560
600 DIM B(N,1): RESTORE
620 FOR K=1 TO N
630 READ M,D,Y,B(K,1)
640 GOSUB 120
650 B(K,0)=JD
660 NEXT K
670 RESTORE
698 '
699 '** SORT BY JULIAN DATES **
700 P=N
710 P=INT(P/2)
720 IF P=0 THEN 900
730 K=N-P: J=0
740 I=J
750 L=I+P
760 IF B(I,0)<B(L,0) THEN 790
770 T1=B(I,0): T2=B(I,1): B(I,0)=B(L,0): B(I,1)=B(L,1): B(L,0)=T
1: B(L,1)=T2: I=I-P
780 IF I>=1 THEN 750
790 J=J+1
800 IF J<=K THEN 740
810 GOTO 710
898 '
899 '*** DRAW "FRAMEWORK" ***
900 PMODE 4,1: PCLS: SCREEN 1,1
910 LINE(60,16)-(244,166),PSET,B
920 FOR M=1 TO NI-1
930 Y=166-M*C/SF
940 LINE (60,Y)-(244,Y),PSET
950 NEXT M
960 XO=60:YO=166
970 CIRCLE(244,166-BG/SF),4
980 LINE(60,166)-(244,166-BG/SF),PSET
998 '
999 '*** SCALE & PLOT GRAPH ***
1000 FOR K=1 TO N
1010 XK=60+INT((B(K,0)-J0)/2+0.5): B(K,0)=XK
1020 IF MC=1 THEN YY=YO ELSE YY=166
1030 YK=YY-B(K,1)/SF: B(K,1)=YK
1040 CIRCLE (XK,YK),2
1050 LINE (XO,YO)-(XK,YK),PSET
1060 XO=XK: YO=YK
1070 NEXT K
1098 '
1099 '** DRAW $ CALIBRATION **
1100 C$=STR$(INT(166-C/SF))
1110 DRAW "BM10,166R46BL23BD10U8F4L8E4"
1120 DRAW "BM10,"+C$+"R46BL23BU10D8H4R8G4"
1130 DRAW"BM0,162;XDL$;"
1140 C$=STR$(C): L=LEN(C$)
1150 FOR K=1 TO L
1160 IF LEFT$(C$,K)="" OR LEFT$(C$,K)="" THEN 1190
1170 V=VAL(MID$(C$,K,1))
1180 DRAW "XNR$(V);"
1190 NEXT K
1200 I$=INKEY$:IF I$<>"M" THEN 1200
1298 '
1299 '** EXTRAPOLATION MENU **
1300 CLS:PRINT@10,"* OPTIONS *"
1310 PRINT:PRINT" TWO KINDS OF EXTRAPOLATION ARE AVAILABLE:"
1320 PRINT:PRINT "(1) 'AVERAGE SPENDING RATE' LINE, OR"
1330 PRINT:PRINT "(2) LINE THROUGH THE LAST 2 DATA POINTS ONL
```

Listing continued

Listing continued

```

y"
1340 PRINT:INPUT "YOUR CHOICE";EX
1350 IF EX<1 OR EX>2 THEN 1300
1360 SCREEN 1,1
1370 ON EX GOTO 1400,1500
1397 '
1398 '**** "AVERAGE RATE" ****
1399 '**** EXTRAPOLATION ****
1400 B(0,0)=60: B(0,1)=166: SL=0
1410 FOR K=1 TO N
1420 SL=SL+(B(K,1)-B(K-1,1))/(B(K,0)-B(K-1,0))
1430 NEXT K
1440 SL=SL/N
1450 YI=166+SL*184
1460 IF YI<2 THEN 2000
1470 LINE(60,166)-(244,YI),PSET
1480 I$=INKEY$: IF I$="M" THEN 1300 ELSE 1480
1497 '
1498 '*** "LAST-2-POINTS" ***
1499 '**** EXTRAPOLATION ****
1500 SL=(B(N-1,1)-B(N,1))/(B(N,0)-B(N-1,0))
1510 YI=B(N,1)-SL*(244-B(N,0))
1520 IF YI<2 THEN 2000
1530 LINE (XK,YK)-(244,YI),PSET
1540 I$=INKEY$: IF I$="M" THEN 1300 ELSE 1540
1997 '
1998 '***** GOING BROKE! *****
1999 '
2000 CLS: PRINT @9, "*** WARNING ***"
2010 PRINT: PRINT" EXTRAPOLATED SPENDING RATE ISBADLY OFF-SCAL
E. PLEASE CHECK YOUR FIGURES!"
2020 PRINT" IF FIGURES ARE CORRECT, THE EXTRAPOLATION CAN BE
BROUGHT BACK ON-SCALE BY SPECIFYING A FICTITIOUS ENLARGED B
UDGET."
2030 END
4999 '
5000 DATA 1,31,83,1000
5010 DATA 2,28,83,2000
5020 DATA 3,31,83,3000
5030 DATA 5,31,83,5000
5040 DATA 4,30,83,4000
5050 DATA 0
    
```

Julian equivalent for all dates of interest to the program (the program computes time intervals by subtracting Julian dates), so you might call it often. I wanted it near the beginning of the program to speed up execution, hence the jump.

The program uses the string variables in lines 200-250 to draw a dollar sign and to calibrate the scale for the final PMODE 4 graph. The techniques for drawing text on a high-resolution graphics screen are well known by now; these particular characters are from the set I defined in a previous article (*80 Micro*, Anniversary Issue 1983, p. 469).

Notice that the numerals (NR\$(1), and so on) are elements of an array. Expgraph doesn't need the other elements since it doesn't label every division of the graph, but this is a handy way to organize data. It makes life simpler when you call up the graphical equivalents of each digit in a number.

As far as the user is concerned, the program begins at line 300. That queer spacing in the text of the menu is necessary for an attractive screen display.

The program calls for only two pieces of information: the starting date for the year and the total budget. Enter the date as:

Month,Day,Year

comprehensive financial management package.

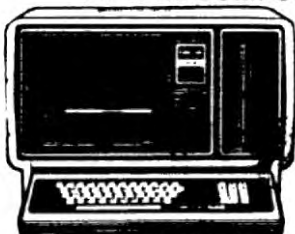
The REMs all have line numbers like 198 and 399, and are not referenced by GOTOs or other control transfers. Feel

free to delete them.

Expgraph is written in a fairly linear fashion, except for one odd move at the beginning: the jump around the routine at line 120. This routine calculates the

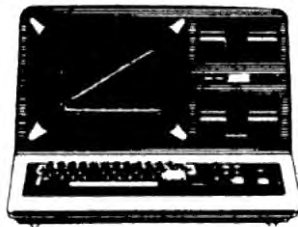
You need one or two digits for the month and day, and two for the year; the program adds the 1900. (Readers who expect to be concerned with the

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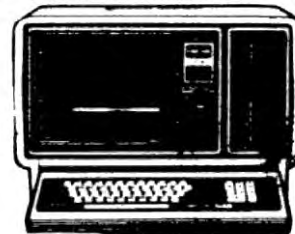
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232

THE COLOR KEY

21st century can modify line 120 when the need arises.)

Now the auto-scaling routine at line 370 takes over. This is a modification of a more general routine published in the December 15, 1981 issue of *Electronics* (p. 159).

I've simplified it by assuming that the graph shows only positive numbers. You start with zero expenditures and spend up toward your total budget.

The routine starts by trying to fit the budget figure onto a graph with 10 major divisions. If this requires the divisions to have unacceptable values (i.e., not one, two, or five times an integer power of 10), the program automatically adjusts.

The final graph might have an unusual number of divisions, but they will be a convenient size. The program plots the history of a \$775,000 project on an eight segment display, with every segment corresponding to \$100,000.

The variable C (line 420) is the dollar value associated with each major division of the graph; you need it later in the labelling routine. MX (line 460) is the maximum value you can show on the graph, and is equal to C times the number of major divisions.

I decided that the graph for Expgraph would be 184 positions wide and 150 high. The conversion between dollars and vertical coordinates on the screen is governed by a scale factor SF, equal to MX/150. The final variable in this routine is NI, the number of major vertical divisions.

The 184-position width provides a reasonable fit to a two days/position scale. If you want to use Expgraph for some other period of time, change this when you get to the plotting routine.

Once the program calculates the scaling factors, it moves to the second menu at line 500. This asks the user how to interpret the data.

To make a sensible graph, you have to know whether each piece of data represents the total money spent since the beginning of the year or since the end of the last reporting period. The selection variable MC is used in the plotting routine.

The user doesn't need to keep track of how many data points are to be plotted. The program checks in lines 560-600, and sets up a data array of the appropriate size. Note that a DATA 0 sets up a simple out-of-data test. If you use another technique, such as a disk file, to

supply information to Expgraph, you must modify this.

The data array B(K,J) is $N \times 2$ in size, where N is the number of data points. The first subscript ranges from 1 to N, while the second takes the values zero and 1. B(K,0) is the Kth Julian date, while B(K,1) is the corresponding expenditure figure.

Now the program reads the data statements a second time to add data to the array (lines 620-670). It calculates the Julian dates and puts the array in order using the Shell-Metzner sort in lines 700-810.

Ordinarily, financial data is available in chronological order, but you might not be able to enter a report in the proper sequence. Expgraph frees you from having to worry about this.

Lines 900-980 set up the outline of the graph, draw horizontal lines at the major divisions, and plot the budget figure and the straight line connecting it to the origin. Lines 1000-1070 plot the actual data points and connect them.

There isn't much to say about the plotting routine. It scales the Julian dates to the graph coordinate system in line 1010, and scales the financial figures in line 1030.

Variable names XK and YK are the same as B(K,0) and B(K,1), but I wanted to shorten the notation for some of the plotting instructions.

The graph is even more useful when the program calibrates the dollar scale in lines 1100-1190. The program finds the vertical position of the first major division line and converts it to a string in line 1100. Expgraph uses the string in a Draw command (line 1120) to locate a fiducial mark: a horizontal line segment with a down-pointing arrow.

Line 1110 draws the complementary line, complete with an up arrow, aligned with the lower edge of the graph. This sets up a gap one major division high, into which you write the dollar value of that division—\$1,000, \$50,000, or whatever. Line 1130 even draws the dollar sign.

Lines 1140-1190 convert the variable C to a string, analyze it one digit at a time, and draw the NR\$ variables corresponding to each digit. The Execute option of Extended Color Basic's Draw command comes into play here.

Line 1160 is necessary because Basic wants to lead off with a blank when converting a number to a string. Without it, the calibrations all start with

a leading zero.

With the zero suppressed, and with the screen coordinates I've chosen for the graph, you have enough room for a six-digit number plus the dollar sign. Expgraph can properly label a major division of up to \$500,000.

Now that the raw data is graphed, press the M key to get to the third menu for extrapolation options. The average-expenditure-rate method assumes that all reporting intervals are of equal length. At this level of accuracy, such an assumption isn't unreasonable if the reporting intervals are months of the year. You shouldn't use this method if you mix monthly and weekly data, though.

Should either extrapolation method indicate that you are headed for disaster, with anticipated expenses far in excess of your budget, the program gives you a warning message (lines 2000-2030) and throws you off.

Serves you right.

Final Thoughts

One word of warning: If you get into this type of graphics data presentation, be careful about the positive and negative signs of vertical distances on the screen.

The Color Computer uses an inverted coordinate system: The positive direction for vertical measurements is down. This causes me a few headaches whenever I start a new graphics project.

Expgraph has been a workhorse for me. I can't claim that the extrapolations are accurate to six significant figures, but they're good enough to tell me when a real budget problem is in the making—something I might not notice in columns of numbers.

Other users might want to spruce up the display a little. You might like to add a title, or vertical lines to indicate the end of each month or another reporting interval.

You might even want to add more labels to the dollar scale. Of course, if you do that you need a complete set of numerals for your draw statements. ■

Scott Norman welcomes reader response to The Color Key. Write c/o 80 Micro, 80 Pine St., Peterborough, NH 03458.

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TECHNICAL COMPARISON CHART

FEATURES OF THE FINISHED BASIC PROGRAM	PRODUCER	JR.	QUICKPRO	CREATOR
Full Screen Oriented Input of All Fields	YES	YES	NO	NO
Edit without Retyping with insert & delete	YES	YES	NO	NO
Restrict field Length automatically	YES	YES	YES	NO
Unlimited Restriction choice for each field	YES	YES	NO	NO
User defined Custom Prompts for each Field	YES	YES	NO	NO
Full Speed Typing in ALL Fields	YES	YES	NO	NO
Immediate Exit from Any Field to Menu	YES	YES	NO	YES
Enter Fields from last Record automatically	YES	YES	NO	YES
Fast BTREE File Structure (No Sort Needed)	YES	YES	NO	NO
Find Record with Part of a Key	YES	YES	NO	NO
Hi-Speed Global Search for ANY Field in a Record	YES	YES	NO	NO
Duplicate Keys and Multiple Keys Supported	YES	YES	limited	NO
Global Field Replacement Function	YES	YES	NO	NO
Run Predefined Reports from Finished Program	YES	YES	NO	NO
Select Reports from Menu in Finished Program	YES	YES	NO	NO
Sort (machine language) ANY Field-Free	YES	NO	NO	NO
Custom Mailing Labels Option (any Size)	YES	NO	NO	NO
Do Calculations on fields in Program	YES	YES	YES	NO
Sell Finished Program with No Royalty	YES	YES	NO	NO
PRODUCER CAPABILITIES & FEATURES				
Toll Free Question Line	YES	YES	NO	NO
Create PROFESSIONAL Finished Program	YES	YES	NO	NO
Modify Program without Starting Over	YES	YES	NO	NO
Ease of Use including Complete TUTORIAL	YES	NO	NO	NO
Number of Calculations allowed per field	8	8	1	0
Use Field Names for Calculations	YES	NO	NO	NO
Use ALL Math Functions in Calculations	YES	NO	NO	NO
Generates a BASIC Program	YES	YES	YES	YES
Custom Design exact Screen YOU desire	YES	YES	NO	NO
Full Feature Screen Generator (graphics)	YES	NO	NO	NO
Easy Report Generation with Any Restrictions	YES	NO	NO	NO
Complete & Thorough DOCUMENTATION	YES	YES	limited	NO
Detailed Quick Reference Materials	YES	YES	NO	NO
Audio Cassette Tutorial Available	YES	NO	NO	NO
Program Planning Form Provided	YES	NO	NO	NO
Sample Programs Available before Purchase	YES	YES	NO	NO
FREE UTILITIES INCLUDED				
Free Menu Driven DOS Utility Package	YES	YES	NO	NO
Free Disk Operating System (Super Fast)	YES	YES	NO	NO
File Rebuilder & Reorganizer included Free	YES	NO	NO	NO

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FEATURES

- screen generator allows easy definition and creation of fields
- B-tree file lets you search, insert, delete and edit
- reports by single restriction (no sort)
- much more (see technical comparison chart)

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For an independent product review of the PRODUCER see page 62 of March issue of 80 Micro



Photo 1. The MC-10.

★ ½

Model MC-10 Micro Color Computer
Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
\$119.95

by Beve Woodbury

Radio Shack's new MC-10 Micro Color Computer is a good computer on which neophyte users can learn Basic programming. It's reasonably priced, fairly versatile, and accepts Basic commands from a single keystroke. But its versatility is limited by a small (4K) memory capacity and a lack

of software.

The MC-10 is aimed at the low-end market currently dominated by the Timex-Sinclair 1000 and the VIC-20. Each computer has advantages and disadvantages, but the MC-10 comes out last in my opinion.

Physical Description

The MC-10 has an ivory case. It's 2 inches high by 8½ inches long by 7 inches wide, and weighs a little under 2 pounds (see Photo 1). It generates eight colors on a 32-character by 16-line display. You can display text and graphics on the same screen.

This computer has a cassette recorder port (see Photo 2), an RS-232C port for

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Our reviewers use a five-star rating system. One star represents the low end of this spectrum, while five stars represent the spectacular and high end of the spectrum.

a printer or telephone modem, and a port for inserting an optional 16K RAM module. It doesn't have a port for joysticks or EPROMs.

The MC-10 comes with an antenna switch that connects to a TV, the connecting cable, a manual, a quick reference card, and a bulky, heavy power supply you must use to connect the computer with a wall outlet.

According to Tandy, the keyboard is "standard typewriter style." The keyboard letter/number format is standard, but the keys are the small chiclet style that would horrify any touch typist.

The keys are well labelled. Regular and special characters are identified on each key, and Basic commands appear on the panel above the key. You access special characters, such as the 16 graphics characters, by simultaneously pressing the shift key and the character key.

You access Basic commands by simultaneously pressing the control key and the key associated with the desired command. The control key is in the lower left corner, and the shift key is in the lower right corner. The enter key

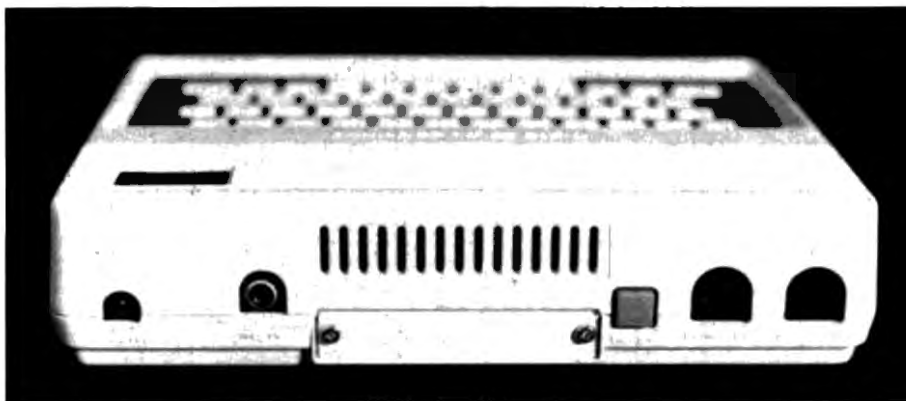


Photo 2. A rear view of the MC-10.

and the break key are also on the far right of the keyboard.

I was immediately ready to dislike the keyboard, but the more I used it in programming, the more I liked it. It is definitely a one-hand keyboard. All but the smallest of hands can span it to press the shift or control key and any other key.

This leaves one hand free to follow any text you're copying. The MC-10's size could be a great advantage to anyone handicapped by the use of only one hand.

Once I became familiar with the keyboard, I could type in a program much more quickly than usual. Each Basic command requires only one keystroke, thus eliminating typos in the command words.

You don't need to type CHR\$(n) for graphics, although the command is available. The background color of the graphics character is determined by the color of the cursor when you press the shift and graphics keys.

Change the color of the cursor by pressing control and the zero key. The color changes each time you press the keys, cycling through the full range of colors. These three options greatly reduce programming and debugging time.

Several keys have special functions when you use them with the control key. The Q key deletes the current program line. The A key erases by backspacing. The W key produces exponentiation. The S and Z keys are "reserved for special purposes" that Tandy has yet to define.

The shift key with the @ key pauses a program. The shift key with the zero key switches the keyboard between upper- and lowercase modes.

Lowercase letters don't appear on the screen. The MC-10 prints lowercase letters in reverse video: green letters on black background. They should appear on a printout, but I couldn't test the printing capabilities as I don't have access to a serial printer.

The reset button on the back of the computer clears the screen or gets you out of a hang up while retaining the program and variables in memory.

The MC-10 can also generate music, or noise, depending on the listener's perspective. The lowest musical note is approximately the E below middle C, moving up 255 tones to the very high tones. This sound capability could be useful in detecting early high-sound hearing disabilities.

Like the machine, the manual is compact and easy to understand. The information is presented in a factual, instructive manner without all the cartoon features of the CoCo manuals. The documentation has a good table of contents, but no alphabetical index to help locate specific information.

A novice can start at the beginning of the manual setting up the computer and its accessories, then progress smoothly to programming. The Basic commands appear in logical order, starting with Print commands and ending with mathematical functions. The explanations are detailed, and include sample program lines and simple programs.

Evaluation

The MC-10's portability is definitely an asset. You can use it wherever you

"The MC-10 is useful for learning Basic, but it does have many disadvantages."

have access to a television. My teenage users commented that it would easily fit into their book bags.

If you plan to connect your MC-10 to a motel television, be sure to check with management first. Many motels have silent alarms connected to their television cables.

The MC-10 is useful for learning Basic, but it does have many disadvantages.

The lack of automatic line numbering slows program entry, and no edit mode exists to aid debugging. This is frustrating when you make a typing error at the end of a long line. You have to retype the entire line, possibly creating more typing errors.

The MC-10 has no means of using files. This severely limits programming use. The closest you can get is to use an array as a file. You can set up an array in a program with string or numeric characters.

You can save an array of numeric characters on tape using the CSAVE* command, then load it back for future use with the CLOAD* command. This lets you simulate data files limited to numeric data.

Even if file input/output becomes available, it would be difficult to use the MC-10 for any application that requires keyboard input. One-handed data entry on a miniature keyboard is difficult and error-inducing.

The computer has no Else command, and program line length is limited to 127 characters.

Also, the MC-10 doesn't control the motor (start/stop) on the cassette recorder. You must manually turn the recorder on and off.

All these disadvantages are probably due to the limitations of MC-10 memory size. I expect Tandy to come out with an Extended Basic add-on that will include automatic line numbering, the Else command, cassette motor control, and expanded graphics commands such as Line, Print, and Paint.

It would be beneficial if you could use CoCo program tapes on the MC-10 and vice versa. However, the CoCo runs on a 6809 ROM chip and the MC-10 runs on a 6803 ROM chip. These two chips require different Basic command tokens.

(A Basic command is tokenized in memory so it fits in 1 byte of memory, regardless of the command's length. Of and Restore each occupy 1 byte.)

The MC-10 loads a tape written on the CoCo and vice versa, but the different command tokens produce strange programs. For example, Print on the MC-10 becomes Data on the CoCo, and Next becomes End.

All things considered, the MC-10 is up against some stiff competition. You can purchase the 1K Timex-Sinclair 1000 with a 16K RAM add-on for approximately the same price as the 4K MC-10. And the Timex-Sinclair accepts 63 one-keystroke commands and generates 20 graphics characters.

I prefer the real keys on the MC-10 to the membrane keys on the Timex-Sinclair 1000 and I think the MC-10 has a clearer manual. The Timex-Sinclair 1000 doesn't have color, but you can program it in Assembly language.

The larger memory (at the same price) and the ability to use Assembly language give the Timex-Sinclair 1000 a decided advantage if you're willing to

sacrifice color and real keys. Both are primarily learning computers and have limited expansion capability.

The 5K Commodore VIC-20 is close to the MC-10. I've seen it for \$159.95, but know it's been on sale for under \$100. The VIC-20 isn't as portable; it's about three times the size of the MC-10 and has a heavy power supply unit.

The added size provides room for expansion. In addition to cassette and serial ports, the VIC-20 has a joystick port, a cartridge port, and a port for special accessories. You can use the serial port for a printer or a disk drive. You can also expand memory to 32K.

The VIC-20 has a true typewriter-style keyboard with access to 60 graphics characters and eight colors. Upper- and lowercase letters appear on the screen.

You can also choose from 16 screen colors, eight border colors, and eight graphics colors. Even letters can appear in one of eight colors. The VIC-20 has high-resolution graphics and each pixel is separately programmable.

One-stroke Basic commands are not available on the VIC-20. This makes program typing more difficult and time consuming, but the real keys make data entry much easier. File input/output is available, so the VIC-20 is a more practical computer for data handling or business use than the MC-10.

The screen display is 22 characters wide by 23 lines long. This causes the characters to appear spread out and distorted. I found text displays quite unpleasant and difficult to read on the screen.

Rumor has it that the Timex-Sinclair 2000, the U.S. version of the English Spectrum, will be released in October. If it's really like the Spectrum and sells for under \$200, it might be worth considering.

The Spectrum is a color computer with high-resolution graphics and 16K RAM. The screen display is 32 characters wide by 24 lines long. The keyboard is almost standard-size with chiclet-style keys.

You can enter Basic commands and graphics with one keystroke. The Spec-

trum is expandable to 48K RAM, and disk drives and printers are available for it.

Perhaps some of Tandy's products for the MC-10 will help make it more competitive with the other low-end computers. As I write this review, Tandy is advertising games and personal time saver programs from a library of ready-to-run MC-10 cassette software. They are also touting a \$49.95 16K RAM add-on.

Unfortunately, advertising has precluded availability, and Radio Shack Computer Centers aren't sure when they'll have the software or expansion RAM. These products might be available by the time you read this article. I'm hoping that Tandy will soon offer telecommunication software (which will require the purchase of a modem) and Extended Basic.

The MC-10 is a good, compact, portable computer severely limited by its 4K size. You should evaluate future expansion capability and cost, as well as the competition, before rushing out to

Gold Plug - 80

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Ahhh, instant relief! At last there is a permanent cure for contact oxidation on Model I edge connectors. Many TRS-80 users are familiar with the symptoms: untimely resets, spontaneous reboots, or the inability to get the computer started at all without a frustrating session with a pink eraser.

The Gold Plug 80 is a well made device consisting of an edge-card plug with gold plated contacts, available with either 34 or 40 contacts. The rear of the plug has ter-

minal tabs which fit exactly over the existing foil fingers on the TRS-80's connectors. After installation, the original plugs have been extended about a half inch, meaning that the plastic door covers no longer fit. This did not trouble me, but you should take it into consideration. E.A.P.'s advertising leaflet, by the way, cautions you about the doors, which is refreshing. They also have the excellent policy of permitting you to return any plugs ordered for a refund if after seeing them you are un-

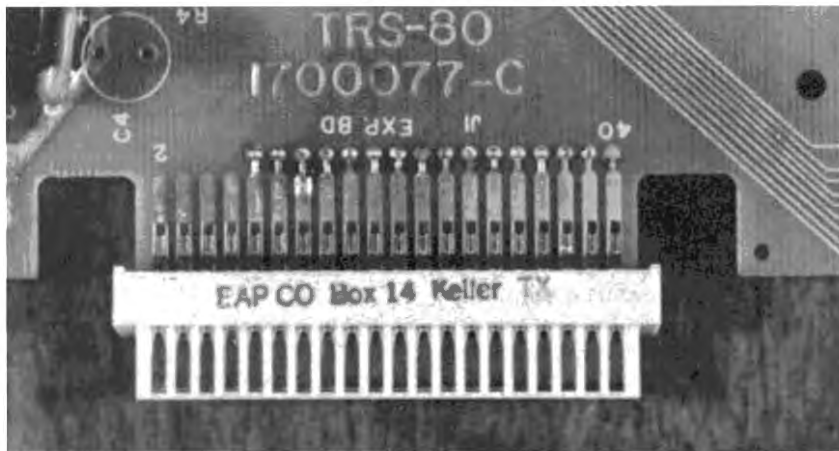
willing to undertake the installation.

An excellent set of instructions accompany the plugs, and they are shipped promptly. I ordered mine by mail on a Monday and received my set of plugs by first class mail on Tuesday of the next week.

Installation

Installation requires a soldering iron (I use a 40-watt Weller), Rosin-core solder, a Phillips screwdriver, and your last Pink Pearl. The keyboard and Expansion Interface have to be disassembled to get at the connectors, which are then cleaned—the eraser's last fling. The Gold Plug 80 is fitted over the existing plug with the contacts centered, and then soldered to the board. I have some soldering experience, but it proved to be an easy, safe job. The contact is heated, a very small amount of solder applied, and then you go on to the next contact. It took about an hour to do all six plugs.

GOLD PLUG 80 Mod I (6) \$ 54.95
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MC/VISA

purchase one.

If a beginner becomes really interested, he'll quickly outgrow the MC-10's capabilities. He'll have to de-

cide whether to purchase a new computer that can grow with his interest, or whether the MC-10 will satisfy him and at what cost.

On the other hand, if the beginner who buys an MC-10 finds no lasting interest in computers, he won't be out several hundred dollars. ■

★★★★

Liberator
John Crane
Computer Shack
1691 Eason
Pontiac, MI 48054
Model I, III, and 4
\$19.95 cassette
\$24.95 disk

by Michael E. Nadeau

Yes, this is another Donkey Kong clone. But if Donkey Kong is your game, Liberator is the best of the lot for the Models I, III, and 4.

The game's plot pits you, a "brilliant scientist," against your own robot,

which has gone haywire. You must work your way through an industrial complex where the robot is holding your helpers captive.

You climb ladders, hop elevators, jump barrels, and dodge drone robots in the attempt, at speeds fast enough to keep you on your toes, but not so slow that you easily master the game. You'll find it difficult to predict the frequency of the rolling barrels and movements of the drones; this adds to the game's challenge.

Liberator has five different screens and a total of four captive helpers. (You guessed it; they are young, helpless, and female. On the TRS-80, though, they look more like young, helpless fire hydrants. Computer Shack should have left the sex of the helpers up to the game

player; after all, women play arcade games, too.)

On too many games that involve moving a player up and down ladders it's difficult to get the player properly aligned on the ladders. This is frustrating. With Liberator, I found it quite easy to get the player to move as I wished.

You control your player's direction with the arrow keys and make him jump with the space bar—a comfortable arrangement. The program permanently stores the top 10 scores, and the same disk boots on the Models I, III, and 4.

Liberator's documentation is brief and adequate. And, as usual with Computer Shack programs, the package is professionally presented with striking artwork.

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SOFTRENDS

✓ 492

REVIEWS

My only complaint about Liberator is that the difficulty level doesn't seem to increase with your score. Computer Shack ads claim that the game has 20 levels of play, but my copy doesn't seem to have this feature.

Computer Shack might be referring to the sequence of the five screens. Each screen differs in complexity. The different screens seem to appear randomly

at first, but the ratio of difficult to easy screens increases as your score gets higher.

Even without increasing the level of difficulty, Liberator still presents a challenge each time you play it. With the price of arcade-style games so high, their staying power is an important consideration that makes Liberator a good value. ■

★ ★ ★

Computer Programming for Kids and Other Beginners on the TRS-80 Computer

Royal Van Horn
Sterling Swift Publishing Company
1600 Fortview Road
Austin, TX 78704
\$9.95

★ ★ ★ / ★ ★ ★ ★
(see last paragraph)

BASIC Programming for the Classroom Teacher
Joan M. Miller, Ruth King Chaya, and Debra J. Santora
Teachers College Press
1234 Amsterdam Ave.
New York, NY 10027
\$15.95

by Mary Gasiorowski

These new books for beginners address two different audiences: children and teachers. They are not self-teaching books. Their emphasis is on programming, and they provide only one part of a complete training in computer literacy.

You could easily use these books in an elementary or middle school class for computer programming. *Computer Programming* offers basic training for kids, and *BASIC Programming* prepares the teachers.

Computer Programming

Computer Programming is designed for home use; it's a good resource for the whole family, and especially for children. It is printed in large, easy-to-read type.

In general, the book progresses from easy to more complex material. *Computer Programming* explains computer

components (keyboard, CPU, ROM, RAM, screen), some special keys (enter, shift, clear, left arrow, break), and gets right into programming and graphics.

Computer Programming also has some exercises designed as classroom lessons. It gives you a program to try, usually asks a question about the result, and often encourages you to experiment further.

This is not a true self-teaching book. Adults should go over the material with children. For example, the instructions to turn on the computer are technical and perhaps scary—multiple pages of large type with very few pictures to depict what is happening.

Computer Programming implies many concepts without fully explaining them. It explains that a computer has two types of memory, RAM and ROM, but not why. More diagrams would help clarify the coordinate system for graphics.

This book has lots of examples illustrating some of the finer points of programming. It occasionally requires that the student draw or write the result of the program example. This reinforces comprehension, but the book, or the adult working with the student, needs to do this much more often.

Computer Programming has many good points: It's easy to read and laid out well. It's interesting and fun, and it teaches elementary programming. You should read it in front of a computer, where you can try the examples.

And you shouldn't read the book alone. In fact, the author suggests you read it "with a friend," preferably an adult who can answer questions and offer suggestions on programming problems.

BASIC Programming

BASIC Programming is written by teachers for teachers. In a nontechnical way, it explains Basic commands and

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✓ 103

REVIEWS

writing programs. It provides nonmath examples, so it's a good book for teachers in all disciplines.

The material in this book is derived from the authors' experiences giving in-service teacher workshops. It is designed for such workshops, rather than for at-home reading.

BASIC Programming accompanies the TRS-80, Apple, and Commodore PET computer systems with information and examples for all three. It is not intended to replace the manuals that come with the systems, however.

BASIC Programming introduces a command, gives an explanation and examples, and offers exercises to develop a clear concept of the command. It also provides answers to all the exercises, a glossary, a bibliography, and an extensive index. In addition, the authors have suggestions for using programming in the classroom.

The authors provide good descriptions of the various Basic commands, especially some of the more difficult concepts such as RND, ON-GOSUB and MID\$. The examples are better than average. The exercises are thought provoking, and you should work them out at a computer.

In fact, you should study the whole book at the computer. Many of the examples don't show the result of the program, so if you have no computer available and you're not familiar with the result of the commands, you might find the discussions following the examples obscure.

The later chapters introduce some fairly complex programs. One chapter details a program to test for parts of speech in a language-arts lesson. Another chapter sets up a phonics quiz.

New commands and concepts are introduced in the last four chapters, but the exercises at the end of each chapter do not start simple and gradually become more difficult; they are all fairly complex. This could be a problem for

beginners who need straightforward exercises to better understand a new command.

If you are a beginner and must choose only one book to read, this might not be the best one. For a real beginner, the comment in the first chapter, "your instructor, or the manual will . . ." is not very helpful.

References to the enter/return key imply that one such key exists. Those who have used a variety of microcomputers know that some label the carriage-return key "enter" and others call it "return," but this might be confusing to a beginner.

Another confusing aspect of *BASIC Programming* is the authors' desire to provide information for several brands of computers. Some Basic commands are different from computer to computer.

If a school has several different types of computers, it's great to find information applicable to each in one book. But if your school has only one type of computer, perhaps you should look for a book for beginners based on your computer.

In the preface, the authors express the hope that this book will help in-service and pre-service training for teaching effective classroom computer use. That is the best use for *BASIC Programming*. An experienced and knowledgeable instructor would talk through the material, answer questions, and provide more examples.

BASIC Programming for the Classroom Teacher is a quality reference and instruction book. It's a good book for a school to have, a better book for several teachers to work on together, and a very good book for teacher in-service training.

I give *BASIC Programming* two ratings: three stars for general school and teacher use, and four stars for specific use in teacher-training workshops. ■

★ ★ ★ ★

The Executive Calculator
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by Michael W. Ecker

The Executive Calculator is a collection of over 150 business- and consumer-oriented programs.

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and hold keys are not disabled.

Skydiver

From your block-figure airplane, you eject the skydiver by pressing the space bar. Open his parachute the same way. The object is to land on target. You set plane speed, wind speed, and target area.

The plane always travels horizontally, but its altitude varies with each run. When the chute opens, wind speed affects the diver's lateral movement. At high wind speeds, wraparound is disconcerting since it might take the diver through two complete passes of the screen.

If your diver plummets to earth with his chute unopened, a reasonable representation of a helicopter rescues him, the game ends, and you are unceremoniously dumped to the Basic ready prompt. Otherwise, entering new parameters or pressing the enter key to return the same limits restarts the game.

A few random catastrophes (e.g., a chute failing to open) are thrown in for good measure. With the plane at its highest speed and a maximum wind velocity, an illegal function call appears on some runs. This doesn't impair the game at other settings.

The remaining games require a bit more digital dexterity in using the space bar and the enter key. The last three games add the greater than (>) and less than (<) signs and repeat key for sideways movement. The slow response time when you repeatedly press a key is frustrating. Background graphics do not vary during any game.

Star Battle

In Star Battle, you're a fighter pilot protecting a base unimaginatively represented by a plus sign (+) at center screen. You can fire lasers horizontally along the center row as various enemies fly up to and then across that row to attack the base.

Your limited number of annihilator bombs (triggered by the enter key) let you eliminate attackers anywhere on the screen, especially from below where your lasers aren't effective. Star-studded galaxies roll up the screen between attacking waves, a nice touch.

An error terminates the game prematurely at some higher levels of difficulty.

The Wall

The Wall descends on your spaceship as you try to blast holes through to a

stationary enemy space station. You lose if the wall squashes you, if you blast an embedded mine, or if one of two types of randomly appearing flying juggernauts clobbers you.

Your approach speed increases with each successive pass of The Wall, and later stages include horizontal as well as vertical movement.

Space Swarm

Ten differently shaped antagonists chase you in Space Swarm. Some are capable of diagonal movement and others are armed with a series of line-segment energy rays. All the games give points for destroyed aliens, but Swarm offers intriguing varieties and requires quicker reactions than the previous games.

If you fire at an attacker but his missile reaches you first, you lose. You don't get credit for zapping the enemy. You'll probably find Swarm the most challenging and fascinating of the five games.

Mayhem

Mayhem pits your single missile silo against a lone bomber in one variation, or four types of destructive mechanisms in the other. They're out to obliterate four cities whose names you enter.

A direct hit on a city produces a small mushroom cloud, but when your missile silo blows or you lose all your cities, the nuclear blast fills most of the screen. The scoring mechanism appears to have a bug; it rolls back to zero on several occasions.

Mayhem is the only game in which you can fire missiles at angles other than vertical.

I wouldn't put TRSDOS and Basic on the distribution disk, or run the distribution disk in your second drive as described in the manual. Instead, I suggest making the usual back-up copies since the disk isn't protected.

The games don't contain explanation frames, so read the adequate instructions before embarking on your adventures.

The games are all variations on tried and true themes. After all, the Model II character generator is not intended for detailed graphics, and Basic puts a damper on speed. Presumably, Maryland will rectify the problems by the time this review is published.

If you must have games for your Model II in spite of its infirmities, the disk from Maryland Games is not exorbitantly priced, the games are quickly and easily learned, and they'll keep game addicts occupied. ■

★ ★ ½

The Genie in the Computer

Rachel Kohl, Laura Karp, Ethan Signer
John Wiley & Sons
New York, NY
\$12.95

by Richard Ramella

The idea behind *The Genie in the Computer* is learning TRS-80 Level II Basic through graphics. And the graphics, though simple, give quick results that illustrate simple programming techniques for the neophyte computer user.

The genie of the title is a graphics face that begins as a few X's on the screen, but becomes more complex as the book progresses. The genie transforms into various guises and activities as the reader's programming capabilities become more sophisticated.

This book is a good idea. Standard

texts that come with computers often fail to explain all the unit's capabilities. This book contains a lot of mildly interesting ideas and a few examples that will enlighten you. However, do not expect sophisticated graphics.

Chapter One sets the book's tone by presenting the genie's first face: two X's for eyes and three for a mouth. This elementary drawing explains line sequence in Basic.

The chapters continue to add other simple facial features in a kind of typewriter art on the screen. This is effective because the authors patiently explain the purpose of each line in the short programs.

Genie will help any beginner, and even barely literate children, start computing. Kids will probably forego the detailed instructions and simply type in the painlessly short programs. Even this is a useful introduction to Basic programming. ■



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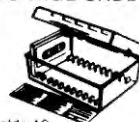
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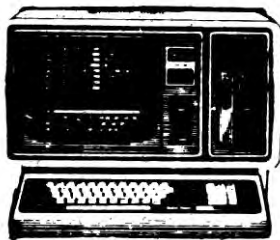
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✓146

ming techniques could write them. However, the total package is impressive and covers a wide variety of financial questions.

The Executive Calculator performs the types of calculations listed in the main menu: pricing and profit, interest calculations, depreciation techniques, real estate formulas, lease calculations, graphs and charts, personal loans, financial decision making, equivalents and conversions, and miscellaneous calculations.

The Model I version comes on cassette. You have to transfer the nearly one dozen modules to disk. The Model III version is already on disk.

The programs themselves, although nominally in Basic, are invisible. You can display them from your directory only by specifying invisible files (use DIR (INV) or DIR (SYS, INV)). Consequently, they're difficult to modify.

The manual is an 85-page user's guide on saddle-stitched, colored paper. It is fairly well done, has few errors, is easy to read, and comes with program examples. In general, the programs are so straightforward I didn't have to consult the manual.

The loading instructions are simple, although you invoke an unusual Copy routine to reproduce the Model III disk on one of your system disks. The directions show you a permanent patch to TRSDOS that bypasses the initial date and time prompts and automatically loads The Executive Calculator.

Program Format

The programs are arranged in a main menu with submenus for each entry. The user's guide illustrates each of these, so you should first read the manual to avoid confusion.

You must select one of the main menu entries to access a submenu. After each calculation, the program prompts "Enter 'A' for Again, 'X' to return to Main Menu. . . ?" This is a nice feature that eases program use. I found that you can also figure another calculation by hitting the enter key.

Speaking of shortcuts, an INKEY\$ routine, instead of the Executive Calculator Input routine, would allow quicker, one-key responses to program prompts.

Calculations

I found most of the programs to be mathematically accurate. The loan



amortization program produces exactly the same results as one I wrote. The same is true of the interest calculations. I don't think that anyone need worry about The Executive Calculator producing incorrect values.

However, the vagaries of binary and single-precision arithmetic do produce some unsettling program results. In the yards-to-miles conversion, entering 1,760 yards produces .99968 miles. In fact, 1,760 yards is exactly one mile. This type of error is unfortunate because the five decimal places suggest accuracy to that level.

The manual contains a summary sheet of the various utilities under the main menu headlines. It's fairly impressive, although I thought some of the calculations were a little too trivial to include.

The conversion module and some of the miscellaneous calculations are not much more than multiplication or division, as in converting square feet to

square inches. Many also abbreviate to the point of imprecision: Square inches appear as inches, for example.

Some of the miscellaneous calculations are also trivial: finding a square root, finding a tangent, multiplication, and division. However, some useful utilities appear in this same module: the number of days between two dates, or the day of the week a given date falls on.

The program does have other shortcomings, but MCS Software is planning corrections for some of them. For instance, I'd like to do further calculations of one type by hitting the enter key in response to a prompt.

In the loan amortization program, I'd like to see a way to change only the interest rate for comparison purposes. Along these lines, The Executive Calculator contains a terminology error: The correct term for the actual yearly interest rate is effective annual rate, not nominal rate.

Another problem is that the section on graphs always starts off with a bar graph, even when you choose a line graph. Since it's possible to toggle back and forth between them, this is mostly an inconvenience.

Evaluation

In spite of my specific criticisms, I feel that this is a useful collection for the average business user. Some of the programs include sound and graphics, and you get a lot of solid financial programs for the money.

The value of these small utilities is their number and their presence in one package. Comparable packages could easily cost twice this much. If MCS attends to the minor difficulties, what is now an excellent buy will become even better. ■

★ ★

Maryland Model II Games (Volume 1)
3304 Carlton Ave.
Temple Hills, MD 20748
\$29.95

by Charles R. Perelman

Maryland Model II Games provides five games in Radio Shack Basic. Given the Model II's limited resolution, black and white CRT, and graphics

character set, you can't expect Pac-Man. All things considered, this is a credible group of games.

Skydiver, Star Battle, The Wall, Space Swarm, and Mayhem are in order of increasing complexity. You can adjust input factors to vary the difficulty of each game.

Object definition is coarse, with small symbolic representations for various types of space attackers, weapons, or ships. Movement is limited and much slower than the usual arcade games. Response time is also slow. The break



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Maxi Stat
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Model I and III, 48K
Two disk drives, printer
\$199.95

by John B. Harrell, III

Maxi Stat is a comprehensive statistics package and a valuable ad-

dition to the library of anyone who analyzes data. It is a full and powerful system that provides functions normally available only on mainframe computers.

You don't need to be a programmer to use Maxi Stat. But it's not a package for the casual user, and you need to know something about statistics.

Maxi Stat provides many analytical functions, including custom programming interface, write subfile, frequency distribution, descriptive statistics, cross-

tabs and chi-square analysis, correlation and linear regression, t-test for matched pairs or independent groups, multiple linear regression, analysis of variance, and multiple variable response.

The write subfile option is not a true analytical function. It allows selection of a subset of data from one file and, possibly, recoding the data and writing it to another file. You can then use this subfile as further input to Maxi Stat.

To perform any statistical analysis using Maxi Stat, you must use the vari-

Games at a Glance

Gauntlet, Computer Shack, 1691 Eason, Pontiac, MI 48054, Models I and III, \$19.95 cassette, \$24.95 disk.

by Mary E. Ruth

Gauntlet is another tank game for the Models I and III. The game begins by informing you that aliens have landed in San Francisco—the opening sequence includes the alien spaceship hovering over the Golden Gate Bridge.

You battle the creatures within a 9- by 6-square matrix of city blocks. You have three tanks—use the arrow keys to traverse city streets and avoid aliens, then fire at them using the space bar.

You score 60, 70, 80, or 90 points for each alien, depending upon the type killed. When you kill an alien, another takes its place. For every 10,000 points you score, you receive a new tank. At least that's what the documentation says—I wouldn't know.

The game manual is serviceable if unimpressive. It mentions "terrific sounds"—after two or three games, the death-march tunes become annoying.

The game is difficult at first, and it doesn't get any easier. ■

Dig Out, Computer Shack, 1691 Eason, Pontiac, MI 48054, Models I

and III, \$19.95 cassette, \$24.95 disk.

by Mary E. Ruth

Dig Out, a Dig Dug play-alike, puts you at the controls of an underground rover who burrows tunnels and dodges monsters through 15 subterranean levels. Use the arrow keys to maneuver your rover through existing tunnels or create your own passageways as you go.

You begin the game with four rovers; you get another for every 10,000 points you score. Firing the space bar repeatedly at close range kills the enemy beasts roaming the tunnels; you score 500 points for each one killed.

Two rocks sit on each screen; touching one means certain death. For every monster the rock kills, you score 1,000 points.

The monsters travel through tunnels in any direction. In the absence of tunnels, they burrow up to the top of the screen. Don't position yourself directly below one of them; they drop deadly eggs.

As you progress through the different levels, their speed and resourcefulness increase. You advance to another level only when you kill all the monsters in your present level.

The game comes in a brightly (although not cleverly) designed package. The documentation is adequate

but riddled with misspelled words. The game's sounds seem appropriate at first, but quickly turn into a tiresome drone.

But Dig Out is still fun and challenging. ■

Weerd, Big Five Software, P.O. Box 9078-185, Van Nuys, CA 91409, Models I and III, \$19.95.

by Ronnie Brown

Weerd is a refreshing change of pace from run-of-the-mill computer games. Forget about energizers, disruptoids, and blue meanies. Just watch out for all those nameless critters that flit, skitter, and swoop around your screen.

Your mission is to defend a planet from all sorts of alien craft. Your shots must hit an invader or reach the top of the screen before you can fire another volley.

You have three ships and three sets of energy shields for each round. Shields last for six seconds and protect against all alien bombs, eggs, and debris, but not against kamikaze ships.

If you're tired of playing computer simulations and serious arcade games, try Weerd. ■

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†60 lines per page, random line lengths, 40 char/line.
Assumes CPU can output text at a minimum of 3000 char/sec.

ous phases of the system to create codebook, data files, and control files. The Maxi Stat task execution system uses a set of these three files to perform the required analysis.

Codebook Management Phase

The codebook is the format description of the data file that the program's analysis section uses. You can enter data in the fixed or free format modes. This allows a wide variety of input formats, including output from most other programs that write an ASCII output file.

You can even edit files using most of the popular text editors. Data record size is limited to 255 characters in the fixed mode and 127 characters in the free-format mode.

Begin the format control entries of the codebook by specifying the number of variables. A variable can be any type of data (an X-ordinate value, an answer to a question, and so on) and can be in numerical or alphanumeric format.

Each variable has a label of up to 40 characters. Maxi Stat uses the label to refer to this variable in any further input or output concerning it.

In the fixed-format mode, you then specify the starting column for the data and the number of columns required for the data field. As part of each variable, Maxi Stat allows the assignment of val-


ue labels to the expected responses.

Figure 1 shows a typical codebook entry. The example contains two variables. The first is the respondent's age in years. You enter it in fixed numeric format beginning in column one and taking two columns.

The second variable is the respondent's candy preference. You enter it in

Fixed	(specifies the file format type)
Respondent's Age (in years)	(variable #1 name used by Maxi Stat)
1	(starting column number)
2	(number of columns used)
N	(specifies numeric type field)
@	(end of variable #1 description)
Respondent's Candy Preference	(variable #2 name)
3	(starting column number for fixed format)
1	(number of columns used)
A	(specifies alphanumeric type)
A = Snickers	(these three)
B = 3 Musketeers	(items specify)
C = No Preference	(the preferences)
@	(end of variable #2 description)

Figure 1. Codebook file format.



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52 • 80 Micro, September 1983

IF YOU'RE GOING TO BE PICKY ABOUT AN OPERATING SYSTEM SEE WHICH WAS PICKED BEST.



The readers of 80 Micro were asked to select their favorite operating system for the TRS-80 Model I&III. LDOS, DOSPLUS, TRSDOS, MULTIDOS, WOBOS I and NEWDOS/80 were all on the ballot. They picked NEWDOS/80.

The editors of 80 Micro have also awarded their Hall of Fame Awards. From among every software package on the market, the editors picked only six that they felt made a lasting and significant contribution to the TRS-80 computer. NEWDOS/80 was one of the six.

Since we first introduced the NEWDOS operating system we've been stating its features, capabilities and advantages. Thank you 80 Micro readers and NEWDOS/80 users for supporting us.

Version 2.0 . . .

High Performance DOS

NEWDOS/80 Version 2.0 is our highest performance system yet. The versatility and sophistication of Version 2.0 includes features like:

- Double density support on the Model I

- Enhanced compatibility between Model I and III
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 - Selective variable clearing
 - Can display BASIC listings page by page
 - Automatic repeat function key
 - Routing for peripheral handling
 - Enhanced disassembler
 - Command chaining
 - Superzap to scan files
 - Fast sort function in BASIC
- Hard Disk Support Now Available**
- Support for Apparatus and Radio Shack's Model III hard disk (optional-available upon request for additional \$60)

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

For more information see your local computer store or contact Apparatus, Inc., 4401 S. Tamarac Parkway, Denver, CO 80237, 303/741-1778.

TRS-80 and TRSDOS are registered trademarks of Tandy Corp., LDOS - Logical Systems, DOSPLUS - Micro Systems Software, MULTIDOS - Cosmopolitan Electronics, WOBOS I - Western Operations, NEWDOS/80 - Apparatus.

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✓ 40

What do people who've used the NEW amber or green replacement CRT's say about them?

"...Anyone could easily install this replacement CRT. The instructions are clear, simple (if not over simplified), and complete. At no time during the installation was I confused or lost. It even worked the first time I turned it on.

"I believe the orange (amber) phosphor is a great improvement over the standard monitor. Often I sit at my computer for several hours at a time and I can really tell the difference between the two monitors...

"The (Langley-St.Clair Soft-View) CRT is an excellent product and makes the TRS-80 an even better computer."

*Mark Renne
Review in 80 U.S.*

"The instructions...are in pleasingly plain English, and I was able to install the CRT in about twenty minutes, even though I had never performed such a task before. The difference in the display is most gratifying; it has a much more 'professional' appearance, the contrast is much better, and it is definitely easier to use for sustained periods of time. The last item is particularly important, since my TRS-80 is mostly used for word processing.

"Again, thank you very much for your excellent service in providing me with a product which is everything it was advertised to be, and which makes my computer more useful...I will not hesitate to recommend your fine product and company to other TRS-80 owners."

*J. Kimble Rigney
Columbus, Ohio*

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LSIS's NEW SOFT-VIEW
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REVIEWS

a fixed, alphanumeric format beginning in column three and taking one column. The letter designations listed in the codebook file specify preferences.

Figure 1 appears extremely complex, but Maxi Stat makes it easy to create a file like this with a conversational input sequence that acquires the appropriate information from the user. You never see this file format unless you need to edit the file. The documentation is explicit in its description of all the file formats.

The Codebook Management Phase lets you add to an existing codebook, edit, and print, in addition to creating the file. The editor used for this and each of the other phases is a mixture of Basic and machine-language coding.

The commands are similar to those used in Electric Pencil, making the editor a snap for those already familiar with this system. A word of caution—this is not Pencil and significant differences do exist.

Maxi Stat uses a defined field size for all input required in the various routines. The program displays the specified input field size with the appropriate number of underline characters on the video terminal prior to input and then it updates the input field as you enter each character.

This helps when composing an appropriate data title. However, using the INKEY\$ function in Basic slows the input routine considerably; a rapid typist can overtype the input routine.

Data Management Phase

The next major phase is the Data Management Phase. This is not essential to the system as you can prepare data with any other program as long as that program writes the data file to the disk in ASCII format. ASCII is the standard TRS-80 disk output mode of operation using the PRINT #n statement.

The Data Management Phase directly creates a data input file. The program prompts you for the input values of each variable in the codebook used by the creation program, and constructs the data file in a format the codebook specifies.

Once you create the codebook, this is an easy method to input data in raw form. But if you've reduced and prepared the data for computer input in accordance with the codebook format, a word processor can create the data file much faster.

The Data Management Phase also allows editing the data file and printing the raw data. The editor used is much the same as that used by the codebook manager. The most notable additions to the editor in this phase are data verification and the provisions for setting and using tabs in any video screen location.

You can use the data verification function to read any data file field and verify that each entry is within the specified bounds. This is an extremely valuable function that saves many hours of validating large raw data files.

Analysis Management Phase

The last part of Maxi Stat is the most important—the Analysis Manager. This phase allows the creation and maintenance of job control files that specify the tasks Maxi Stat performs. This allows the creation of many tasks to be saved as one file for execution as a batch system.

The functioning of the analysis manager is similar to the previous phases. The control file is created, edited, and printed as before. The most significant function of the analysis manager is execution of the analysis control file.

Figure 2 lists the contents of a typical control file. This file contains the complete list of tasks Maxi Stat performs; each task is separate and distinct from the others.

```
Linear Regression Test of Maxi Stat ( page heading to be used for all tasks this run )
BKEX2:1 ( codebook file name specified on drive 1 )
EXDAT2:1 ( data file name specified on drive 1 )
Graphical Representation of Data ( title of this particular task )
5 ( analysis selection—linear regression )
1 ( variable number on the x axis of the graph )
2 ( variable number on the y axis of the graph )
@@ ( end of task symbol )
```

Figure 2. Task control file format.

In Fig. 2, the task is set up to execute a linear regression analysis, and prints out the pertinent statistics with a rudimentary graphical representation of the data, including the linear fit that the analysis determines.

The first entry in Fig. 2 is a page heading that appears on all printed pages. Next are the specified codebook and data files for the task to be performed. The last entries are a subtitle for the task and the analysis type.

The number of the variable to be analyzed (which corresponds to the variable number in the codebook used for this analysis) follows the analysis type. In most of these options, the program lets you input a range of variables on which a particular analysis acts. This saves you from reentering the task for each variable analyzed.

The only information missing in this example is the recoding of input data for the specified analysis. One of the analysis manager's most powerful features is the ability to construct recoding directions that allow data manipulation during task execution.

For example, you specify one variable as the respondent's age, and data analysis reveals that its range is 15 to 75 years. You want to group the respondents into age brackets and analyze the data within these brackets. You can manipulate this information during task execution by entering the proper recode directives into the analysis task file.

You can perform an absolute recode, a conditional recode, and a select-if recode as part of any task. Each choice is temporary, modifying the data only as the program reads it from the input file and writes it to the temporary file during data preparation for the analysis subtask.

You can make these changes permanent by using option number one, write subfile. The new file will now contain the recoded data.

Documentation

The user's manual comes in a high quality, three-ring binder. It's divided into six chapters and an appendix, separately tabbed for easy access. A section called Statistical Notes, consisting of the formulas and concepts used by Maxi Stat, provides enough background to let an accomplished programmer modify the system.

A section called Sample Outputs enhances the user's understanding of vari-

ous Maxi Stat routines. It's not comprehensive or detailed enough for anyone but an accomplished programmer to make much use of it. Many of the examples aren't reproducible due to lack of proper input data.

In general, the manual is comprehensive and concise, if not wholly accessible to the beginner.

Pluses and Minuses

The menu-driven Maxi Stat system is easy to use. Error detection is good and prompting for error correction is clear.

System operation, particularly the input routines, is relatively slow because most of the system is written in Basic. However, Maxi Stat is responsive enough that the delay isn't annoying.

The input prompts are excellent. The program specifies each input field on the video screen by first displaying the field size using the underline character. Each input character then appears in the respective position in the field. This feature is particularly useful when you build the data file using the data management phase of Maxi Stat.

Many of Maxi Stat's features depend on the DOSPLUS 3.4 kernel on the system disks. The Getting Started section of the manual addresses how to move the programs from this system to another but does not address any system dependencies.

For example, the DIR command, which you can substitute for a file name at the appropriate prompts, works only with DOSPLUS. This is because under TRSDOS the directory has an intentional error in the Hash Index Table (HIT) sector byte for DIR/SYS that makes the directory inaccessible to the operating system, and the data address marks on the directory track cause a "TRIED TO READ LOCKED/DELETED RECORD" error.

Maxi Stat can't communicate with the operating system in Basic under the TBasic interpreter supplied with the DOSPLUS kernel, although other systems, including DOSPLUS, can. Maxi Stat compensates for this by accessing Dir/SYS under Basic program control, and formatting and displaying the directory under program control.

Numerous conflicts in disk structure exist on the Model I double density disk. These conflicts make the disk unusable if you don't own a version of the DOSPLUS operating system or LDOS. The most significant conflict is location

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"This is the first letter produced with your CRT. After we try it for a while, we'll probably order two more for our other TRS-80 Mod IIs...from you, no one else.

"Congratulations. Your advertising is accurate."

*Rene Gnam
Clearwater, Florida
From an unsolicited
letter of testimonial*

"I recently replaced the old black & white CRT in my (Heathkit) H89 microcomputer with one of the new Amber non-glare CRT's sold by Langley-St.Clair Instrumentation. The decrease in eye strain was quite dramatic and I highly recommend the amber tube in place of either the plain white or ghastly green that Heathkit offers...

"I must admit there is one drawback. Since the amber tube has a non-glare surface, I can no longer see people sneaking up on me."

John Roy

*Review in
Buss Newsletter December 1982*

LSI's NEW SOFT-VIEW REPLACEMENT CRT

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of the directory on a track other than track 17, and the use of more than five sectors in one granule.

Data disks formatted in single density under DOSPLUS in other than 35-track mode have the disk directory written approximately half the distance into the disk (e.g., a 40-track disk has the directory on track 20). This causes difficulty and additional head movement in finding the directory when you use the disk with a system expecting the directory on track 17.

The Maxi Stat system places two unnecessary restrictions on the user during specification of file names. First, you must specify a drive number for each reference to a file. This is not required when the file has been previously defined. Second, the Basic input routines do not allow for any file extensions.

Maxi Stat allows the use of floating point or real data as input values. The user must be careful when using data that is not integer in value. You can only use this particular data type in the free data format and it might cause problems in print output formatting.

One annoying feature of the editor routines used to maintain the codebook, data files, and task control files is the system reboot on exit from the editor. The Basic high memory value is set on entry to the editor to protect the code's machine language portion that the Basic part of the editor loads.

After setting the word beginning at 40B1 hexadecimal (hex) to the appropriate value upon entry to the editor, the program resets this value by POKING a Z80 HALT instruction into 402D hex (normal DOS exit point) and calling it via the USR function of Basic to exit the editor.

On the normal TRS-80, this causes a system reset, as the halt signal is tied to the reset line of the computer. This feature doesn't work on other computers, such as the LNW-80, and requires pressing the reset button to exit.

The editor is a hybrid consisting of a Basic main program with machine-language support routines. The editor's commands are almost identical to Electric Pencil and its performance is quite good.

One significant difference is the handling of insert/overwrite modes. The editor is normally in the overwrite mode of operation, meaning that text is replaced with the new text you type over it. Maxi Stat's editor automatically goes into the insert mode if you at-

tempt to extend a line and remains in the insert mode until you press the break key, the enter key, or the appropriate control key.

Another difference is that you can't exit the editor, short of resetting the computer, without rewriting the text buffer to the disk.

The DOSPLUS 3.4 kernel selected for sale with this software package doesn't have a sufficient number of commands to support full operation with this system alone. Maintenance of the Maxi Stat data disk using commonly found utilities and system functions

from other operating systems eventually forces you to move this program to another operating system.

Conclusion

The Maxi Stat system is a superior product that provides a means of complete statistical analysis without accessing the programmer levels of the computer. The system is easy to use and relatively error free.

You would have to make a substantial programming effort to duplicate the program's many functions. Maxi Stat is well worth its price. ■

★ ★ ★

The Home Accountant
Continental Software
11223 South Hindry Ave.
Los Angeles, CA 90045
Model III, 48K
Two disk drives, printer recommended
\$74.95

by Timothy Daniel

Quick! Without looking, how much money is in your wallet? If your guess is accurate, you're a good candidate for Continental Software's Home Accountant. You don't have to be rich to use it. But you have to care about your money and where it goes to appreciate this package.

At first glance, Home Accountant is just another checkbook program. But if you dig deeper, you'll find a checkbook program gone wild.

You can use up to 99 budget categories, incorporate automatic depreciation or appreciation, search for individual transactions, print checks, generate graphs, print financial statements, and, yes, even balance your checkbook.

Here's what you need to get started: a Model III with at least 48K RAM and TRSDOS 1.3, two disk drives, and a printer, preferably one that can handle 132-column printouts.

The multilevel menu format lets you select the options you want. You can start by trying to balance your checkbook. It's a bit like hauling trash in a Cadillac, but when you're ready to upgrade, the capability is there.

At the Core

The nucleus of Home Accountant is

its budget module. You only have two budget categories in the simplest application, one for your checking account balance and the other for cash. The 99 budget categories are divided among expenses, income, assets, and liabilities.

Each category contains two values. The first is a current balance, reflecting the transactions entered to date. The second is assigned by you and is the amount you've budgeted for that category. While budget values aren't required, they can help, since Home Accountant reports on their deviation from actual values.

Once you set categories and enter predicted values, the budget module becomes dormant and you can use the transactions module to enter daily expenses and income. Without complete and accurate reporting, Home Accountant is just an expensive time waster.

In a bare bones checkbook configuration, data entry and reconciliation take about an hour a month. If you choose to use full record keeping, plan on spending as much as an hour to enter a week's worth of transactions.

Home Accountant's two data entry shortcuts, automatic transactions and split payment, aren't usually found in a home finance program. Home Accountant allows you up to five automatic entries per checkbook. Every time you run the Start New Month routine, transactions such as monthly car payments or retirement check deposits are automatically entered.

Split transactions are handy for when you write a check at the store and get some cash back. To keep square with your budget, allocate the amount of the check to two categories: food and cash.

Another split payment is insurance that covers both your home and car. You can split transactions among any number of categories, but, of course, the dollar total of the splits must equal the original transaction total.

You enter all transactions in a cash, credit card, or checkbook account. You must specify an existing budget category. This provides some measure of protection, but the most important error trap is when you reconcile the checkbook balances with your bank statement. If a problem occurs, you might need to use Home Accountant's search/edit feature.

You can base a search on something as vague as the dollar amount of a transaction or the budget category, or a criterion as specific as the date and check number. Once you locate a transaction of interest, you can review and correct it.

While this system of checks and balances might fall short of accepted accounting standards in the business world, it should be adequate for home accounting.

The Report Modules

Home Accountant really goes to work when you access the report modules, the most comprehensive of which is aptly named Printed Reports. Within the module are three sections: budget, personal balance sheet, and income/expense summary. Each of these offers several options.

Budget reports range from a simple printout of the categories you've defined and their assigned numbers to a 12-month budget summary. A third printout, identical to the budget summary, lists monthly totals for each category.

Both the actual and budget printouts require 132 columns. However, you might get by with your standard-width printer; Continental includes a software routine that sends user-defined control characters to your printer. That way, printers like the MX-80FT or the NEC 8023 can generate 132-column output using a reduced type size.

The second section of the Printed Reports module produces a personal balance sheet. This report represents your financial health, listing the current balances for all your assets and liabilities, including checking, cash, and credit cards.

On a balance sheet, net worth is literally the bottom line. You can get a

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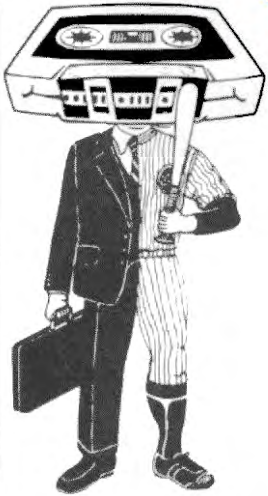
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REVIEWS

balance sheet that compares your actual numbers with the budget numbers. A third option is a report that compares one month's data with the previous month's.

The last section of the Printed Reports module comprises the income and expense summaries. Just as the balance sheet calculates your assets and liabilities, the income and expense summary is a picture of the running balances of the income and expense accounts.

Formats include a single month's data, year-to-date totals or a range of fewer months, comparison to a prior month's total, and comparisons to budget. A numerical percentage accompanies each figure, showing its relationship to total income. Reports conclude with net income, the difference between income and expense totals.

The Printed Reports module provides totals only. For the story behind those totals, you'll need to use Home Accountant's Activity Report module.

You can tailor Activity Report print-outs to your needs, ranging from a listing of all transactions entered to a highly focused report of transactions on a particular credit card that are tax deductible.

You produce Activity Reports using screens like those in the Transactions module's search/edit function. Specify the criteria of interest and the program searches the transactions file for a match.

Besides listing transactions, the Activity Reports module prints checks. You'll need a special kind of computer-compatible check to do this; Continental Software includes information on where to order them.

To print checks, you must enter the pertinent information in the transaction module, go to the Activity Reports module, and search for the appropriate entry. Before printing, you have a chance to enter a name and address, a handy addition if you want to use window envelopes.

Last but not least among Home Accountant's reports is the Graph module. Available only as a video display, the Graph module generates a histogram comparing 12 months of actual and budgeted values for a given category. The program fits a trend line to the actual values, letting you see what the totals might be in the future.

Home Accountant's features are

aimed at middle- to upper-middle-class households where income comes from salary, most purchases are made by credit card or check, and investments are simple. If you have a complex portfolio or if you wheel and deal, you might want more flexibility than this program offers.

"Your computer-generated reports probably won't substitute for a loan application, but they do add credence to your claims."

Not Perfect

This accounting program's documentation is of mixed quality. For instance, the user's guide includes a brief introduction to the program and a step-by-step walk-through of setting up budget categories, entering and editing transactions, and printing reports.

After the first few sessions, you won't need the manual thanks to the menu-driven format, on-screen prompts, and error trapping. But the documentation falls down in providing realistic examples or advice on how to set up your budget.

Continental provides no demonstration disk or sample data base. If you want to experiment, you must start from scratch.

You must also watch for some pitfalls. Do plenty of planning before setting up your budget categories. Consider what information you need a year down the road; once you start a system, it's difficult to go back and change it.

Don't underestimate the time it takes to maintain accurate records. Ideally, you should keep a handwritten log of your daily expenses, entering them into the computer at least weekly. If you

don't, you might end up lumping many transactions into a miscellaneous account, diluting the value of future reports.

Other drawbacks include the inability to create a back-up of the program master disk, plus frequent and sometimes lengthy waits while the program accesses disks.

My final gripe centers on Continental Software's unusual support policy. To get service direct from Continental, you must shell out an additional \$20. If you choose not to register and you blow the program disk, it costs you \$17.50 for a replacement.

Direct Benefits

Home Accountant's most obvious benefit is its precise tracking of your daily financial activity down to the penny. Such record keeping pays off in two ways.

First, by taking time to record and enter transactions, you become more conscious of your spending. This form of self-monitoring can be effective in curbing excess spending.

A second advantage comes at tax time. Using Home Accountant's records, you can take full advantage of deductions. If, for example, you feel that the standard sales tax deduction is less than that to which you are entitled, you can rely on your computerized records to find out what was paid.

Home Accountant's ability to generate a balance sheet is another plus. These numbers might have little direct impact on your daily habits, but they make it easier when you apply for credit or other forms of financial assistance. Whether for a college scholarship or a home mortgage, an institution is likely to ask questions to determine your net worth.

Your computer-generated reports probably won't substitute for a loan application, but they do add credence to your claims. Stapling a copy of your balance sheet to the application indicates that you are on top of things and that the data you provide doesn't come from thin air.

No financial software package can do everything. It can't replace the advice you receive from a tax consultant or accountant, and it won't magically change the size of your balance. But if tracking your money closely is important to you, Home Accountant might be worth checking out. ■

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★ ★ ½

TRS-80 for Kids from 8 to 80

Michael P. Zabinski
Howard W. Sams & Co. Inc.
4300 W. 62nd St.
Indianapolis, IN 46268
\$9.95

by Richard Ramella

My 7-year old son got first dibs on this book. Five minutes after he disappeared into the computer room with it, I heard a whoop and he came running into the front room. "It works!" he yelled. He successfully entered and ran a program on his own.

That's the most important thing I can say about *TRS-80 for Kids from 8 to 80* by Michael P. Zabinski, founder of the National Computer Camp. The material works and encourages the reader to keep going. Any beginner can profit from this book's approach.

The 11 short chapters are in a workbook form familiar to elementary-school students. They include lots of white space, room to write in answers, illustrations, and humor.

The first chapter describes the TRS-80 Models I and III and sets the tone for what follows: simply presented material and questions designed to make the user look carefully at the computer. He'll also want to experiment.

The book increases in sophistication step by step. The user learns concepts, types in material, and—in the best of all possible worlds—gets the important idea that he can change parts of a program to make the computer perform interesting tricks.

The last chapter contains seven longer programs. The user, no longer a beginner, might have to work hard to get these programs running, but that's good. You can learn a great deal by keying in published programs.

One warning: Children enjoy achieving on their own, but an experienced adult should be ready to offer necessary help, no matter how simple the material. Tactful assistance keeps frustration low and encourages the child to continue alone.

TRS-80 for Kids is the first of two volumes. The second book offers more Basic programming concepts. I recommend this book, especially for children. Absorbing even a few of the ideas here will get them on their way to Basic competency. ■

★ ★ ★ ★ ½

**Forms III
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**Prosort III
Model III
\$150
Combination price: \$225**

**The Small Computer Company
230 W. 41st St.
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by Wynne Keller

Forms and Prosort are both superb enhancements to the popular Profile III+ data-base management software. They feature extensive new printout formats and sort/select capabilities. Serious users won't want to be without them.

Forms

The Forms programs let you format virtually any type of report and have complete control over the placement of fields on a page. This frees you from the limitations imposed by Profile III+ relative to the number of lines per record and the spacing between records.

The Forms programs come on a TRSDOS-formatted disk. Using simple Do file commands, you transfer some of the programs to your Profile Creation disk and some to your Runtime disk. This transfer creates a new menu that offers extended file functions.

The Forms programs come with a 65-page manual in a three-ring binder that includes an index and a table of contents. Experienced Profile users have little need for this manual because the Forms formatting instructions are similar to those for Profile's Report generator.

For those who need more help, the Forms disk provides a complete sample data base, and the manual provides a tutorial on creating an invoice form.

The largest form possible is 132 characters wide and 66 characters long. You can specify a shorter length, and you control width by proper field placement.

You have to be careful not to locate a field so that it overruns the form. If it does, a solution might be to print the form in reduced character format.

In developing a format for your form, you'll want a printout ruler to measure character width and line length. The screen displays the cursor position at all times.

Using the arrow keys and a few other keys, position the cursor and type. You can place almost anything on the form, including special characters if you have a printer that supports them.

As with Profile, the @ symbol prints the record number. Pressing the asterisk and field number prints that field. You can force fields to the left to close up spaces between adjacent fields. The program supports page numbering and dating.

Printouts

The program creates fancier printouts using special functions like underlining and half-line feeds if you have a Radio Shack Daisy Wheel II printer; a Dot Matrix 200, 400, or 500 printer; or a Line Printer V or VIII.

With some printers, you can also print characters not found on the keyboard, such as fractions or the English pound symbol.

If you have a different printer, four user-defined codes are available. This process requires patience and involves patching one of the programs with the hexadecimal codes for your printer. It should take programmers less than a half hour to make the changes.

The program does not have an option to select print size, but you can patch this into the spare codes, too.

To print records with Forms, you first have to build an index with Profile III+ or Prosort because Forms doesn't have sort or select capabilities.

Forms III is a fine program. It's easy to use and increases Profile III+'s flexibility tenfold.

Prosort

Prosort solves a variety of the problems inherent in Profile III+. With Profile III+, you can divide a data file into three segments, and any field used for sorting has to be in the first segment. Since the first segment cannot exceed 255 characters, some fields you want to sort might not meet this restriction.

Also, you have to assign field numbers in the proper order. The primary sort field must be first with the secondary sort field immediately following. For instance, Profile III+ would never sort a data file organized as part

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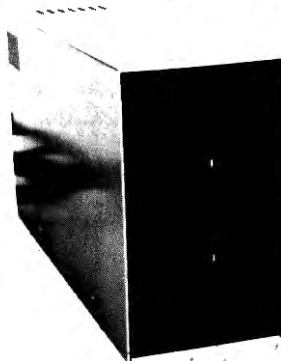
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number, part name, and vendor code first by vendor, then by part name and number. To do so, vendor would have to be the first field.

Field length is nearly as important as field placement. The primary sort must include all the primary sort field, then as much of the secondary sort field as fits in the computer's memory. If the primary sort field is long, the secondary field might not fit.

These sort limitations are a serious problem in some applications. Initializing Profile III+ requires an extraordinary amount of advance planning, and it provides no flexibility should your needs change.

Prosort allows sorting by any field, in any order, from any segment, ascending or descending. You can save the indexes created by these sorts on disk and use them for printouts. It's also possible to build one index from another, thereby fine-tuning the selection process as much as necessary.

The Prosort programs come on a formatted TRSDOS disk. You can transfer them to your own Runtime disk with a simple command.

The 77-page manual has a hard cover and a three-ring binder. It's divided into a sample section and a reference section. The sample is a step by step tutorial using a data base provided on the disk. The reference section provides similar information in a more condensed form.

Running Prosort

Access Prosort through the Extended menu, which offers Prosort itself, printing labels or reports from Prosort indexes, and selection of records from a Prosort index.

You can save five indexes on disk for reports, and use a sixth for searches in the regular portion of Profile III+. This sixth index, the Inquiry index, replaces the regular Profile index, and you access it from the usual Profile menu.

To build an index, specify the fields to sort and search. Five fields from any segment of the data file can be included in the sort. You control the length of the field to be sorted. Sorting just the first few characters of the field improves speed, and is frequently all you need.

You can put each field in ascending or descending order. Best of all, the sort fields do not need to fit in memory. If the file is too large, the program automatically sorts in segments, and the segments merge together into a single index.

The search can total 16 fields, but this number is misleading because you might use some fields more than once in the search. For example, if you want to search a range, enter the field of the range twice: once for the low number, once for the high.

Similarly, to search the state field for AZ, CA, and NY, you must select the state field three times. Even so, 16 fields should be adequate for most needs.

After specifying the select fields, enter the search relationship (And or Or), the search mode (Equals, Range, and so on), and the search item.

The sort/search then proceeds. I sorted four fields in a 225-record data base and the computer was busy less than a minute. When I added search operations, it was slightly slower, but well under two minutes. It takes you longer to set up the sort/search than it takes the computer to perform it.

Once you establish it, you can use an

index over and over. Of course, you'll want to re-sort whenever you make changes or additions in the data base.

This points up the only flaw I found in the program: It doesn't save the search/sort criteria for any particular index. If you decide to re-create an index, you must start over specifying which fields to sort and search.

It is possible to create an index from another index. In this way, you can achieve sophisticated selection. Prosort also supports mass updates on an index. This permits the recalculation of math formulas on selected records—a powerful enhancement. The SuperScript merge also functions from Prosort indexes.

Forms and Prosort require a multi-drive system. Their sort/select and printout capabilities are valuable enhancements to your Profile III+ data base. If you depend on Profile, don't miss them. ■

★★

Optimal Manager
Transpower Corporation
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by Charles R. Perelman

Here's your opportunity to improve efficiency by applying statistical and operations research techniques to your business. Optimal Manager is an impressive potpourri of quantitative analysis and useful algorithms that Ronald Satz has gathered into 47 Model II programs covering many common business problems.

Three 8-inch disks contain the routines in compiled Microsoft Basic. Other versions are available for CP/M and Xenix operating systems.

You need two disk drives to run the software. Distribution disks are password protected and autoloading from initialization to prevent copying or tampering.

If a disk is damaged, a registered user can obtain replacement disks from Transpower for \$20. They furnish registered owners with any updates. If you

have problems, call or write the author.

What the Programs Do

All programs are grouped in four modules: Optimal Product Investment, Optimal Product Manufacture, Optimal Product Distribution, and Optimal Product Pricing and Advertising.

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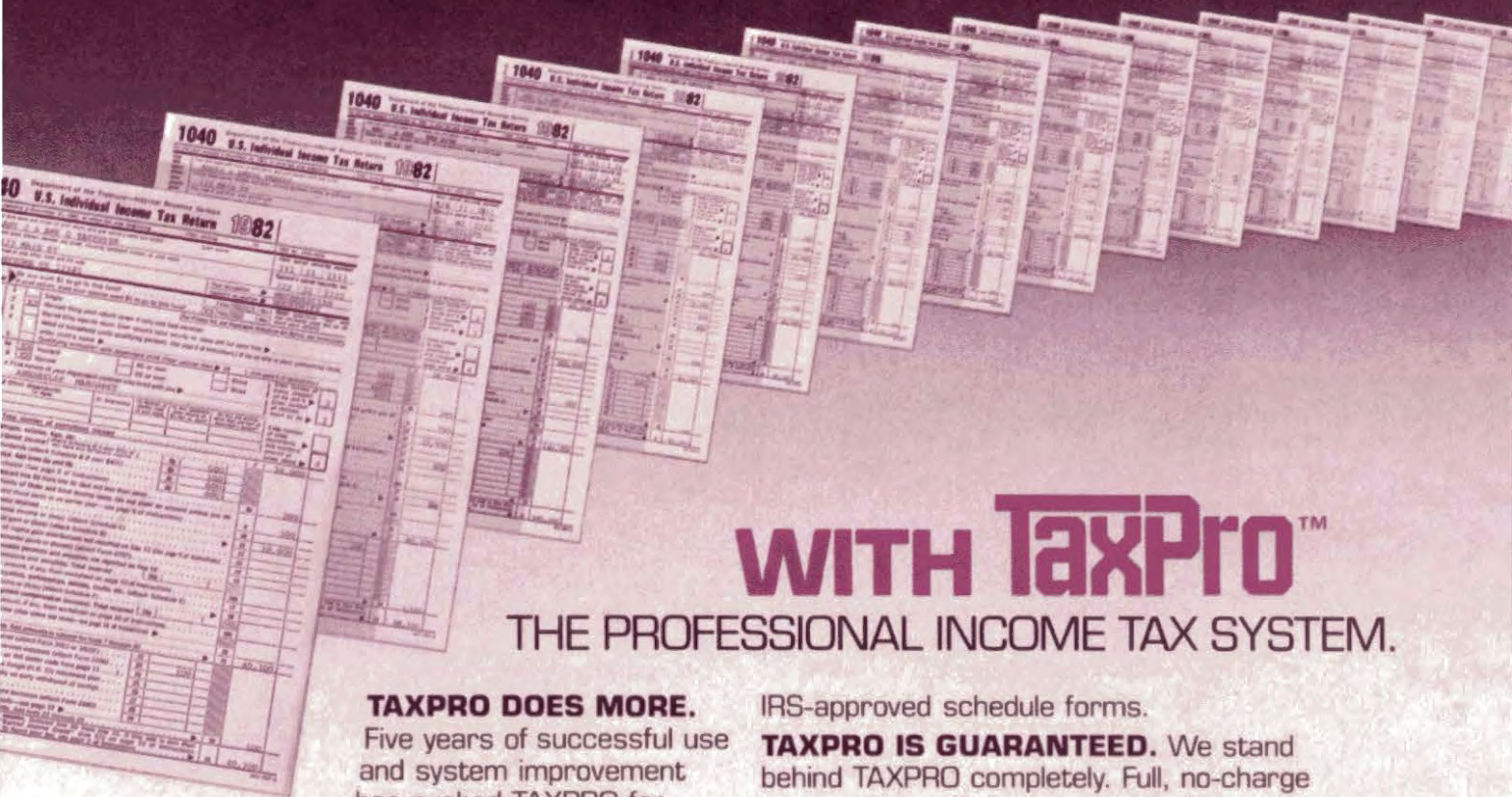
Your computer handles the complex mathematics, repetitive calculations, and iterations, so you don't need to understand calculus or any underlying theories.

However, you need to know the fundamentals of quantitative analysis management techniques or have ready access to a reference text to get anything meaningful out of this package.

I tested more than half the programs. All performed without error. The formats for the other programs were either more sophisticated or varied enough from the texts I consulted so I couldn't validate them with my references.

With Optimal Manager you can forecast components of your business plan such as market share, demand, product

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cost, pricing, profit level, and plant expansion alternatives. You have several inventory control models as well as machine reliability, maintenance and replacement policy evaluations, resource allocation techniques, and quality control measurements.

Determination of the critical path for a Project Evaluation and Review Technique (PERT) network, and other scheduling and quality control routines are presented. You can use the system to evaluate job applicants, assign employee tasks, and select project teams.

Other programs help you determine plant or warehouse locations, shortest delivery routes, and shortest distance or cost for shipment or maximum flow path. Waiting line (queuing) procedures measure efficiency in serving customers.

Investors can benefit from programs that allocate investment funds, select a stock portfolio, and determine when to sell appreciating assets. Output is an optimum management solution, as the system name indicates.

To his credit, Satz has structured program inputs for practical application. This causes problems at times because of the rigidity of the system. No provision is made, and no information is given, for using a program if you are missing some of the inputs.

Running the Programs

From the master menu you choose a submenu listing all programs in a particular module, then select again from the submenu for the actual program. The program prompts inputs with an opportunity for correction.

After you enter all data, the program screens all input prompts individually without showing the data you previously entered. You must either enter new data or press the enter key if you recall that the original input is satisfactory.

Each time you rerun a particular program, the same input prompts appear. Pressing the enter key retains input data from the prior run. Reentering unchanged data using the enter key is fine, but not having the prior information on the screen for review is a problem. Since the disk is protected and the program compiled, you can't patch it to correct such an oversight.

Each program produces both screen and printer output. After completing a run with hard copy, "Dual Routing now OFF" might appear. Satz claims

this is a TRSDOS defect that shows up on some printers.

In the output, the program lists all parameters that the user specifies, but it often doesn't print assumptions chosen from screen menus. Printing them would produce a complete presentation.

If you want to abort a routine, Reset is your only recourse. You must use TRSDOS initialization with autorun of Optimal Manager. Neither the hold nor the break key is active at run time. Satz states that these problems are unique to

"You can use the system to evaluate job applicants, assign employee tasks, and select project teams."

TRSDOS and don't occur with other operating systems.

Other annoying program features include the following.

- Solutions scroll too rapidly to read, so you need a printout to review the entire output.
- The lack of a top-of-form prior to printout results in gaps in schedules when top-of-form occurs in the middle of a solution.
- Inability to change the length of page although the TRSDOS Forms information appears during each printout routine.
- Most punctuation not accepted in titles apparently results from using Input rather than Lineinput.
- Lack of commas in large numbers makes them hard to read.
- No identifying numbers when you enter a series of related inputs such as a data table makes it difficult to keep track of entries.

For example, the second item might be followed by seven or eight unnumbered question marks for entry of parameters or details relating to that item. This problem is compounded

when you try to correct an entry and can't view the original data.

Documentation

The distribution disk is configured for thin-line disk drives. Instructions in the manual for deactivating the thin-line patch for the standard Model II are incorrect.

I finally booted drive zero with a system disk for the Model II containing Patch. Then I switched this disk to the second drive and ran Unthin with the distribution disk in drive zero to make the necessary DOS changes. The documentation is being revised to correct this.

The manual is nicely prepared in a padded three-ring binder with plastic envelopes for the distribution disks. It is clearly and legibly printed with wide margins. You get a sample solution run for each program, a description that usually consists of one paragraph, and reference notes commenting on one or more input or output factors.

Unfortunately, the descriptions don't mention alternatives offered in some programs. Obviously, they need explanation. Each program has a screen description that you can read or skip since it duplicates the manual and offers no further enlightenment.

Pros and Cons

Optimal Manager is on the right track in offering a whole gamut of menu-driven programs that propose solutions to everyday business decisions.

Operations research proponents or students of quantitative analysis techniques might take issue with some of the models selected, but this comprehensive package gives managers insight and provides computer simulation for different resource allocations and business game plans.

Satz fails, however, to reach the level of most business decision-makers who are unskilled in quantitative analysis jargon and have no background in managerial science. I strongly disagree with his statement on the last page of the manual that "Inputs and outputs are very clear and simple to understand."

A number of programs require input of figures for standard deviation. Nowhere in the programs or manual is this fundamental statistical measure defined or its use explained. If you do understand the implications of its use, you'll want a table of area under the normal probability curve or a program to deter-

mine the area, neither of which is included.

Similarly, such terms as regretist, Poisson distribution, Erlang distribution, penalty coefficients, and sigma limits appear throughout the manual or programs without definition and some are abbreviated without explanation.

The manual tells you, for example, that the program uses the Cobb-Douglas function to determine proportions of labor and machinery for optimal production results. You enter two exponents, but you get no explanation of their significance. The reference note states that exponents are usually between 0.4 and 0.6.

After some research, I found that the exponents apparently relate to the relative increase in product from applying a 1 percent increase in labor or ma-

chinery (capital in the original Cobb-Douglas function). Quality documentation should explain all essential terms and illustrate usage if it's not obvious to a complete novice.

Figure 1, a documentation sample, is the description and reference notes for an algorithm to determine the shortest route through a network. Many manual descriptions contain more technical lingo than this one.

You can use this program to determine shipping routes between two destinations when a number of alternative paths exist. Figure 2 is the solution. A vertex is equivalent to a location or town at a junction in the network of connecting roads.

To use Optimal Manager, the majority of businessmen need a manual that contains definitions of unusual, scientific,

or statistical terms in plain English, or at least some explanation of why a measure or parameter applies.

The manual also needs instructions for obtaining data required for input where not obvious or instructions on using estimated amounts for standard deviation.

A discussion of the meaning of results, including the significance of probability distributions, the meaning of regretist and other alternative choices, and the effect of penalty coefficients or other limitations on accuracy is missing.

The manual doesn't contain a presentation of the actual algorithm and references for further information on the technique and statement of assumptions inherent in the method. This would help interested users understand routines of special value to their business, then use the specific algorithm as the basis for a customized program.

In fairness, Satz often indicates the general analytical method or names the algorithm applied, and he lists four texts on the last page of the manual as the sources of some of his material. I found these references difficult to locate. You'll need more information if you want to go beyond mechanical use of the program.

The average user also needs statements of the algorithms' limitations and assumptions necessary for validity.

Suggestions of other types of problems for which a routine is suitable would be helpful. A limited number of alternative applications are mentioned in a few instances, but some of the programs have wider applications than title designations indicate.

The interface of manager and scientific analytical procedures through the documentation must be improved to render Optimal Manager truly useful. The software needs more tutorial documentation written in non-technical terms.

If you are familiar with quantitative analysis as applied to management decisions or are willing to spend time studying textual material to interpret the required inputs and meaning of outputs from these optimization programs, Optimal Manager is a worthwhile investment.

Be sure the range of methods encompasses problems you face. The software represents a considerable programming effort and furnishes a broad array of analytical management tools. ■

PROGRAM UNIT III. 5: MINIMUM DISTANCE OR COST PATH

Description

This program unit uses Dijkstra's algorithm to locate the shortest path through a directed graph, given the distance matrix (distance from each vertex to each other vertex). Inputs to the program unit consist of the number of vertices in the graph or network, the distance matrix, the starting vertex, and the ending vertex. The program unit outputs consist of the sequence of vertices on the shortest path and the length of this path.

Reference Notes

Devise the distance matrix of your network before running this program unit. Remember that the "distance" may actually be cost or time, whichever is relevant to your problem.

Figure 1. Sample documentation.

Vertex	Distance Matrix					
	Vertex 1	Vertex 2	Vertex 3	Vertex 4	Vertex 5	Vertex 6
1		17		31		
2	17		12	29		
3		12		16		
4	31	29	16		5	17
5				5		10
6			32	17	10	

Sequence of Vertices on the Shortest Path:

1, 4, 5, 6

Minimum Distance From Vertex 1 to Vertex 6: 46

Figure 2. Solution to algorithm in Fig. 1.

REVIEW DIGEST

RAM Sledges, XYZT Computer Dimensions Inc., Two Pennsylvania Plaza, Suite 1500, New York, NY 10121, Models I and III, \$25.

"The RAM Sledges program does what its makers claim. It makes Z80 programs relocatable and provides all the code necessary to do this.

"...This product will be useful for intermediate to advanced assembly-language programmers. It relieves much of the tedium associated with writing relocatable Z80 code and suffers only from the fact that you cannot specify segments of a program for relocation." *InfoWorld*, June 27, p. 50.

The Complete Book of Word Processing and Business Graphics, Walter Sikonowiz, Micro Text Publications Inc., Prentice-Hall Inc., Englewood Cliffs, NJ 07362, paperback, \$14.95.

"While both word processing and business graphics are indeed thoroughly covered in this informative and comprehensive (if somewhat dry) work, nowhere are the two combined to show how graphics and charts, for example, can be incorporated in a report without cutting and pasting.

"...The book offers extensive—but by no means complete—lists of manufacturers of computers, peripherals, and software, and concludes with a well-stocked glossary." *Personal Computing*, July, p. 141.

The VC Formula Printer, The Alternate Source, 704 North Pennsylvania Ave., Lansing, MI 48906, Models I and III \$39.95, Model II version under special order \$49.94.

"...a series of linked machine language programs...read a standard VisiCalc file and then send to your printer the formulas in a layout that is like the spreadsheet you created.

"...This product provides an ex-

cellent, easy-to-read, logically arranged listing of the VisiCalc formulas. ...It solves for many of us the problem of obtaining easily read and understandable hardcopy backup. It aids in program development by eliminating the wasteful use of computer memory...." *Basic Computing*, July, p. 114.

Alcor Pascal and Advanced Development Package, Alcor Systems, 800 West Garland Ave., #204, Garland, TX 75040, Models I and III, 48K, one disk drive, Pascal \$199, ADP \$125.

"Alcor Pascal is a powerful language-development system...Nearly all of standard Pascal is implemented along with many useful extensions to the language. The performance of Alcor Pascal programs is usually much better than equivalent programs written in BASIC, and the Advanced Development Package Z80-code-generator option lets you produce even faster programs." *Byte*, July, p. 470.

ListMaker, Reader's Digest Services Inc., Microcomputer Software Division, Pleasantville, NY 10570, Models I and III, \$97.50.

"...ListMaker can handle large numbers of records, of course; its limitation is that it lacks the sophisticated multi-level sorting capabilities often required when working with long lists.

"...because the program is menu driven and interactive, it is extremely easy to use. ...Error handling was excellent. When trouble occurs, the program displays an error message in plain English." *Creative Computing*, June, p. 100.

SuperScriptsit 1.1.0, Tandy/Radio Shack, One Tandy Center, Fort Worth, TX 76102, Models I and III, Disk systems, \$199.

"Radio Shack has released an updated version of SuperScriptsit, version 1.1.0, which corrects some of the problems associated with the original release.

"...It appears that this updated release has not lost any of the special features that made the original version so powerful. ...The special printing capabilities are more accessible now that drivers for all of the current Radio Shack printers are provided." *Basic Computing*, July, p. 113.

NEWBASIC 2.0, Modular Software Associates, 209 18th St., Huntington Beach, CA 92648, Models I and III, \$39.95.

"NEWBASIC 2.0 adds a set of powerful commands to Disk Basic.... A total of 49 new commands may be added.

"...NEWBASIC is a very useful tool for anyone programming in BASIC who wants very high speed graphics and animation effects that are simple to program, and needs the advanced commands and time-saving features this program provides." *Basic Computing*, July, p. 110.

Pro-Color-File, Derringer Software Systems, P.O. Box 5300, Florence, SC 29502, Color Computer, \$79.95.

"...there will be a number of hours between 'program-arrival' and 'up and running', but I believe the effort is worth it.

"Pro-Color-File is a very sophisticated data base management program.... P-C-F can best be described as a system rather than a program, because it consists of 8 programs and one control file, plus a series of at least 7 control and data files for each database.... I describe it in such detail to indicate the versatility of the systems not the demands the system makes on the user." *Color Computer News*, June, p. 22.

CALENDAR

September

- 12-14 IEEE Computer Society, Silver Spring, MD. **International Conference on Computer-Aided Design** Santa Clara, CA.
- 15-18 Northeast Expositions Inc., Chestnut Hill, MA. **Twin Cities Computer Show and Software Exposition** Minneapolis Auditorium, Minneapolis, MN.
- 16-18 **Great Southern Computer and Electronics Show** Veterans Memorial Coliseum, Jacksonville, FL.
- 16-18 **Compufair Seattle** Center Exhibition Hall, Seattle, WA.
- 19-21 American Management Associations, New York, NY. **User Documentation Course** Washington, DC.
- 22-24 Northeast Expositions Inc., Chestnut Hill, MA. **Rocky Mountain Computer Show** Merchandise Mart, Denver, CO.
- 26-29 IEEE Computer Society, Silver Spring, MD. **Compcon Fall '83** Marriott Crystal Gateway, Arlington, VA.
- 29-Oct 1 Northeast Expositions Inc., Chestnut Hill, MA. **CP/M '83 East** Hynes Auditorium, Boston, MA.

October

- 3-6 IEEE Computer Society, Silver Spring, MD. **8th Data Communications Symposium** Cape Cod, MA.
- 5-6 DeNardi Enterprises, Los Altos, CA. **Compusource '83** Red Lion Inn, San Jose, CA.
- 7 Creative Learning Association, Charleston, IL. **Compcon '83** Martin Luther King University Union, Charleston, IL.
- 7-9 **Great Southern Computer and Electronics Show** Expo Center, Orlando, FL.
- 7-10 Institutes for Human Resources Inc., New Smyrna Beach, FL. **The Electronic Village Expo 83-84** Tupperware Convention Center, Orlando, FL.

- 8-9 Tidewater Radio Conventions Inc., Portsmouth, VA. **Computer Convention/Flea Market** Virginia Beach Pavilion, Virginia Beach, VA.
- 16-18 Texas Association for Educational Data Systems, Austin, TX. **TAEDS 1983 Convention** Hilton Hotel, Austin, TX.
- 18-19 Architecture Technology Corp., Minneapolis, MN. **Conference on Local Computer Networks** Hilton Inn, Minneapolis, MN.
- 18-20 IEEE Computer Society, Silver Spring, MD. **EdComp-Con '83: Applying Technology to Education** Red Lion Inn, San Jose, CA.
- 19-21 Raging Bear Productions, Corte Madera, CA. **National Software Show** Trade Show Center, San Francisco, CA.
- 22 Plymouth State College, Plymouth, NH. **Conference on Computers and Education** PSC campus.
- 23-26 George Washington University Medical Center, Washington, DC. **7th Annual Symposium on Computer**

- Applications in Medical Care** Convention Center, Baltimore, MD.
- 24-26 American Institute of Aeronautics and Astronautics, Orlando, FL. **Computers in Aerospace Conference** Hartford, CT.
- 24-26 Association for Computing Machinery, New York, NY. **ACM '83** Sheraton Centre, New York, NY.

November

- 1-4 American Production & Inventory Control Society, Falls Church, VA. **26th Annual International Conference** Hilton Hotel, New Orleans, LA.
- 7-9 IEEE Computer Society, Silver Spring, MD. **24th Annual Symposium on Foundations of Computer Science** Tucson Marriott, Tucson, AZ.
- 10-12 Northeast Expositions Inc., Chestnut Hill, MA. **North-east Business Computer Show and Software Exposition** Hynes Auditorium, Boston, MA.

Coming Next Month

Ever feel that you're getting older while people around you stay the same? Turn the tables on them with the October *80 Micro*—there's a relativity program that tracks the time and age difference between you, traveling in a spaceship at nearly the speed of light, and a friend left behind on Earth.

The issue's theme is science, and relativity is just the beginning. Model I/III/4 astronomers will appreciate a seasonal sky display, that shows the night sky and indicates desired targets (such as Virgo, the Big Dipper, or Polaris), and a program that keeps your telescope in sync with the Earth's daily rotation.

You shouldn't look at the sun, but we've got a program that tells its altitude and azimuth from any location at any time.

For business users, there's a business trend forecaster and a financial health analyzer. Assembly-language Model 16 programmers can study a tutorial on the 68000, and people who hate decimals can try a utility that accepts and displays numbers in fractions.

Finally, the month's game lets you take a dangerous ride on a Spacefly. Spaceflies don't approach the speed of light; in fact, as you play you may find yourself aging rapidly. ■

DATAGRAPH

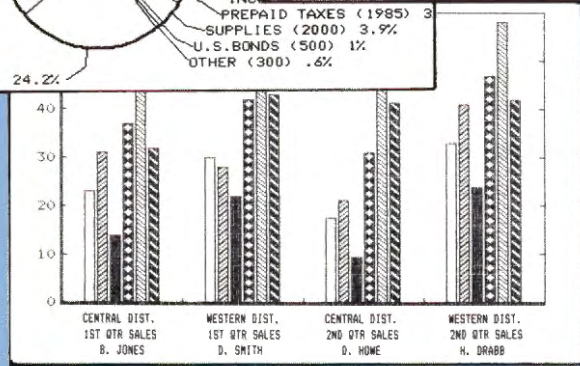
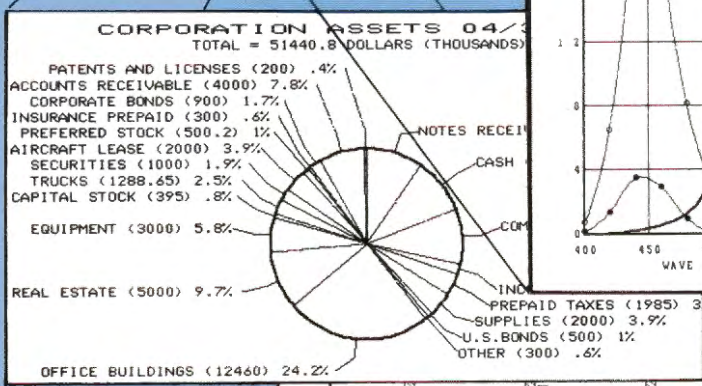
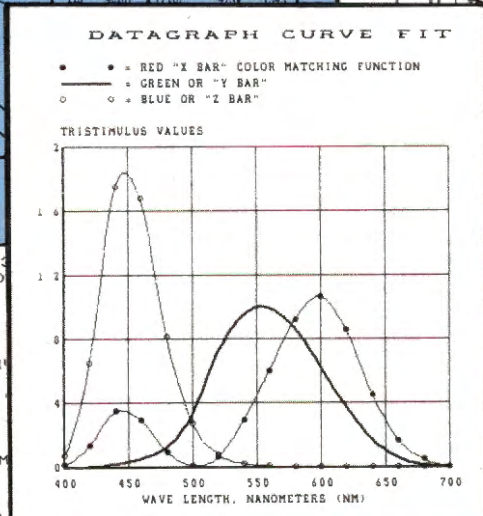
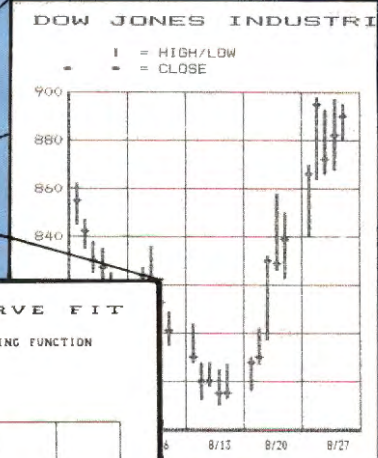
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105	78.88	972.56	406.77	117.01	137.87	1044	433	41,159	14,669	
106	79.14	964.69	402.59	117.16	138.12	1049	440	38,463	23,709	
107	77.29	990.39	391.19	115.19	135.08	216	1535	5,794	25,844	
100	76.20	915.70	385.24	114.07	133.06	576	1028	11,759	37,075	
109	76.44	968.69	384.82	112.87	133.49	907	420	20,933	15,739	
112	76.52	965.77	388.34	112.66	133.52	928	433	25,813	19,192	
113	76.35	915.10	387.18	112.49	133.79	578	993	12,407	24,532	
114	76.58	966.47	389.55	112.39	133.47	914	412	23,382	13,773	
115	76.89	969.27	396.16	112.66	134.22	769	471	21,567	13,526	
116	77.35	973.29	411.78	113.22	134.77	880	642	23,222	14,425	
119	76.10	970.97	403.55	114.35	134.97	745	750	16,718	15,338	
120	75.81	950.68	394.89	113.80	131.65	371	1172	5,589		
121	75.39	946.25	392.46	115.80	131.38	517	754	15,737		
122	74.78	910.44	372.83	113.90	130.28	407	1824	11,057		
123	74.72	941.19	391.44	111.74	130.23	483	700	16,694		
126	74.45	939.91	389.19	111.47	129.84	514	878	11,694		
127	75.19	949.44	394.44	111.72	131.12	943	350	28,178		
128	74.79	942.50	395.43	112.49	130.34	466	788	14,435		
129	74.67	948.67	398.94	112.71	130.24	774	710	19,438		
130	74.27	947.27	400.22	112.62	129.55	727	776	16,777		

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1231	41.21	77.83	447 -1572
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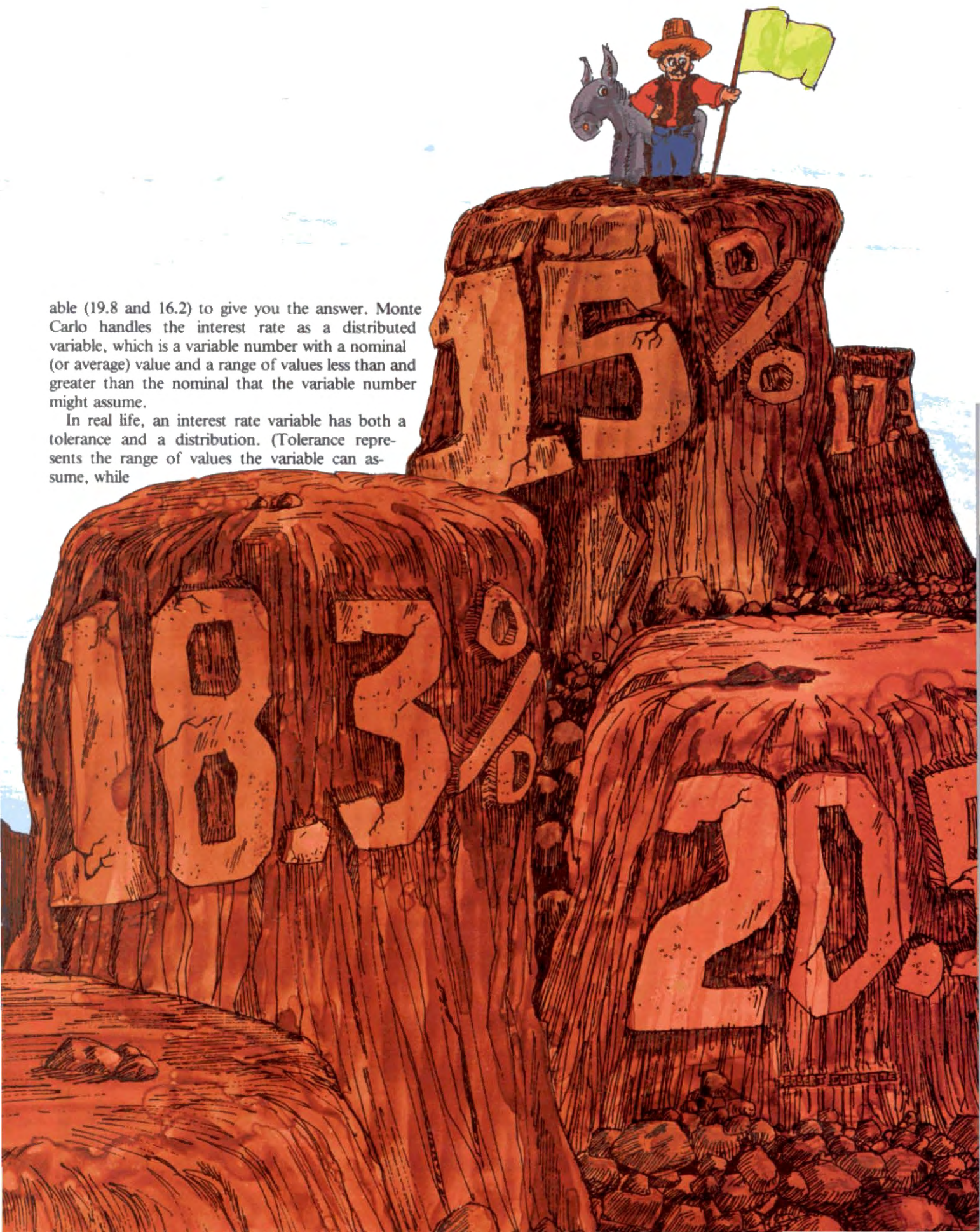
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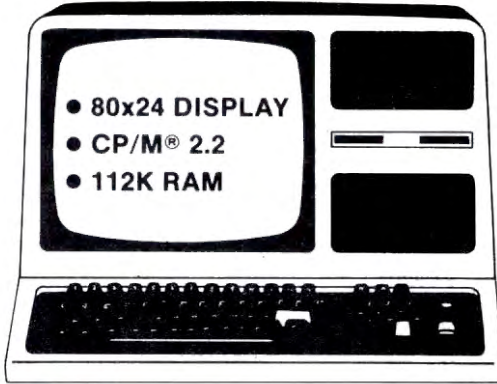
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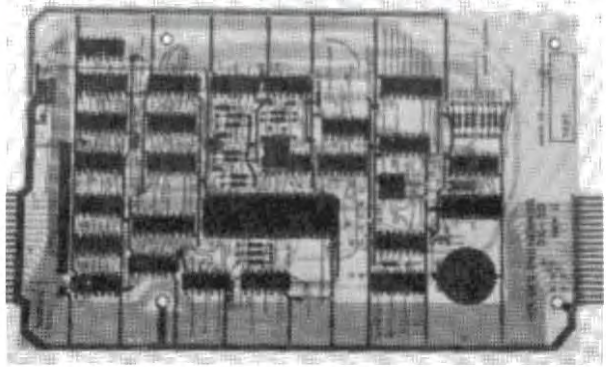
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the distribution is the probability of a particular value occurring.)

Thus, while the interest might vary from 19.8 to 16.2, it's more likely to remain around the nominal, 18. You can describe this with a statistical distribution known as a normal curve (see Fig. 1).

The program randomly varies each assigned distributed variable about its nominal value according to the associated tolerance and distribution. The program calculates each variable independently, then determines an outcome by using these variables in the set of equations that defines the problem.

Monte Carlo runs many trials, records each of the results, and checks for limits. It might repeat this procedure several hundred times. Finally, the program evaluates the results of all the trials and calculates a probability to determine the answer.

Variable Types

You must define your problem within the system's constraints, using three unique types of variables to describe the environment.

Distributed variables describe a number that varies over a predictable range. Enter it in the form:

Name, Nominal Value, Plus Tolerance, Minus Tolerance, Distribution

The name is a descriptive identifier from one to six characters long. For equation calculation, the program uses it in place of the actual number.

The nominal value is the numerical base for the tolerance calculations, the number the variable will most likely assume. The plus tolerance is the percent above the nominal that you let the value reach. The minus tolerance is the percent below the nominal that you let the value reach.

The distribution ranges from zero to five and describes how close to the nominal the majority of values lie. Zero defines a flat distribution and five is a narrow distribution (see Fig. 2).

The program randomly varies the distributed variables for each Monte Carlo trial. In a worst-case analysis, the pro-

gram holds these variables at their extreme tolerances while it calculates the statistical variables. Sensitivity analysis determines the extent of the effect that the individual distributed variable has on each statistical variable.

The second category of variables, constant/calculated, has a dual purpose. You can use them as constants, variables whose values don't change, by entering them in the form:

Name, Value

Name is from one to six characters long. The program equations use it in place of the associated number. For instance, you might want to define an interest rate as: Rate, 19.2. In this case, every time the program sees Rate in an equation, it substitutes 19.2. This might be useful for documentation, although

"This program calculates two sensitivity numbers. . ."

you can use 19.2 directly in an equation.

This type of variable is more frequently used as an intermediate calculated variable. To use it in this form, enter the number as:

Name, 0

When the program finds this variable to the right of an equals sign in an equation, it calculates the value of the expression to the left and uses that value to replace the zero. Whenever the program encounters the name in an equation, it uses the new value.

The program uses statistical variables to calculate its statistics. Enter them in the following form:

Name, High Value, Low Value

Name is from one to six characters long and identifies the associated variable.

You set the high value as the absolute upper limit of the statistical variable. As the program calculates each value, it keeps track of how many values fall

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higher than the limit. Then it calculates the percentage of the total.

This occurs in a similar manner for the low value. In addition to the percent over and under the limits, the program calculates the standard deviation, mean value, and highest and lowest numbers found out of all trials. The program does this in turn for each variable defined as statistical.

Equations

The program's heart is in the equation definition; it does all the calculations. By using the three variable types and relating them to each other with mathematical symbols, you can simulate general systems.

The computer evaluates each equation from left to right. The operators, or mathematical symbols, have no predefined precedence, so the program evaluates the leftmost operator first and the rightmost operator last. Consequently, the equals sign must be the last mathematical symbol encountered in the equation.

For instance, assume you want to find the payback on a simple interest loan. You write the equation as follows:

$$\text{Rate} * \text{Amount} + \text{Amount} = \text{Paybck}$$

Notice the equation's syntax. It starts with a variable, followed by an operator, then another variable, and so on until the last part consists of an equals sign followed by the variable you wish to find.

You've previously defined the variables Rate and Amount. Paybck is either a constant or statistical variable; the value of the expression immediately to its left determines its value. Note the space between each variable and the fol-

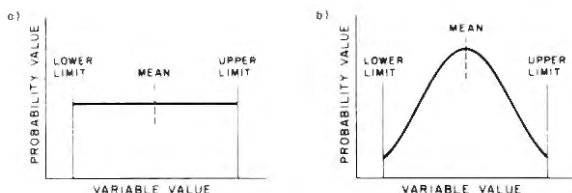


Figure 1. Uniform distribution and normal distribution.

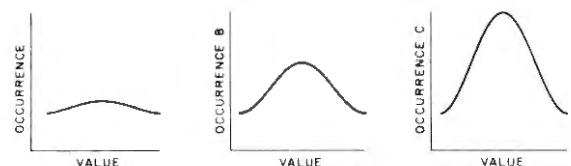


Figure 2. Distribution ranges from zero to five.

lowing operator. It lets the program distinguish correctly between the two.

Assume that Rate is a constant variable with a value of .18 (18 percent), and Amount is a constant with a value of 100. The program starts its evaluation on the left by multiplying the rate times the amount. Then it adds that sum to the previous amount. The program transfers the answer to the variable called Paybck.

The program's math operators are the four basic functions, + - * /, and five special functions:

INT TAN SIN COS ABS

The INT function truncates a floating point number to the integer portion, without a rounding operation. TAN, SIN, and COS are the standard trigonometric functions calculated in radians. The ABS function converts a number to its absolute value (makes it positive).

To take a number's sign and divide it by another, use the following equation:

SIN Number / Other = Ans

The program calculates and treats each special function and the variable

following it as a single variable.

For instance, to add a number to another number's integer, you'd use the following equation:

Num1 + INT Num2 = Ans

Notice how the program treats the function INT and the variable following it, Num2, as one variable. Only one operator (+) appears before and one operator (=) after the group.

You also have a comment function. The > character denotes the beginning of a comment. You can place it at the beginning of a line (in place of an equation), or at the end of a line (after an equation):

> This is an example of a comment
Num + Var = Ans > Here's a comment

The program ignores text following a >. Note that you need a space after the >, just like any other operator.

Entering Data

The program accepts data in one of two forms. When you first run it, the program asks whether you want to retrieve data from a disk file. If so, enter

the file name. The program reads the data from the specified file into its memory (see sidebar for the disk data format). The program normally creates this data at the end of a session.

You can also enter data from the keyboard. The program asks you to enter values for each type of variable and all equations you want the program to use.

A prompt requests the number of distributed variables you wish to enter. Don't worry if you make mistakes entering the data. The editing features let you add, change, or delete. Enter the variables one at a time until all distributed variables are in the proper form.

Next enter the number of constant or calculated variables you want to use. It helps to define the problem before you begin entering so you know how many variables you're going to need. Enter the variables in the standard form described earlier.

When you enter the statistical variables, specify a generous amount. The program uses only those input here in the statistical calculations. First enter the number of variables you'll use, then the variables themselves in the proper form.

Your last input items are the equations. The number of equations directly affects the program's cycle time; the more equations you enter, the longer it takes to finish the calculations.

For instance, if you specify 250 trials and the program takes one minute per cycle (because of the number of equations), the complete run would last around four hours. This is not unusual, due to the inherent speed of the Basic interpreter.

Comments, however, don't take up much computation time and make the equations much more readable. You should try to use highly descriptive names for the variables.

Editing

Much of the program's power and flexibility come from its editing capabilities. Once you enter your data, the program enters the edit mode. (If you enter data from the disk at start up, the program bypasses edit and asks for the number of trials.)

The first screen in this mode is an edit menu (see Fig. 10). Choose the proper group number to add, change, or delete variables or equations. When you choose a group, the information as it currently exists appears with a corresponding number on the screen. This is the data edit mode.

Choose a line number to display a

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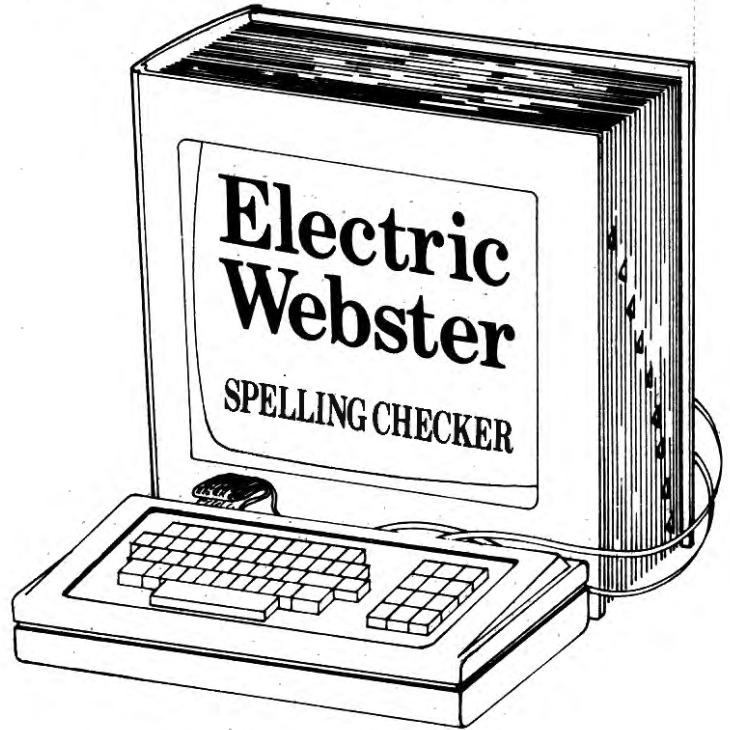
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copy of the line at the bottom of the screen, and enter the line edit mode.

The arrow (cursor) appears above the text to be edited, starting at the leftmost character. By typing from the keyboard, you can overwrite characters that are in the cursor position. The program increments the cursor after each keystroke, so you can completely retype the whole line or any portion of it.

You can also move the cursor without destroying the characters it indicates. Using the left-arrow key, you move the cursor one space to the left with each depression. When the cursor is in the leftmost position, additional keystrokes have no effect. The right-arrow key moves the cursor one character to the right in the same manner.

By using shift right arrow or shift left arrow, you move the cursor immediately to the rightmost or leftmost position respectively. Two other features in the line edit mode are insert and delete.

Enter the insert mode by pressing the up-arrow key. At the cursor position, the program enters all characters you type. The line separates to let you insert without overwriting existing characters. Pressing any other edit key removes the program from the insert mode.

Use the down-arrow key to delete any character located directly under the cursor. The rest of the characters move left to fill the void created by the deletion. Successive pressing of the down-arrow key deletes multiple characters. You can also use the clear key to delete all characters from the current cursor position to the end of the line.

The last editing key is the shift up-arrow. Use it any time during the line edit mode to end editing and return to the data edit mode. The program will make no changes. This is helpful if you decide not to change a line after all. To end the line edit and save all changes, press the enter key.

The data edit mode lets you make changes, additions, or deletions to data already entered. For example, suppose that you've entered three distributed variables numbered 1, 2, and 3. To add a fourth variable between numbers 2 and 3, enter 2.5 in response to the prompt below (see Fig. 12).

Insert Line=Fraction - Delete Line=NULL -
Abort Edit='Enter'

This puts you into the line edit mode with all its features and lets you enter another variable. When you press return (ending the line edit mode), the variable list reappears on the screen. The program renumbers the list so the

line you just entered occupies line number 3, and the remaining lines are adjusted accordingly.

To delete a line, enter the number corresponding to the line you want to

delete. When you enter the line edit mode, press the clear key to erase the line, then press return.

When the program relists the data, the line is gone and the remaining lines

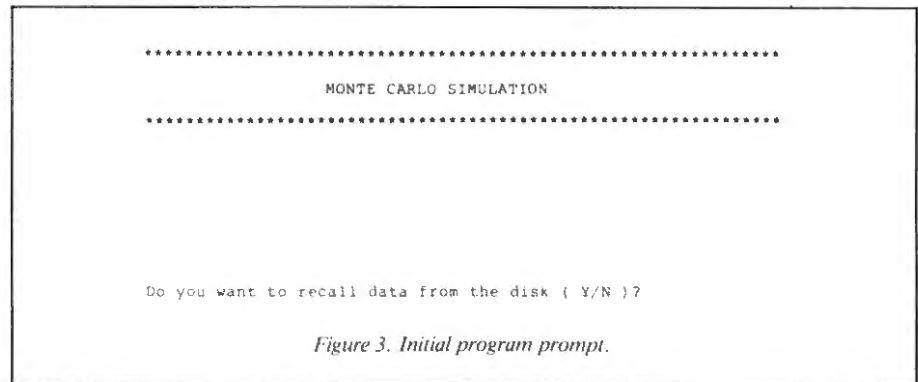


Figure 3. Initial program prompt.

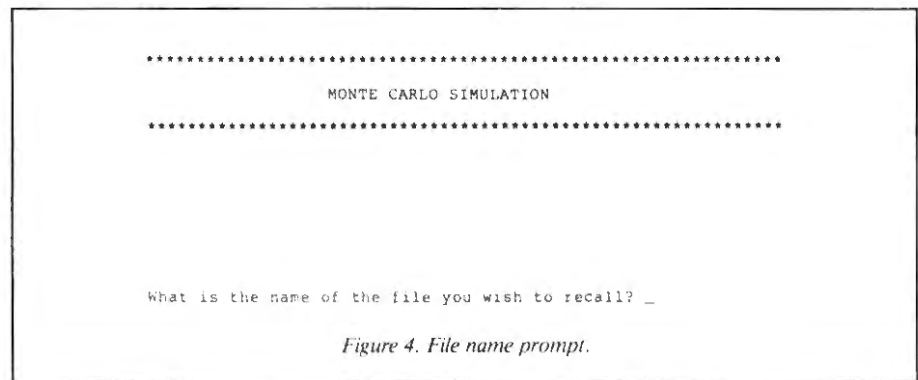


Figure 4. File name prompt.

Format of Data File

After you enter data into the program for analysis, you have the option of saving that data to disk for future use. The program stores it as a sequential file in the following order:

1. An integer value of the number of distributed variables.
2. A string value containing the name of the first distributed variable.
3. A single precision value containing the nominal value.
4. A single precision value containing the plus tolerance.
5. A single precision value containing the minus tolerance.
6. A single precision value containing the distribution value.
7. The program repeats data #2 through #6 for each distributed variable that data #1 specifies.
8. A single precision value of the number of constant variables.
9. A string variable containing the

name of the first constant variable.
10. A single precision variable containing the value of the first constant variable.

11. The program repeats data #9 and #10 for each constant variable that data #9 specifies.

12. A single precision value of the number of statistical variables.

13. A string value containing the name of the first statistical variables.

14. A single precision value containing the upper limit.

15. A single precision value containing the lower limit.

16. The program repeats data #13 through #15 for each statistical variable that data #12 specifies.

17. A single precision value of the number of equations.

18. A sequential list of all the equations that data #17 specifies follows. The program stores each equation as a string variable. ■



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have moved up one position.

Return to the main menu from the data edit mode by pressing return without entering a number. You can choose another category to edit or go on to the analysis portion of the program (Monte Carlo trials or sensitivity analysis).

Monte Carlo Analysis

When you press the enter key from the main menu, the program enters the Monte Carlo analysis portion of the

program. The computer randomly assigns numbers to each distributed variable within its range, then calculates the statistical variables found in each equation. This process occurs once for each trial you request.

Before the analysis begins, the program asks you how many trials you'll need. You can enter any number from zero to the numerical range of the machine. If you enter zero, the program returns to the main menu and takes no

further action.

The more trials you enter, the longer it takes to complete the analysis. The length of time required for each trial varies depending on the amount and length of the equations. You can estimate about three seconds per equation per trial. If you have 20 equations, the program would take about one minute per trial.

You should limit the number of trials to between 50 and 100 to give best results. Less than 25 will not yield accurate results.

During the course of its analysis, the program keeps you updated as to its progress. On the bottom of the screen, you see the trial number and equation currently being evaluated.

When the program completes the required number of trials, it asks if you want a printout. If you enter Y and a printer is available, the output is directed to the printer as well as the screen. The program abbreviates the screen output due to the 64-column limitation.

The program next asks you to enter a comment line. You can enter any number of characters up to 255 for the program to use as a printout title.

As the program evaluates each equation, it dynamically checks for errors. If it encounters one, it displays a message and halts evaluation (see Table 1 for a list of possible error messages).

If the program encounters an error, you should return to the edit mode and review the equation in question. Check for proper syntax, and make sure you've previously defined all variables in one of the three variable sections.

A sample of a single trial Monte Carlo run appears in Fig. 13. It contains three distributed variables, two constant variables, four statistical variables, and four equations.

The first portion of the output shows the distributed variables, their nominal values (in this case, all had the value of 10), their plus and minus tolerances (5 percent), and their distributions (ranging from DIST1, a narrow distribution, to DIST3, a flat distribution).

I set up this program's variables to directly reflect the state of the distributed variables: I set STAT1 equal to DIST1 in the program's equation section. This is one way to see what is directly happening to the distributed variable.

The printout indicates that as the distribution becomes flatter (going from STAT1 to STAT3), the value the distributed variable assumes deviates further from the nominal, 10.

```
*****
MONTE CARLO SIMULATION
*****

There are three types of variables allowed in this program;

1) DISTRIBUTED - These are varied for each trial depending
   on the entered tolerance.
2) CALCULATED/CONSTANT - These are used for intermediate
   calculations and to simplify long equations.
3) STATISTICAL - These will be tallied for each trial and a
   statistical analysis will be performed after the
   last trial.
PRESS ANY KEY TO CONTINUE.
```

Figure 5. Display to manually enter data.

```
ENTER THE NUMBER OF DISTRIBUTED VARIABLES ( < 21 ) ? 2
Enter the distributed variables in the form -
NAME,NOMINAL,+TOL,-TOL,DISTRIBUTION

Where - 'NAME' is a string of 8 characters or less.
        'NOMINAL' is the nominal value of the variable.
        'TOLERANCE' is the per cent variation from nominal.
        'DISTRIBUTION' is 0 for flat to 5 for narrow.

ENTER DISTRIBUTED VARIABLE # 1
? _
```

Figure 6. Distributed variable prompt.

```
ENTER THE NUMBER OF CONSTANT OR CALCULATED VARIABLES ( < 21 ) ?
1
Input the constant variable name ( < 9 char. ),
Followed by its constant value. Enter 0 if it is to
be calculated.

VARIABLE 1 NAME,CONSTANT? _
```

Figure 7. Constant or calculated variable prompt.

```
ENTER THE NUMBER OF STATISTICAL VARIABLES ( < 21 ) ? 1
STATISTICAL VARIABLES
Input variable in the form: NAME,UPPER LIM,LOWER LIM.

VARIABLE 1 ? _
```

Figure 8. Statistical variable prompt.

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You can also see this in the standard deviation of the statistical variable that quantitatively shows you the dispersion from the mean. The STD. DEV. increases from .14 to .18 as the distribution gets flatter.

The high and low values show the

largest and smallest numbers that the statistical variable assumes out of all the trials run. This determines how far outside the limits the variable traveled.

The limits appear under the headings Minimum and Maximum. You set these when you first enter the statistical vari-

able into the program. The percent of values outside these limits appears under the headings %Under and %Ovr.

The next section shows the equations used to calculate the statistical variables. By setting the statistical variable equal to the distributed variable, you can have the output track the distributed variable. Note that equation 1 is a comment line.

The final section shows the constants used in this example. Since STAT4 is equal to the constant, 10, the standard deviation in the statistical section is zero, showing no variation from the mean.

The statistical output consists of several numbers that describe a sample sufficiently to forecast what the whole population should look like in an infinite sample. The larger the sample size, the greater the accuracy.

The mean is the average number in the sample. The closer you get to this value, the more likely it is to occur (see Fig. 1). In a normal distribution, the mean is the curve's highest part.

As you get further from the mean, less of the population will have that value in any one trial. The standard deviation is the percentage of that population that falls in any range of numbers.

```

Enter the equations in the form:
VAR OPER VAR OPER VAR = VAR COMMENT
Where VAR is a previously defined variable followed by a space
and OPER consists of one of the following math operators:
      + - / * |
or one of the following trig operators:
      LOG SIN COS TAN INT
The functions are in radians and the LOG is natural. Each
operator must be followed by a space. The expression is
evaluated from the left to the right. The COMMENT is ignored.
A null equation (for comment purposes) may be entered by
starting a line with a ' > ' followed by a space.

EQUATION 1 ? _
  
```

Figure 9. Equation prompt.

```

Enter the number to change or input.
1 - DISTRIBUTED VARIABLES
2 - CONSTANT OR CALCULATED VARIABLES
3 - STATISTICAL VARIABLES
4 - EQUATIONS
5 - ALL
6 - SENSITIVITY ANALYSIS/WORST CASE
'ENTER' - MONTE CARLO ANALYSIS
  
```

Figure 10. Edit menu.

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NAME	DESCRIPTION
1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMOM	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDDVAL	Value of a bond
30 DEplete	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model:i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEJUE1	Single server queuing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPFOT	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQJIOQ	Fixed quantity economic order quantity model
53 FQEOQWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEJUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBJD	HOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFIL	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
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use them in conjunction with the statistical descriptors, you can make a good estimation of a problem's outcome.

During the output of the statistical data, the program asks if you want graphical output. If you answer yes, it produces a small bar graph for each statistical variable.

Figure 13 is a sample of a run with a graphical output. The first of the two columns left of the bar graph is labeled

Range. It starts at the value chosen for the variable Minimum value, and ends with the value chosen for the variable Maximum value. Range is divided into 10 equal groups.

The next column, labeled Number, contains the number of trials during which the variable fell into the corresponding range group. The bar graph itself consists of a normalized graph of the results. To the graph's right are the pertinent corresponding statistical results.

Examine the results of the first statistical variable, STAT1, in Fig. 13. The minimum/maximum range chosen for this variable is 9.5 to 10.5. The graph's first line, labeled 9.5, contains all values that fall below but don't equal 9.5. The next line of the graph, labeled 9.6, contains all values equal to and greater than 9.5, but less than 9.6.

This continues for 10 equal groups until you reach the final number, 10.5. The first line labeled 10.5 contains all values equal to and greater than 10.4, but less than 10.5. The last line labeled 10.5 contains all values 10.5 or greater.

The lowest value calculated in this run is 9.66. In the graph, only one value (9.66) fell in the 9.7 category. The graph itself is normalized to 15—the largest number of values out of all categories assumes a value of 15. The program scales all other categories from this value.

Notice that range 10.1 of variable STAT1 contains 27 values. The number 27 also appears on the graph's top border, indicating that the longest line shown (consisting of 15 asterisks) contains 27 values. The next largest cate-

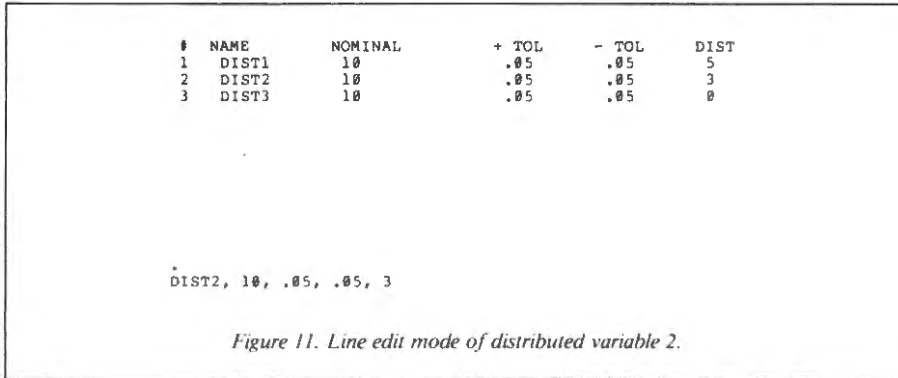


Figure 11. Line edit mode of distributed variable 2.

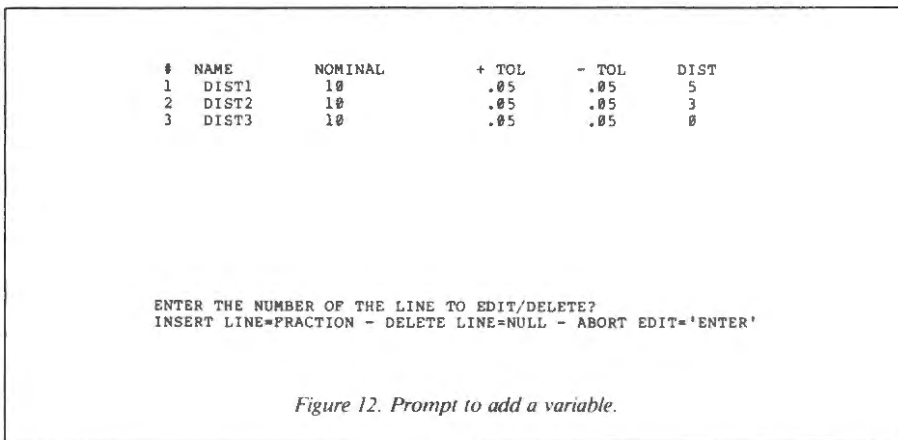






Figure 12. Prompt to add a variable.

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gory (range 10) contains 21 values that correspond to 12 asterisks (the integer value of 21 divided by 27 times 15).

By normalizing the graph in this manner, you keep the number of values always in scale. To the graph's right is the statistical data for the variable previously presented in the statistics output.

Since the range always starts with the minimum value specified for the variable and ends with the maximum value, judiciously select this range during the statistical variable input.

If the range is too large (minimum equal to zero and maximum equal to 100) and the actual high/low values are much closer together (e.g., low value equal to 47.2 and high value equal to 48.9), the resulting graph is meaningless.

You can't change the range after you've run the Monte Carlo simulation and keep the accumulated data intact. If the range is too large, you must begin the trials over again. I recommend that you first execute a trial run of only one or two trials to gauge the magnitude of the statistical variable value.

To reinforce the concept of the statistical variable distribution, you can use the graphical output shown in Fig. 13. Notice that DIST1 (equal to STAT1) has a distribution of five, DIST2 (equal to STAT2) has a distribution of three, and DIST3 (equal to STAT3) has a distribution of zero.

Notice the relative differences in the graphical output of the corresponding statistical variables. STAT1 ranges from 9.7 to 10.3 in a fairly narrow grouping. STAT2 has a broader distribution (more evenly grouped) from 9.7 to 10.5, while STAT3 is a relatively flat grouping from 9.6 to 10.5.

Sensitivity Analysis

You enter the program's sensitivity portion by choosing item 6 from the main edit menu (see Fig. 10). The sensitivity analysis determines the degree to which a particular distributed variable affects any one statistical variable.

For instance, if your equation relates a statistical variable to one distributed variable and one calculated variable, and the calculated variable relates in turn to two other distributed variables, it's difficult to determine which of the distributed variables has the greatest effect on the equation.

The sensitivity analysis places a quantitative measurement on each distributed variable as it relates to each statistical variable. This lets you easily ascertain its contribution to the overall statistical value.

Mechanically, the program operates much as it did for the Monte Carlo analysis: It must make several passes through each equation, varying a different value each time. However, the program individually assigns each variable its worst case tolerance value instead of random values.

The first pass sets each distributed

variable at its nominal value. The screen shows a trial number of zero as the program calculates each equation.

Then the program begins by setting the first distributed variable to its maximum positive tolerance, leaving all other distributed variables at their nominal values. This appears on the screen as trial 1 to indicate that the program is

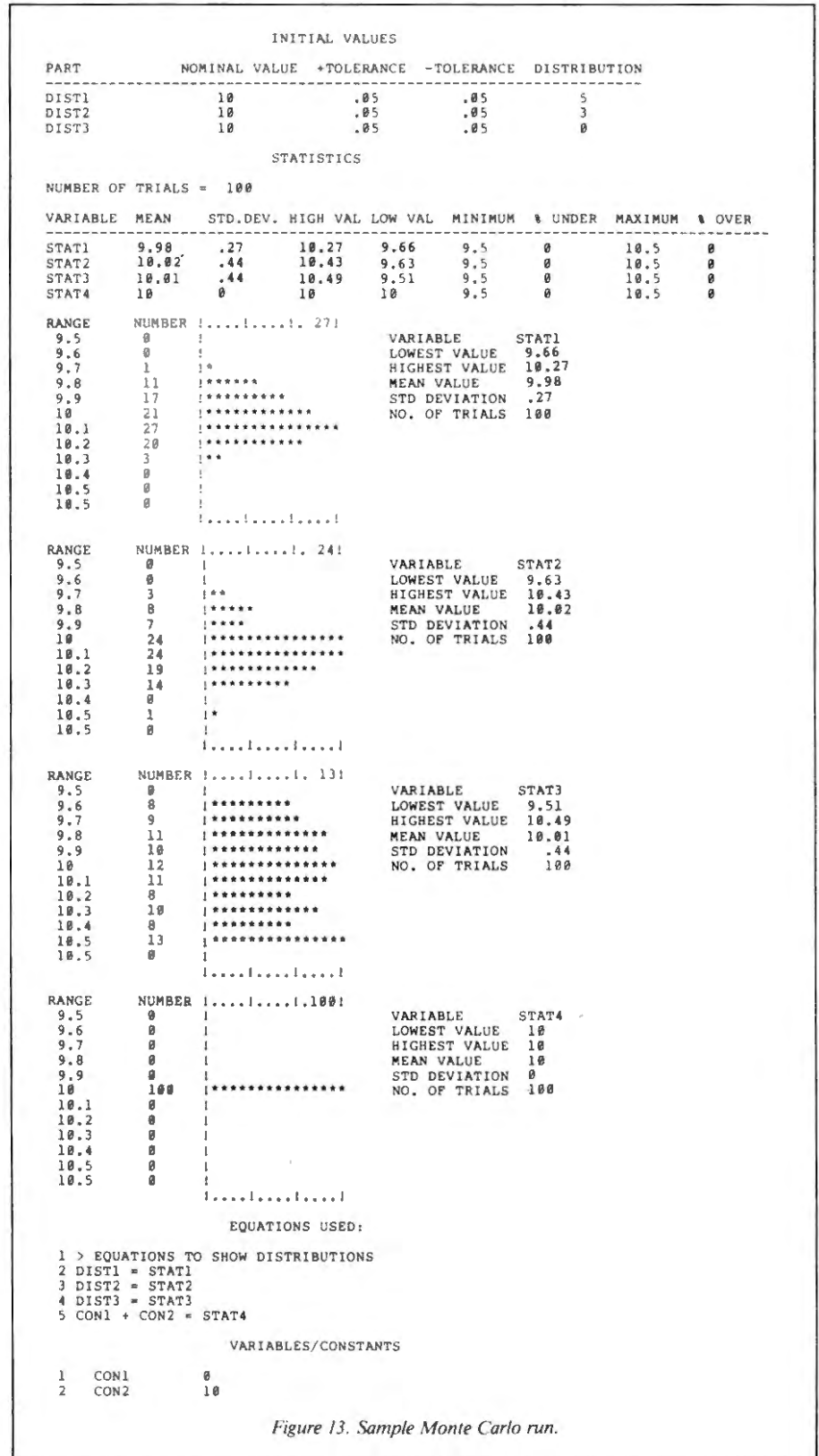


Figure 13. Sample Monte Carlo run.

"The program's heart is in the equation definition. . ."

SENSITIVITY ANALYSIS

STATISTICAL VARIABLE = STAT1		PLUS TOLERANCE		NOMINAL VALUE = 10		MINUS TOLERANCE	
DISTRIB	STATISTICAL	RELATIVE	ACTUAL	STATISTICAL	RELATIVE	ACTUAL	ACTUAL
VARIABLE	VALUE	SENSITIVITY	SENSITIVITY	VALUE	SENSITIVITY	SENSITIVITY	SENSITIVITY
DIST1	10.5	1	5	9.5	-1	-5	
DIST2	10	0	0	10	0	0	
DIST3	10	0	0	10	0	0	

STATISTICAL VARIABLE = STAT2		PLUS TOLERANCE		NOMINAL VALUE = 10		MINUS TOLERANCE	
DISTRIB	STATISTICAL	RELATIVE	ACTUAL	STATISTICAL	RELATIVE	ACTUAL	ACTUAL
VARIABLE	VALUE	SENSITIVITY	SENSITIVITY	VALUE	SENSITIVITY	SENSITIVITY	SENSITIVITY
DIST1	10	0	0	10	0	0	
DIST2	10.5	1	5	9.5	-1	-5	
DIST3	10	0	0	10	0	0	

STATISTICAL VARIABLE = STAT3		PLUS TOLERANCE		NOMINAL VALUE = 10		MINUS TOLERANCE	
DISTRIB	STATISTICAL	RELATIVE	ACTUAL	STATISTICAL	RELATIVE	ACTUAL	ACTUAL
VARIABLE	VALUE	SENSITIVITY	SENSITIVITY	VALUE	SENSITIVITY	SENSITIVITY	SENSITIVITY
DIST1	10	0	0	10	0	0	
DIST2	10	0	0	10	0	0	
DIST3	10.5	1	5	9.5	-1	-5	

STATISTICAL VARIABLE = STAT4		PLUS TOLERANCE		NOMINAL VALUE = 10		MINUS TOLERANCE	
DISTRIB	STATISTICAL	RELATIVE	ACTUAL	STATISTICAL	RELATIVE	ACTUAL	ACTUAL
VARIABLE	VALUE	SENSITIVITY	SENSITIVITY	VALUE	SENSITIVITY	SENSITIVITY	SENSITIVITY
DIST1	10	0	0	10	0	0	
DIST2	10	0	0	10	0	0	
DIST3	10	0	0	10	0	0	

STAT	NOMINAL	WORST CASE	
VARIABLE	VALUE	POSITIVE	NEGATIVE
STAT1	10	10.5	9.5
STAT2	10	10.5	9.5
STAT3	10	10.5	9.5
STAT4	10	10	10

Figure 14. Sample sensitivity analysis.

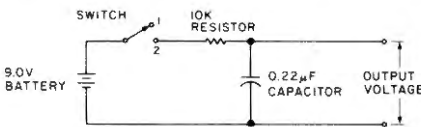


Figure 15. Electronic circuit schematic.

varying the first distributed variable.

As the program works on each equation, it records the value of each statistical variable. It then compares this value to the value of the statistical variable calculated when all variables were

nominal. In this manner, the program makes a quantitative analysis on each individual distributed variable.

Next, the program returns the first distributed variable to its nominal value and proceeds to the second distributed variable. Trial 2 appears on the screen to inform you of the program's progress. This process continues until the program has tested all distributed variables.

At this point, the program shows only the positive effect of the distributed variables. It now repeats the process, varying each distributed variable to its maximum negative tolerance. A minus sign precedes the trial number corresponding to the number of the distributed variable currently being calculated.

The program's last type of calculation is the worst-case analysis. In this mode, it again varies each distributed variable to its maximum tolerance; however, all variables change at the same time.

The program uses the data accumulated during the first part of the analysis to determine which variation (maximum positive or negative tolerance) yields the worst case value for each statistical variable. This process occurs for the worst case positive and worst case negative situations.

This program calculates two sensitivity numbers, relative and actual. The actual sensitivity is a ratio of the percent change in the function's value to the overall change in the element or variable causing that change. The relative sensitivity is a ratio of the percent change in the function to the percent change in the variable.

In the equation $V * 5 / 10 = STAT$, assume that the variable V has a nominal value of 25 with a tolerance of plus and minus 5 percent. Now, you can calculate the actual sensitivity of the variable V with respect to the variable STAT.

The program first calculates the nominal value of STAT, or 12.5 ($25 * 5 / 10$). Then it varies V to its maximum positive tolerance, 26.25 ($1.05 * 25$). Next, the program recalculates the equation using the new value for V to arrive at the answer, 13.125 ($26.25 * 5 / 10$).

Then the program subtracts the nominal value from the new value, divides the result by the nominal, and multiplies by 100 to obtain the percent of change. The actual sensitivity in this example is

ELECTRONIC CIRCUIT ANALYSIS
INITIAL VALUES

PART	NOMINAL VALUE	+TOLERANCE	-TOLERANCE	DISTRIBUTION
RES	10000	.1	.1	3
CAP	2.2E-07	.5	.2	2

STATISTICS

NUMBER OF TRIALS = 20

VARIABLE	MEAN	STD.DEV.	HIGH VAL	LOW VAL	MINIMUM	% UNDER	MAXIMUM	% OVER
TIME	9E-04	9E-04	1.3E-03	7E-04	8E-04	5	1E-03	15

RANGE	NUMBER	1.....1.....1 20!	VARIABLE	TIME
8E-04	1	1****	LOWEST VALUE	7E-04
8.2E-04	2	1*****	HIGHEST VALUE	1.3E-03
8.4E-04	3	1*****	MEAN VALUE	9E-04
8.6E-04	2	1*****	STD DEVIATION	9E-04
8.8E-04	0	1	NO. OF TRIALS	20
9E-04	1	1****		
9.2E-04	4	1*****		
9.4E-04	1	1****		
9.6E-04	1	1****		
9.8E-04	1	1****		
1E-03	1	1****		
1E-03	3	1*****		
		1.....1.....1		

EQUATIONS USED:

- > ELECTRICAL CIRCUIT EXAMPLE
- VOLT / BATT = RATIO
- 1 - RATIO = CVOLT
- 0 - LOG CVOLT * RES * CAP = TIME

VARIABLES/CONSTANTS

1	RATIO	.333333
2	CVOLT	.666667
3	BATT	9
4	VOLT	3

Figure 16. Electronic circuit analysis.



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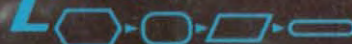
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+5 percent. A 5 percent change in V yields a 5 percent change in STAT.

However, if V has a nominal value of 25 with a plus and minus tolerance of 10 percent, the actual sensitivity is 10 percent because it's a measure of the function's overall change.

On the other hand, you use the relative sensitivity for a comparison between two variables. It's a measure of a percent change's effect in the variable, not overall change. The program divides the actual sensitivity value (5 percent) by the variable tolerance (5 percent) to obtain the relative sensitivity (1 percent).

Even if the function's overall change increases by 10 percent, the relative sensitivity remains at 1 percent. This determines which variable is most sensitive to change regardless of its tolerance.

Figure 14 is a sample printout of sensitivity analysis results. The example's data is the same as that in the Monte Carlo analysis printout. The printout's first line lists the variable the program is currently examining, along with its nominal value. This occurs for each statistical variable.

Next are headings to describe the data. One column is for the distributed variable. The next column indicates statistical value (the value the statistical variable assumes when the program takes

the corresponding distributed variable to its extreme), relative sensitivity, and actual sensitivity for both positive and negative cases.

In the first case, STAT1, the statistical variable was sensitive only to variable DIST1 because DIST1 is the only variable involved in the equation with STAT1 (DIST1 = STAT1). When the program varies DIST1 by 5 percent, it also varies STAT1 by 5 percent, as the actual sensitivity value indicates.

Note that the percent change in the statistical variable for a percent change in the distributed variable (relative sensitivity) is 1 percent. This follows for the minus tolerance as well.

You can see the same kind of results for the corresponding distributed variables in the other cases, with the notable exception of STAT4. In STAT4, none of the distributed variables affected the statistical variable in the associated equation 10 = STAT4.

While the sensitivity analysis shows the effect of varying one distributed variable while keeping the others constant, the worst-case analysis varies all the distributed variable to create the worst possible condition. This occurs for both the worst positive and worst negative conditions.

The results of this calculation follow

```

140 '
150 'INITIALIZATION
160 CLEAR 5000
170 DEFINT C-E,I,O,P,X,Y: DEFSTR B
180 DEF FNB(X)=STRING$(ABS(X-PEEK(16539))," ")
190 DV=20
200 DIM ES(64): EDITING STRING
210 DIM OU(DV,4),RA(DV*2),VA(DV),ST(DV,8),ME(DV),SI(DV)
220 DIM SP(DV,DV),SM(DV,DV),NO(DV): SENSITIVITY ARRAYS (USED FOR
WRST CASE & PLOTTING)
230 DIM MA$(6),FU$(5): MATH & FUNCTION ARRAYS
240 DIM V$(DV*2): VARIABLE NAMES
250 DIM S$(DV): STATISTICAL VAR NAMES
260 DIM L$(DV*2): EQUATIONS
270 D1=0: DEBUG FLAG
280 DE=0: DEBUG FLAG
290 D3=0: DEBUG FLAG (EQUATION FINAL VALUE)
300 FOR X=1 TO 6: MATH FUNCTIONS
310 READ MA$(X)
320 NEXT
330 DATA [,"*","/","+","-","="
340 FOR X=1 TO 5: TRIG FUNCTIONS
350 READ FU$(X)
360 NEXTX
370 DATA LOG,SIN,COS,TAN,INT
380 '-----
390 'FIRST SCREEN
400 CLS
410 PRINT STRING$(63,"**"):PRINT:PRINTTAB(18);"MONTE CARLO SIMULA
TION"
420 PRINT:PRINTSTRING$(63,"**")
430 ' GET DATA FROM DISK
440 PRINT@896,"Do you want to recall data from the disk ( Y/N )?
":
450 GOSUB 9060: INPUT Y/N RESPONSE
460 IFA$="N" THEN 2980: INPUT NEW DATA
470 '-----
480 ' READ OLD DATA
490 PRINT@896,"What is the name of the file you wish to recall";
500 INPUT FS:IF LEN(FS)<>0 THEN 520
510 GOSUB 9100:GOTO490
520 FS=LEFT$(FS,8)+" /UTA"
530 GOSUB9100
540 ON ERROR GOTO 10240
550 ER=0
560 OPEN "I",I,FS
570 IF ER<>0 THEN 510
580 PRINT@896,"READING FILE ";FS;
590 RE=1
600 GOSUB 650 'GET DATA
610 RE=0
620 GOTO 850 'EDIT ROUTINE
630 '-----
640 'SUBROUTINE TO READ OR WRITE DATA
650 IF RE THEN INPUT#1,D ELSE PRINT#1,D
660 FORX=1 TOD
670 IF RE THEN INPUT#1,V$(X),QU(X,1),QU(X,2),QU(X,4),QU(X,3)
ELSE PRINT#1,V$(X);";QU(X,1);QU(X,2);QU(X,4);QU(X,3)
680 NEXTX
690 IF RE THEN INPUT#1,C ELSE PRINT#1,C

```

Listing continued

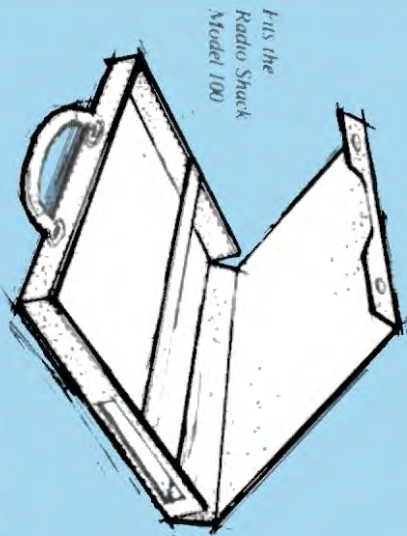
```

700 FOR X=D+1 TO D+C
710 IF RE THEN INPUT#1,V$(X),RA(X) ELSE PRINT#1,V$(X);",",RA(X)
720 NEXTX
730 IF RE THEN INPUT#1,S ELSE PRINT#1,S
740 FOR X=1TO S
750 IF RE THEN INPUT#1,S$(X),ST(X,7),ST(X,1)
ELSE PRINT#1,S$(X);",",ST(X,7);ST(X,1)
760 NEXTX
770 IF RE THEN INPUT#1,E ELSE PRINT#1,E
780 FOR X=1 TO E
790 IF RE THEN INPUT#1,L$(X) ELSE PRINT#1,L$(X)
800 NEXTX
810 CLOSE
820 RETURN
830 '-----
840 ' EDIT ROUTINE
850 CLS
860 PRINT"Enter the number to change or input."
870 PRINT"      1 - DISTRIBUTED VARIABLES"
880 PRINT"      2 - CONSTANT OR CALCULATED VARIABLES"
890 PRINT"      3 - STATISTICAL VARIABLES"
900 PRINT"      4 - EQUATIONS"
910 PRINT"      5 - ALL"
920 PRINT:PRINT"      6 - SENSITIVITY ANALYSIS/WORST CASE"
930 PRINT"      'ENTER' - MONTE CARLO ANALYSIS"
940 PRINT
950 A$=INKEY$:IF A$="" THEN 950
960 N=VAL(A$)
970 IFN=0 THEN 3830 'START TRIALS
980 ON N GOSUB 1020,1680,2150,2570,3100,7500
990 '      EDIST,ECON,ESTAT,EQU,START,SENS
1000 GOTO850
1010 ' EDIST
1020 CLS
1030 PRINT" #";" NAME","NOMINAL","+ TOL";TAB(42);"- TOL";TAB(52)
);"DIST"
1040 A1=0:X=D:FOR A=1TOD
1050 PRINTA;TAB(5);V$(A),QU(A,1),QU(A,2);TAB(42);QU(A,4);TAB(52)
;QU(A,3)
1060 GOSUB2910' SCREEN CHK
1070 NEXTA
1080 A1=D
1090 LI=D:GOSUB8950:D=LI 'INPUT CHANGE SUBROUTINE (INUM)
1100 IPA=0THEN RETURN
1110 IF A>A1 THEN D=A1
1120 IF (A>A1 AND D>=DV) OR (A<>INT(A) AND D>=DV) THEN 1020
1130 IF A>A1 THEN GOSUB 1960' SHIFTC
1140 IF A>A1 THEN D=A:E$="":GOTO1170' ADD A LINE
1150 IF A<>INT(A) AND A<A1 THEN GOSUB 1430:E$="":GOTO1170' SHIFT
D
1160 ES=V$(A)+", "+STR$(QU(A,1))+", "+STR$(QU(A,2))+", "+STR$(QU(A,
4))+", "+STR$(QU(A,3))
1170 GOSUB 9250' EDIT STRING
1180 GOSUB 1350' SEPARATE STRING
1190 IF ER=1 THEN GOSUB 1560:GOTO1020' DDOWN (Delete line)
1200 V$(A)=E$
1210 IF ER=2 THEN 1020' Partial String
1220 GOSUB 1350
1230 QU(A,1)=VAL(E1$)
1240 IF ER=2 THEN 1020
1250 GOSUB 1350

```

Listing continued

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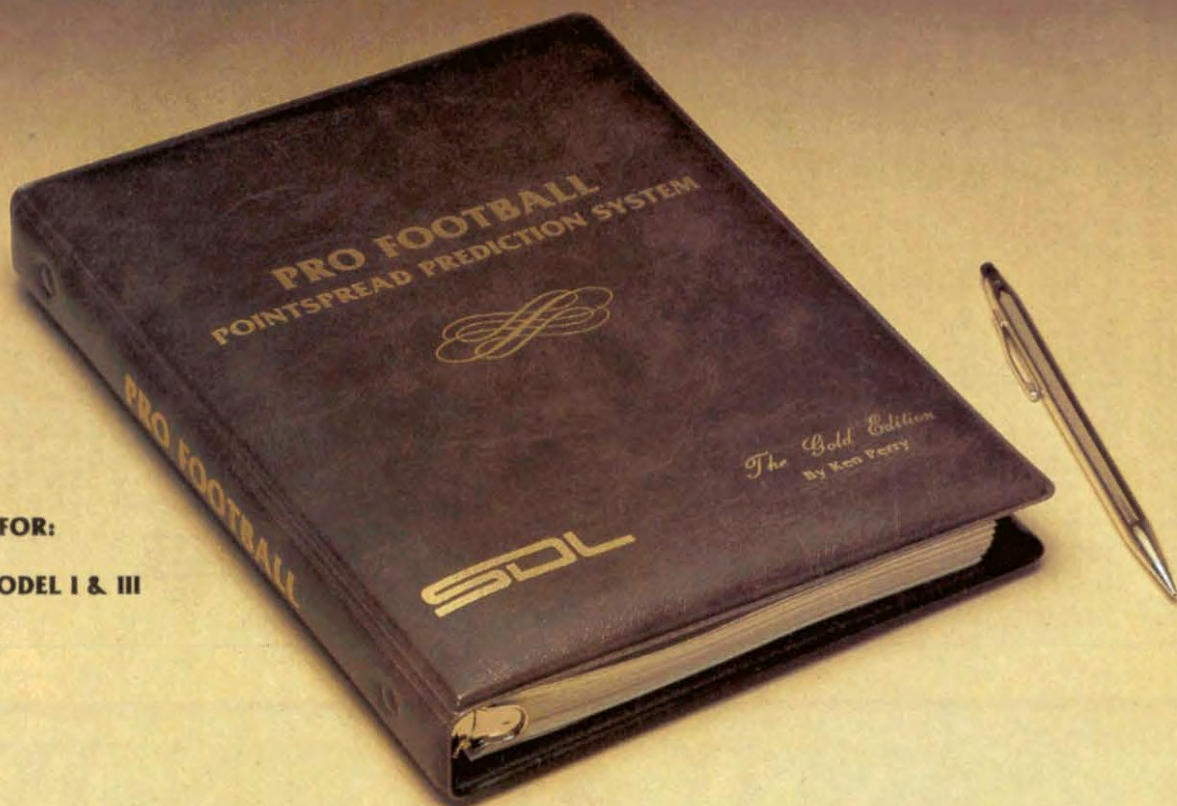
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```

1260 QU(A,2)=VAL(E1$):IF QU(A,2)>=1 THEN QU(A,2)=QU(A,2)/100
1270 IF ER=2 THEN 1020
1280 GOSUB 1350
1290 QU(A,4)=VAL(E1$):IF QU(A,4)>=1 THEN QU(A,4)=QU(A,4)/100
1300 IF ER=2 THEN 1020
1310 QU(A,3)=VAL(E$)
1320 GOTO 1020
1330
1340 'SEPARATE STRING
1350 ER=0:L=LEN(E$)
1360 IF L=0 THEN ER=1:RETURN
1370 X=INSTR(E$, " ")
1380 IF X=0 THEN ER=2:EI$=E$:RETURN
1390 EI$=LEFT$(E$,X-1):E$=RIGHT$(E$,L-X)
1400 RETURN
1410
1420 'SHIFTD SUBROUTINE
1430 GOSUB 1960'-SHIFTC
1440 A=INT(A)+1
1450 FOR X=D TO A STEP -1
1460 VS(X+1)=VS(X)
1470 QU(X+1,1)=QU(X,1)'NOMINAL
1480 QU(X+1,2)=QU(X,2)' + TOL
1490 QU(X+1,4)=QU(X,4)' - TOL
1500 QU(X+1,3)=QU(X,3)' DISTR
1510 NEXTX
1520 D=D+1
1530 RETURN
1540
1550 'DDOWN SUBROUTINE
1560 FOR X=A TO D-1
1570 VS(X)=VS(X+1)
1580 QU(X,1)=QU(X+1,1)
1590 QU(X,2)=QU(X+1,2)
1600 QU(X,4)=QU(X+1,4)
1610 QU(X,3)=QU(X+1,3)
1620 NEXTX
1630 Y=0
1640 GOSUB 2080'-CDOWN
1650 D=D-1
1660 RETURN
1670
1680 CLS'ECON
1690 PRINT" $ NAME", "CONSTANT"
1700 AI=0:X=D+C:FOR A=D+1 TO D+C
1710 PRINTA-D;TAB(5);V$(A),RA(A)
1720 GOSUB2910'SCREEN CHK
1730 NEXTA
1740 AI=C
1750 LJ=C:GOSUB8950:C=LJ
1760
1770 IF A=0 THEN RETURN
1780 IF (A<>INT(A)) AND (C>DV) THEN 1680
1790 Y=INT(A)+1
1800 IF (A<>INT(A)) AND (A<AI) THEN GOSUB 1980:C=C+1'-SHIFT
1810 IF A>AI THEN E$="":A=A+D:GOTO1840'ADD A LINE
1820 A=A+D
1830 E$=V$(A)+" "+STR$(RA(A))
1840 GOSUB 9250'EDIT STRING
1850 GOSUB 1350
1860 IF ER=1 THEN 1900

```

Listing continued

RATE OF RETURN TYPE PROBLEM							
INITIAL VALUES							
PART	NOMINAL VALUE	+TOLERANCE	-TOLERANCE	DISTRIBUTION			
VARCOST	4	.01	.1	5			
VOLUME	10000	.2	.2	0			

STATISTICS								
NUMBER OF TRIALS = 10								
VARIABLE	MEAN	STD.DEV.	HIGH VAL	LOW VAL	MINIMUM	% UNDER	MAXIMUM	% OVER
PROFIT	7997.98	2121.38	10072.4	6442	5000	0	10000	10
RETURN	59.95	17.92	101.44	28.84	25	0	100	10

RANGE	NUMBER	VARIABLE	
5000	0	PROFIT	6442
5500	0	LOWEST VALUE	6442
6000	0	HIGHEST VALUE	10072.4
6500	1	MEAN VALUE	7997.98
7000	2	STD DEVIATION	2121.38
7500	1	NO. OF TRIALS	10
8000	2		
8500	1		
9000	0		
9500	1		
10000	1		
10000	1		

RANGE	NUMBER	VARIABLE	
25	0	RETURN	28.84
32.5	1	LOWEST VALUE	28.84
40	2	HIGHEST VALUE	101.44
47.5	0	MEAN VALUE	59.95
55	2	STD DEVIATION	17.92
62.5	2	NO. OF TRIALS	10
70	0		
77.5	0		
85	0		
92.5	1		
100	1		
100	1		

EQUATIONS USED:

- PRICE - VARCOST * VOLUME = PROFIT
- PROFIT / INVEST - 1 * 100 = RETURN

VARIABLES/CONSTANTS

1	PRICE	4.75
2	INVEST	5000

Figure 17. Rate of return analysis.

the sensitivity data. The printout shows each statistical variable, its nominal value, and worst case values.

Example Problems

Type in the listing (or load the program from Load 80), and save it to disk. You need to access only one file during the course of the program, and you don't need upper memory space. The program runs under any Radio Shack equivalent Disk Basic.

Load the program under file name Monte/BAS. When the program runs, the screen in Fig. 3 should appear. Since you haven't saved any data to disk yet, answer N to the question: Do you want to recall data from the disk (Y/N)? After reading the brief instructions, you can begin to enter data.

The first example is a simple electronic circuit problem (see the schematic in Fig. 15). The component on the far left is a battery, connected in series with a switch and resistor.

When the switch is in position 2 (closed), it lets current flow through the resistor and charge up the capacitor (far right) to the battery voltage according to a formula. How long it takes to achieve a certain voltage depends on

```

1870 V$(A)=E1$
1880 IF ER<>2 THEN RA(A)=VAL(E$)
1890 GOTO1680
1900 Y=A-D
1910 GOSUB 2080'-CDOWN
1920 C=C-1
1930 GOTO1680
1940 '
1950 ' SHIFTC SUBROUTINE
1960 Y=1
1970 GOTO 1990
1980 A=INT(A)+1' SHIFT SUB
1990 A=A-1' INC C ON RETURN
2000 FOR X=D+C TO D+Y STEP -1
2010 V$(X+1)=V$(X)
2020 RA(X+1)=RA(X)
2030 NEXTX
2040 RETURN
2050 '
2060 'CDOWNA SUB
2070 Y=1
2080 FOR X=D+Y TO D+C-1' CDOWN SUB
2090 V$(X)=V$(X+1)
2100 RA(X)=RA(X+1)
2110 NEXTX
2120 RETURN
2130 '
2140 ' ESTAT
2150 CLS
2160 PRINT" # NAME","UPPER","LOWER"
2170 A1=0:X=S:FOR A=1TOS
2180 PRINTA;TAB(5);S$(A),ST(A,7),ST(A,1)
2190 GOSUB2910' SCREEN CHK
2200 NEXTA
2210 A1=S
2220 LI=S:GOSUB8950:S=LI
2230 IF A=0 THEN RETURN
2240 IF (A<>INT(A)) AND (S>=DV) THEN 2150
2250 IF (A<>INT(A)) AND (A<A1) THEN GOSUB 2390:E$="":GOTO2280'-S
HIFTS
2260 IF A>A1 THEN E$="":GOTO2280' ADD A LINE
2270 E$=S$(A)+",""+STR$(ST(A,7))+",""+STR$(ST(A,1))
2280 GOSUB 9250' EDIT STRING
2290 GOSUB 1350
2300 IF ER=1THEN GOSUB2480:GOTO2150'-SDOWN
2310 S$(A)=E1$
2320 IF ER=2THEN2150
2330 GOSUB 1350
2340 ST(A,7)=VAL(E1$)
2350 IF ER=2THEN2150
2360 ST(A,1)=VAL(E$)
2370 GOTO 2150
2380 '
2390 A=INT(A)+1' SUB SHIFTS
2400 FOR X=S TO A STEP -1
2410 S$(X+1)=S$(X)
2420 ST(X+1,7)=ST(X,7)
2430 ST(X+1,1)=ST(X,1)
2440 NEXTX
2450 S=S+1
2460 RETURN
2470 '

```

Listing continued

Listing continued

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Listing continued

```
2480 FOR X=A TO S-1' SDOWN SUB
2490 S$(X)=S$(X+1)
2500 ST(X,7)=ST(X+1,7)
2510 ST(X,1)=ST(X+1,1)
2520 NEXTX
2530 S=S-1
2540 RETURN
2550 '
2560 ' EQUA
2570 CLS
2580 PRINT" #","EQUATION"
2590 A1=0:X=E:FORA=1TOE
2600 PRINTA;TAB(5);L$(A)
2610 GOSUB2910' SCREEN CHK
2620 NEXTA
2630 A1=E
2640 LI=E:GOSUB8950:E=LI
2650 IFA=0 THEN RETURN
2660 IF (A<>INT(A)) AND (E>=DV*2) THEN 2570
2670 IF (A<>INT(A)) AND (A<A1) THEN GOSUB 2760:E$="":GOTO2690'-S
HIFTE
2680 E$=L$(A)
2690 GOSUB9250' EDIT STRING
2700 IF E$="" THEN GOSUB 2830:GOTO2570'-EDOWN
2710 L$(A)=E$
2720 IF RIGHT$(L$(A),1)<>" " THEN L$(A)=L$(A)+" "
2730 GOTO 2570
2740 '
2750 '
2760 A=INT(A)+1' SUB SHIFTE
2770 FOR X=E TO A STEP -1
2780 L$(X+1)=L$(X)
2790 NEXTX
2800 E=E+1
2810 RETURN
2820 '
2830 FOR X=A TO E-1' SUB EDOWN
2840 L$(X)=L$(X+1)
2850 NEXTX
2860 L$(X)=""
2870 E=E-1
2880 RETURN
2890 '
2900 ' Screen Print Check
2910 A1=A1+1:IF A1<>13 OR A=X THEN RETURN
2920 PRINT:GOSUB9120' Pause
2930 A=X-13:PRINT@64,CHR$(31);
2940 RETURN
2950 '
2960 ' START
2970 ' ENTER VARIABLES
2980 PRINT@384,;
2990 PRINT"There are three types of variables allowed in this pr
ogram;"
3000 PRINT
3010 PRINT" 1) DISTRIBUTED - These are varied for each trial dep
ending"
3020 PRINT"
on the entered tolerance."
3030 PRINT" 2) CALCULATED/CONSTANT - These are used for intermed
iate"
3040 PRINT"
```

calculations and to simplify long equations."

```
3050 PRINT" 3) STATISTICAL - These will be tallied for each tria
l and a"
3060 PRINT"
tatistical analysis will be performed after
the"
3070 PRINT"
ast trial."
3080 GOSUB 9120 'WAIT TO CONT
3090 ' ENTER VARIABLE AND EQUATIONS
3100 CLS:PRINT"ENTER THE NUMBER OF DISTRIBUTED VARIABLES ( <"DV+
1" )";:INPUTD
3110 IF D>DV THEN CLS:GOTO3100
3120 IF D=0 THEN CLS:GOTO3300
3130 PRINT:PRINT"Enter the distributed variables in the form -"
3140 PRINT:PRINT" NAME,NOMINAL,+TOL,-TOL,DISTRIBUTION"
3150 PRINT:PRINT"Where - 'NAME' is a string of 8 characters or
less."
3160 PRINT" 'NOMINAL' is the nominal value of the variab
le."
3170 PRINT" 'TOLERANCE' is the per cent variation from n
ominal."
3180 PRINT" 'DISTRIBUTION' is 0 for flat to 5 for narrow
."
3190 FOR A=1TO D
3200 PRINT@768,"ENTER DISTRIBUTED VARIABLE #";A
3210 INPUTV$(A),QU(A,1),QU(A,2),QU(A,4),QU(A,3)
3220 PRINT@768,CHR$(31);
3230 V$(A)=LEFT$(V$(A),8)
3240 IF QU(A,2)>=1THEN QU(A,2)=QU(A,2)/100
3250 IF QU(A,4)>=1 THEN QU(A,4)=QU(A,4)/100
3260 IF QU(A,3)<0 OR QU(A,3)>5 THEN PRINT@960,"DISTRIBUTION MUST
BE BETWEEN 0 AND 5";:GOTO3200
3270 NEXTA
3280 '
3290 GOSUB 9120:CLS 'WAIT TO CONT
3300 PRINT"ENTER THE NUMBER OF CONSTANT OR CALCULATED VARIABLES
( <"DV+1" )";:INPUTC
3310 IF C>DV THEN CLS:GOTO3300
3320 IF C=0 THEN 3460
3330 PRINT:PRINT"Input the constant variable name ( < 9 char. ),
"
3340 PRINT"Followed by its constant value. Enter 0 if it is to"
3350 PRINT"be calculated."
3360 FOR A=D+1 TO D+C
3370 ' * * * * *
3380 '
3390 PRINT@768,CHR$(31);"VARIABLE ";A-D;" NAME,CONSTANT";
3400 INPUT V$(A),RA(A)
3410 NEXTA
3420 GOSUB 9120
3430 GOTO 3460
3440 '
3450 '
3460 CLS:PRINT"ENTER THE NUMBER OF STATISTICAL VARIABLES (<"DV+1
" )";
3470 INPUT S
3480 IF S>DV THEN 3460
3490 IF S=0 THEN CLS:GOTO3590
3500 PRINT
3510 PRINTTAB(30);"STATISTICAL VARIABLES"
```

Listing continued

Listing continued

```

3520 PRINT
3530 PRINT"Input variable in the form: NAME,UPPER LIM,LOWER LIM.
"
3540 FOR A=1 TO 5
3550 PRINT@768,CHR$(30);"VARIABLE ";A;
3560 INPUT SS(A),ST(A,7),ST(A,1)
3570 NEXTA
3580 GOSUB9120:CLS
3590 PRINT"ENTER THE NUMBER OF EQUATIONS";
3600 INPUT E
3610 IF E>2*DV THEN CLS:GOTO3590
3620 IF E=0 THEN 3830
3630 '
3640 CLS
3650 PRINT"Enter the equations in the form:"
3660 PRINT"      VAR OPER VAR OPER VAR = VAR COMMENT"
3670 PRINT"Where VAR is a previously defined variable followed b
y a space"
3680 PRINT"and OPER consists of one of the following math operat
ors:"
3690 PRINTTAB(22);"+ - / * ["
3700 PRINT"or one of the following trig operators:"
3710 PRINTTAB(20);"LOG SIN COS TAN INT"
3720 PRINT"The functions are in radians and the LOG is natural.
Each"
3730 PRINT"operator must be followed by a space. The expression
is"
3740 PRINT"evaluated from the left to the right. The COMMENT is
ignored."
3750 PRINT"A null equation (for comment purposes) may be enterd
by"
3760 PRINT"starting a line with a ' > ' followed by a space."
3770 FOR X=1 TO E
3780 PRINT@896,CHR$(30);"EQUATION ";X;
3790 INPUT LS(X)
3800 LS(X)=LS(X)+" "
3810 NEXTX
3820 GOSUB9120:CLS
3830 INPUT "ENTER THE NUMBER OF TRIALS";NU
3840 IF NU=0 THEN 850 ' EDIT
3850 PRINT@724,"MONTE CARLO ANALYSIS";
3860 PRINT@960,"TRIAL # 1";
3870 'STATISTICS INITIALIZATION
3880 FOR A=1TOS
3890 ST(A,2)=0' # BELOW LOWER LIM
3900 ST(A,3)=-1E9' HIGHEST
3910 ST(A,4)=1E9' LOWEST
3920 ST(A,5)=0' SUM
3930 ST(A,6)=0' SUM OF SQUARES
3940 ST(A,8)=0' # ABOVE UPPER LIM
3950 SM(A,0)=-1E9:SM(A,13)=1E9
3960 FORX=1TOL3
3970 SP(A,X)=0
3980 NEXTX
3990 SM(A,1)=ST(A,1):SM(A,12)=ST(A,7)' SET UP RANGE
4000 Z=(ST(A,7)-ST(A,1))/10
4010 FORY=2TOLL
4020 SM(A,Y)=SM(A,Y-1)+Z
4030 NEXTY
4040 NEXTA
4050 '
4060 FOR TR=1 TO NU

```

```

4070 GOSUB8500' RANDOMIZE SUB
4080 '
4090 GOSUB 4140' CALC VARIABLES
4100 IF ER THEN GOTO850' EDIT
4110 GOTO4490
4120 '
4130 'CALCULATE REMAINING VAR
4140 FOR A=1TOE
4150 PRINT@960,CHR$(30);"TRIAL # ";TR;TAB(15);"EQUATION # ";A;
4160 LS=LS(A)
4170 PR$="+ "
4180 AN=0
4190 ' MAINLOOP
4200 GOSUB5740' GETVAR
4210 IF ER=0 THEN 4260
4220 IF ER=2 AND PR$="" THEN 4260
4230 IF ER=2 THEN 4440' IGNORE COMMENT
4240 '
4250 GOSUB 6580:RETURN' ERROR
4260 GOSUB 7010' CALC
4270 IF ER=0 THEN 4300
4280 '
4290 GOSUB 6580:RETURN
4300 IF DE=0 THEN 4330
4310 PRINT"ANS=";AN
4320 PRINT"VPRES=";VP
4330 IF D0 THEN 4370' CHCK FOR DONE
4340 PR$=OP$
4350 GOTO 4200
4360 ' MAINDONE
4370 IF D3=0 THEN 4440
4380 PRINT"FINAL VALUE OF ";
4390 IF ST=0 THEN 4420
4400 PRINTS$(IN);" IS ";VA(IN)
4410 GOTO4430
4420 PRINTVS$(IN);" IS ";RA(IN)
4430 GOSUB 6580
4440 NEXT A
4450 RETURN
4460 '
4470 ' DO STATISTICS
4480 '
4490 GOSUB 8720' STAT
4500 '
4510 NEXT TR
4520 GOSUB 8860' CLEANUP
4530 '
4540 ' PRN
4550 PRINT@896,CHR$(31);" Do you want a hard copy ( Y/N )?";
4560 GOSUB 9060
4570 IF A$="Y" THEN PR=1 ELSE PR=0
4580 INPUT"Enter a comment line";CS
4590 CLS:IF PR THEN LPRINT CHR$(27);CHR$(14)' DOUBLE WIDTH
4600 L=LEN(CS)
4610 PRINTTAB((64-L)/2);CS' CENTER TITLE
4620 IF PR THEN LPRINT TAB((64-L)/2);C$
4630 PRINTTAB(25);"INITIAL VALUES"
4640 IF PR THEN LPRINTTAB(25);"INITIAL VALUES"
4650 PRINT
4660 IF PR THEN LPRINT" "
4670 PRINT"PART";TAB(15);"NOMINAL VALUE";TAB(33);"+TOLERANCE";TA

```

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B(45); "-TOLERANCE";TAB(56);"DISTRIB"
4680 IF PR THEN LPRINT"PART";TAB(15);"NOMINAL VALUE";TAB(30);"+T
OLERANCE";TAB(42);"-TOLERANCE";TAB(54);"DISTRIBUTION"
4690 PRINT STRING$(63,"-"): IF PR=1 THEN LPRINT STRING$(66,"-")
4700 FOR X=1TOD
4710 PRINTV$(X);TAB(18);QU(X,1);TAB(36);QU(X,2);TAB(48);QU(X,4);
TAB(59);QU(X,3)
4720 IF PR THEN LPRINTV$(X);TAB(18);QU(X,1);TAB(33);QU(X,2);TAB(
45);QU(X,4);TAB(58);QU(X,3)
4730 NEXTX
4740 IF PR=0 THEN GOSUB 6580:CLS
4750 IF PR THEN LPRINT" "
4760 PRINTTAB(25);"STATISTICS"
4770 IF PR THEN LPRINTTAB(25);"STATISTICS"
4780 PRINT
4790 IF PR THEN LPRINT" "
4800 PRINT"NUMBER OF TRIALS = ";NU
4810 IF PR THEN LPRINT"NUMBER OF TRIALS = ";NU
4820 '
4830 PRINT
4840 IF PR THEN LPRINT" "
4850 PRINT"VARIABLE";TAB(11);"MEAN";TAB(19);"STD.DEV.";TAB(30);"
HIGH VAL";TAB(40);"LOW VAL";TAB(50);"%UNDR";TAB(58);"%OVR"
4860 IF PR THEN LPRINT"VARIABLE";TAB(10);"MEAN";TAB(18);"STD.DEV
.";TAB(27);"HIGH VAL";TAB(36);"LOW VAL";TAB(45);"MINIMUM";TAB(54
);"% UNDER";FNB(63);"MAXIMUM";
4870 IF PR THEN LPRINT FNB(72);"% OVER"
4880 PRINT STRING$(63,"-"): IF PR=1 THEN LPRINT STRING$(80,"-")
4890 FOR X=1 TO S
4900 ST(X,2)=ST(X,2)/NU*100
4910 ST(X,8)=ST(X,8)/NU*100
4920 PRINTS$(X);TAB(11);ME(X);TAB(19);SI(X);TAB(30);ST(X,3);TAB(
40);ST(X,4);TAB(50);;ST(X,2);TAB(58);ST(X,8)
4930 IF PR THEN LPRINTS$(X);TAB(9);ME(X);TAB(18);SI(X);TAB(27);S
T(X,3);TAB(36);ST(X,4);TAB(45);ST(X,1);TAB(54);ST(X,2);FNB(63);S
T(X,7);FNB(72);ST(X,8)
4940 NEXTX
4950 IF PR=0 THEN GOSUB 6580
4960 PRINT@960,CHR$(30);"Do you want a graphic output (Y/N)";
4970 GOSUB9060:IF A$<>"Y"THEN CLS:GOTO5320
4980 '
4990 CLS'GRAPHIC STATISTICAL OUTPUT
5000 FORX=1TOS:PRINT:PRINT"RANGE"TAB(10)"NUMBER"TAB(17)"!....!..
...!";
5010 IF PR=1 THEN LPRINT" " ;LPRINT"RANGE"TAB(10)"NUMBER"TAB(17)
"!....!....!";
5020 L=0;FORZ=1TOL2:IFSP(X,Z)>L THEN L=SP(X,Z)
5030 NEXTZ:Z=L/15:L=L/NU*100:PRINTUSING"###";L;PRINT"!":IF PR=1
THEN LPRINTUSING"###";L; LPRINT"! "
5040 FORY=1TOL2:PRINTSM(X,Y);TAB(10);SP(X,Y);TAB(17);"!";
5050 IF PR=1 THEN LPRINTSM(X,Y);TAB(10);SP(X,Y);TAB(17);"!";
5060 PRINTSTRING$(SP(X,Y)/Z+.5,"*");
5070 IF PR=1 THEN LPRINTSTRING$(SP(X,Y)/Z+.5,"*");
5080 ONYGOSUB5130,5150,5170,5190,5210,5230,5250,5250,5250,5250,5
250,5250
5090 NEXTY
5100 PRINTTAB(17)"!....!....!....!"
5110 IF PR=1 THEN LPRINTTAB(17)"!....!....!....!"
5120 GOTO5270
5130 PRINTTAB(38)"VARIABLE"TAB(52);S$(X)
5140 IF PR=1 THEN LPRINTTAB(38)"VARIABLE"TAB(52);S$(X)

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5145 RETURN
5150 PRINTTAB(38)"LOWEST VALUE"TAB(52);ST(X,4)
5160 IF PR=1 THEN LPRINTTAB(38)"LOWEST VALUE"TAB(52);ST(X,4)
5165 RETURN
5170 PRINTTAB(38)"HIGHEST VALUE"TAB(52);ST(X,3)
5180 IF PR=1 THEN LPRINTTAB(38)"HIGHEST VALUE"TAB(52);ST(X,3)
5185 RETURN
5190 PRINTTAB(38)"MEAN VALUE"TAB(52);ME(X)
5200 IF PR=1 THEN LPRINTTAB(38)"MEAN VALUE"TAB(52);ME(X)
5205 RETURN
5210 PRINTTAB(38)"STD DEVIATION"TAB(52);SI(X)
5220 IF PR=1 THEN LPRINTTAB(38)"STD DEVIATION"TAB(52);SI(X)
5225 RETURN
5230 PRINTTAB(38)"NO. OF TRIALS"TAB(52);NU
5240 IF PR=1 THEN LPRINTTAB(38)"NO. OF TRIALS"TAB(52);NU
5245 RETURN
5250 PRINT:IF PR=1 THEN LPRINT" "
5260 RETURN
5270 IF PR=0 THEN GOSUB6580
5280 NEXTX
5290 '
5300 '-----
5310 '
5320 PRINT:PRINTTAB(20);"EQUATIONS USED:"
5330 IF PR THEN LPRINT" ";LPRINTTAB(20);"EQUATIONS USED:"
5340 PRINT:IF PR=1 THEN LPRINT" "
5350 FOR X=1 TO E
5360 PRINTX;TAB(5);L$(X)
5370 IF PR THEN LPRINTX;TAB(3);L$(X)
5380 NEXTX
5390 PRINT
5400 IF PR THEN LPRINT" "
5410 '
5420 PRINTTAB(5)"VARIABLES/CONSTANTS"
5430 IF PR THEN LPRINT TAB(20)"VARIABLES/CONSTANTS"
5440 PRINT:IF PR=1 THEN LPRINT" "
5450 FOR X=1 TO C
5460 PRINTX;TAB(5);V$(X+D);TAB(16);RA(X+D)
5470 IF PR THEN LPRINT X;TAB(5);V$(X+D);TAB(16);RA(X+D)
5480 NEXTX
5490 PRINT:IF PR THEN LPRINT" "
5500 '
5510 PRINT@896,CHR$(31);"Do you want another run ( Y/N )?";
5520 GOSUB 9060
5530 IFA$="Y" THEN850
5540 PRINT@896,CHR$(31);"Do you want to save to disk ( Y/N )?";
5550 GOSUB 9060
5560 IF A$<>"Y" THEN 5710
5570 IF F$="" THEN INPUT "FILENAME";F$: GOTO 5590
5580 PRINT"Enter the filename if different from ";LEFT$(F$,LEN(F
$)-4);:INPUT F$
5590 IF INSTR(F$,"/")>0 THEN 5600 ELSE F$=LEFT$(F$,8)+"/UTA"
5600 OPEN "O",1,F$
5610 IF ER<>1 THEN 5640
5620 '
5630 GOTO5600
5640 IF ER=0 THEN 5670
5650 CLS
5660 INPUT"Enter the filename";F$:GOTO5590
5670 RE=0
5680 GOSUB650
5690 CLS

```

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5700 PRINT"FILE SAVED"
5710 CLOSE:END
5720 '
5730 ' SUBROUTINE TO GET A VALUE FROM L$
5740 ER=0
5750 IF DE=0 THEN 5770
5760 PRINT"GETVAR SUB":PRINT
5770 GOSUB 6420
5780 IF ER=0 THEN 5840' CONT1
5790 IF ER=2 THEN RETURN' IGNORE COMMENT
5800 PRINT@896,CHR$(30);"NO SPACE FOUND AFTER VARIABLE (" ;LEFT$(
L$,10);") IN EQUATION ";A;
5810 RETURN
5820 '
5830 ' CHECK FOR RESERVED TRIG FUNCTIONS
5840 OP=0' CONT1
5850 FOR X=1 TO 5
5860 IF T0$=FU$(X) THEN OP=X
5870 NEXTX
5880 IF OP=0 THEN 6100' CONT2
5890 IF D1 THEN PRINT"TRIG FUNCTION ENTERED":PRINT
5900 GOSUB 6420' GETOKEN
5910 IF ER THEN 5800' SPACE ERROR
5920 GOSUB 6660' EVAL
5930 IF ER THEN RETURN
5940 ON OP GOTO 5960,5980,6000,6020,6030
5950 ' LOG
5960 T0=LOG(T0):GOTO6040
5970 ' SINE
5980 T0=SIN(T0):GOTO6040
5990 ' COSINE
6000 T0=COS(T0):GOTO6040
6010 ' TANGENT
6020 T0=TAN(T0):GOTO6040
6030 T0=INT(T0)
6040 IF D1=0 THEN 6200
6050 PRINT"FUNCTION=";FU$(OP)
6060 PRINT"ANSWER=";T0:PRINT
6070 GOSUB 6570' DISP
6080 GOTO 6200
6090 '
6100 'CONT2 - CHECK FOR CONSTANT
6110 X=ASC(LEFT$(T0$,1)):IF X<48 OR X>57 THEN 6180
6120 T0=VAL(T0$)
6130 IF D1=0 THEN 6200
6140 PRINT"CONSTANT VAL=";T0:PRINT
6150 GOSUB 6570' DISP
6160 GOTO 6200
6170 '
6180 GOSUB 6660' EVAL
6190 IF ER THEN RETURN
6200 VP=T0
6210 IF DE=0 THEN 6240
6220 PRINT"VPRS=";VP
6230 GOSUB 6580
6240 GOSUB 6410
6250 IF ER=2 THEN RETURN' COMMENT
6260 IF SP THEN 6290
6270 ER=0
6280 RETURN
6290 IF ER THEN 5800

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```

6300 'CHECK FOR PROPER MATH OPERATOR
6310 OP=0
6320 FORX=1TO6
6330 IF T0$=MA$(X) THEN OP=X
6340 NEXTX
6350 IF OP=0 THEN 7120' ERROR
6360 OP$=T0$
6370 RETURN
6380 '
6390 ' SUBROUTINE TO GET ONE VAR FROM LINE
6400 '
6410 'GETOKEN SUBROUTINE
6420 ER=0
6430 IF DE=0 THEN 6450
6440 PRINT"GETOKEN SUB":PRINT
6450 T0$=""
6460 SP=INSTR(L$," ")
6470 IF (SP>9) OR (SP=0) THEN ER=1
6480 IF ER=1 THEN RETURN
6490 L=LEN(L$)
6500 T0$=LEFT$(L$,SP-1)
6510 L$=RIGHT$(L$,L-SP)
6520 IF T0$=">" THEN ER=2' COMMENT
6530 IF DE=0 THEN 6560
6540 PRINT"T0$:";T0$;" L$:";L$:PRINT
6550 GOSUB 6580' DISP
6560 RETURN
6570 '
6580 PRINT
6590 PRINT"PRESS 'ENTER' TO CONTINUE";' SCREEN WAIT SUB
6600 INPUTA$
6610 RETURN
6620 '
6630 ' SUBROUTINE TO EVALUATE VARIABLES (EVAL)
6640 '
6650 '
6660 ER=0
6670 IF D1=0 THEN 6690
6680 PRINT"EVAL SUB":PRINT
6690 ST=0
6700 IN=0
6710 FOR X=1 TO C+D
6720 IF V$(X)=T0$ THEN IN=X
6730 NEXTX
6740 IF IN=0 THEN 6820' EVALS
6750 T0=RA(IN)
6760 IF D1=0 THEN 6800
6770 PRINT"TOKEN VALUE =" ;T0
6780 PRINT"INDEX =" ;IN;" RAND VALUES =" ;RA(IN)
6790 GOSUB 6580' DISP
6800 RETURN
6810 '
6820 FOR X=1 TO S' EVALS
6830 IF S$(X)=T0$ THEN IN=X
6840 NEXTX
6850 IF IN THEN 6910
6860 'BEEP
6870 PRINT@896,T0$;" IS AN UNDEFINED SYMBOL IN EQUATION ";A;
6880 ER=1
6890 RETURN
6900 '
6910 ST=1

```

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Listing continued

```

6920 T0=VA(IN)
6930 IF D1=0 THEN 6970
6940 PRINT"STAT TOKEN =" ;S$(IN)
6950 PRINT"TOKEN VALUE =" ;T0
6960 GOSUB 6580 : DISP
6970 RETURN
6980 :
6990 : SUBROUTINE TO CALCULATE VARIABLES
7000 :
7010 : CALC
7020 ER=0
7030 IF D1=0 THEN 7060
7040 PRINT"CALC SUB":PRINT
7050 PRINT"PREVIOUS OPERATOR =" ;PR$
7060 D0=0
7070 OP=0
7080 FOR X=1 TO 6
7090 IF PR$=MAS(X) THEN OP=X
7100 NEXTX
7110 IF OP>0 THEN 7170
7120 ER=1
7130 BEEP
7140 PRINT@996,"ILLEGAL OPERATOR (";T0$;" ) IN EQUATION ";A;
7150 RETURN
7160 :
7170 ON OP GOTO 7210,7250,7290,7330,7370,7410
EXP,MULT, DIV, ADD, SUB, EQUAL
7180 :
7190 : EXPONENTIATION
7200 AN=AN|VP
7210 AN=AN|VP
7220 RETURN
7230 :
7240 : MULTIPLICATION
7250 AN=AN*VP
7260 RETURN
7270 :
7280 : DIVISION
7290 AN=AN/VP
7300 RETURN
7310 :
7320 : ADDITION
7330 AN=AN+VP
7340 RETURN
7350 :
7360 : SUBTRACTION
7370 AN=AN-VP
7380 RETURN
7390 :
7400 : EQUALS
7410 D0=1
7420 IF ST=0 THEN RA(IN)=AN
7430 IF ST THEN VA(IN)=AN
7440 RETURN
7450 :
7460 :*****
7470 : SENSITIVITY ANALYSIS
7480 :*****
7490 :
7500 PRINT@724,"SENSITIVITY ANALYSIS";
7510 FOR X=1TOD' SET DIST VAR TO NOMINAL
7520 RA(X)=QU(X,1) : NEXTX

```

Listing continued

Continued from p. 93

two variables, size of the resistor and size of the capacitor, assuming a constant battery voltage.

First consider the problem's components. The battery produces a constant voltage of 9.0 volts. The resistor is 10,000 ohms and has a manufacturing tolerance of plus or minus 10 percent. The capacitor is .22 microFarads, which you can express as .22 times 10 to the minus six (.22E - 6) Farads and has a tolerance of +50 and -20 percent. The switch does not enter into the calculations.

In defining the variables, use the following set-up:

```

CONSTANTS: BATT,9           (Battery)
DISTRIBUTED: RES, 10000, 10, (Resistor)
              10, 3
              CAP, .22E - 6, 50, (Capacitor)
              20, 2

```

To find how long it takes the capacitor

to charge up to a specific voltage, use the following formula:

$$T_c = - \ln \left(1 - \frac{\text{Output } V}{\text{Applied } V} \right) \times R \times C$$

In this equation, the charge time (Tc) equals the negative of the natural log of the quantity in parentheses, times the resistor value (R) and times the capacitor value (C). Due to the program's limited mathematical evaluation power (it cannot use parentheses), you must break the equation above into several equations to input.

Call the output time (Tc) TIME and define it as a statistical variable, since it's the value with which you're ultimately concerned. The equation would appear as in Table 2.

The first equation evaluates the division within the parentheses. The second equation completes the rest of the calculation within the parentheses, and the

last equation finishes the remainder of the original equation.

Notice that you have to create two intermediate calculated variables to simplify the equation (Ratio and CVolt). You must define these in the variable section before using them in an equation.

Note also the way you create the negative of the log function by subtracting it from zero. The program would flag a negative sign by itself as an error.

Now enter into the computer all the variables and equations as previously defined. You have four constant/calculated variables, two distributed variables, one statistical variable, and three equations. Return to the main menu and enter the edit mode by pressing keys one through four.

To run the Monte Carlo analysis, press the enter key. The program asks for the number of trials; enter 50 to begin. As the program executes, the trial number and the equation the computer is currently calculating appear at the bottom of the screen.

When it completes the analysis, the program asks if you want a printout. If you have an attached printer, you can answer yes. Your printout will be similar to Fig. 16.

The first printout line is the title you

NO SPACE FOUND AFTER VARIABLE name IN EQUATION x
name IS AN UNDEFINED SYMBOL IN EQUATION x
ILLEGAL OPERATOR name IN EQUATION x

Table 1. Error messages in Monte Carlo analysis.

Listing continued

```

7530 TR=0:GOSUB 4130: CALC VAR
7540 IF ER THEN850
7550 FOR X=1 TO S: STORE IN MATRIX
7560 NO(X)=VA(X)
7570 NEXTX
7580 FOR X1=1 TO D
7590 RA(X1)=QU(X1,1)*(1+QU(X1,2)) + TOL
7600 TR=X1
7610 GOSUB4130:IF ER THEN 850: CALC
7620 FORB=1 TO S: STORE IN MAT
7630 SP(X,X1)=VA(X)
7640 NEXTX
7650 RA(X1)=QU(X1,1)*(1-QU(X1,4)) - TOL
7660 TR=X1:GOSUB 4130:IF ER THEN 850
7670 FORK=1 TO S:SM(X,X1)=VA(X):NEXTX
7680 RA(X1)=QU(X1,1): RES TO NOM
7690 NEXTX
7700 '
7710 'CALC SENS & OUTPUT
7720 '
7730 PRINT@960,CHR$(30); "Do you want hard copy (Y/N)";
7740 GOSUB9060:IF A$="Y" THEN PR=1 ELSE PR=0
7750 PRINTTAB(27); "SENSITIVITY ANALYSIS"
7760 IF PR=1 THEN LPRINTCHR$(27);CHR$(14);TAB(10); "SENSITIVITY A
NALYSIS"
7770 FOR X=1TOS
7780 PRINT:PRINT"STATISTICAL VARIABLE = ";$$$(X);TAB(31); "NOMINAL
VALUE = ";NO(X)
7790 IF PR=1 THEN LPRINT "LPRINT"STATISTICAL VARIABLE = ";$$$(X
);TAB(43); "NOMINAL VALUE = ";NO(X)
7800 PRINTTAB(9);"TAB(14)"PLUS TOLERANCE"TAB(36);"TAB(41)"MINU
S TOLERANCE"
7810 IF PR=1 THEN LPRINTTAB(9)"-- -- -- -- PLUS TOLERANCE -- -- --
-- -- -- -- MINUS TOLERANCE -- -- -- --"
7820 PRINT"DIST VAR I STAT-VAL REL-SEN ACT-SEN I STAT-VAL REL-SE
N ACT-SEN"
7830 IF PR=1 THEN LPRINT "DISTRIB STATISTICAL RELATIVE ACTUA
L STATISTICAL RELATIVE ACTUAL"
7840 IF PR=1 THEN LPRINT "VARIABLE VALUE SENSITIVITY SENSI
TIVITY VALUE SENSITIVITY SENSITIVITY"
7850 PRINTSTRINGS(63,"-");IF PR=1 THEN LPRINT STRINGS(80,"-")
7860 MP=(1+QU(X1,2))*QU(X1,1)
7870 MM=(1-QU(X1,4))*QU(X1,1)
7880 MM=(1+QU(X1,4))*QU(X1,1)
7890 ' ACTUAL SENSITIVITY CALC
7900 SP=(SP(X,X1)-NO(X))/NO(X)*100: ACTUAL + IN %
7910 SM=(SM(X,X1)-NO(X))/NO(X)*100: ACTUAL - IN %
7920 RP=SP/QU(X1,2)/100: RELATIVE +
7930 RM=SM/QU(X1,4)/100: RELATIVE -
7940 '
7950 US="####.##":UL$="###.###"
7960 PRINTV$(X1);TAB(11);
7970 IF PR=1 THEN LPRINTV$(X1);TAB(8);
7980 PRINTUSING$;SP(X,X1);:PRINTTAB(20);
7990 IF PR=1 THEN LPRINT SP(X,X1);
8000 PRINTUSINGUL$;RP;:PRINTTAB(28);
8010 IF PR=1 THEN LPRINTTAB(20);:LPRINT RP;
8020 PRINTUSINGUL$;SP;:PRINTTAB(38);
8030 IF PR=1 THEN LPRINTTAB(32);:LPRINT SP;
8040 PRINTUSING$;SM(X,X1);:PRINTTAB(47);
    
```

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```

8050 IF PR=1 THEN LPRINTTAB(44);LPRINT SM(X,X1);
8060 PRINTUSINGUL$;RM;PRINTTAB(55);
8070 IF PR=1 THEN LPRINT TAB(56); RM;
8080 PRINTUSINGUL$;SM;IF PR=1 THEN LPRINT FNB(68); SM
8090 NEXTX1
8100 IF PR=0 THEN GOSUB 6580
8110 NEXTX
8120 ' WORST CASE ANALYSIS
8130 PRINT@960,CHR$(30);"POSITIVE WORST CASE"
8140 FORX=1TOS
8150 FORX=1TOD
8160 SP=(SP(Y,X)-NO(Y))/NO(Y)*100
8170 SM=(SM(Y,X)-NO(Y))/NO(Y)*100
8180 IF (SP>SM) THEN RA(X)=QU(X,1)*(1+QU(X,2)) ELSE RA(X)=QU(X,1)
      *(1-QU(X,4))
8190 IF D3 THEN PRINTX;RA(X);,;
8200 NEXTX;IF D3 THEN PRINT
8210 TR=X;GOSUB4130;IF ER THEN850' CALC
8220 SP(Y,0)=VA(Y);NEXTY
8230 PRINT@960,CHR$(30);"NEGATIVE WORST CASE"
8240 FORX=1TOS
8250 FOR X=1TOD
8260 SP=(SP(Y,X)-NO(Y))/NO(Y)*100
8270 SM=(SM(Y,X)-NO(Y))/NO(Y)*100
8280 IF (SP>SM) THEN RA(X)=QU(X,1)*(1-QU(X,4)) ELSE RA(X)=QU(X,1)
      *(1+QU(X,2))
8290 IF D3 THEN PRINTX;RA(X);,;
8300 NEXTX;IF D3 THEN PRINT
8310 TR=-Y;GOSUB4130;IF ER THEN850' CALC
8320 SM(Y,0)=VA(Y);NEXTY
8330 '
8340 PRINT:PRINT"STAT"TAB(16)"NOMINAL"TAB(34)"-- -- WOR
ST CASE
8350 IF PR THEN LPRINT" ":LPRINT" ":LPRINT"STAT"TAB(16)"NOMINA
L"TAB(34)"-- -- WORST CASE
8360 PRINT"VARIABLE"TAB(17)"VALUE"TAB(34)"POSITIVE"TAB(52)"NEGAT
IVE"
8370 IF PR THEN LPRINT"VARIABLE"TAB(17)"VALUE"TAB(34)"POSITIVE"TAB
AB(52)"NEGATIVE"
8380 PRINT STRING$(63,"-"); IF PR=1 THEN PRINT STRING$(64,"-")
8390 FOR X=1TOS
8400 PRINTSS(X);TAB(16);NO(X);TAB(33);SP(X,0);TAB(51);SM(X,0)
8410 IF PR THENLPRINTSS(X);TAB(16);NO(X);TAB(34);SP(X,0);TAB(52)
;SM(X,0)
8420 NEXTX
8430 IF PR=0 THEN GOSUB6580;CLS' PAUSE
8440 IF PR=1 THEN LPRINT" "
8450 RETURN
8460 '
8470 ' SUBROUTINES
8480 '
8490 'RANDOMIZE SUB
8500 IF DE THEN PRINT"RANDOM SUB"
8510 FOR I=1 TO D
8520 DI=QU(I,3)
8530 GOSUB 8620' GET DIST
8540 IF R >=0 THEN SU=4' MINUS TOLERANCE
8550 IF R <0 THEN SU=2' PLUS TOLERANCE
8560 RA(I)=QU(I,1)*(1-R*QU(I,SU))
8570 IF DE THEN PRINT I,"RAND VALUE =" ;RA(I)
8580 NEXTI

```

assign when the program asks for a comment line prior to the Monte Carlo analysis display. Next the program lists the initial values of the distributed variables. The plus and minus tolerances are in decimal form.

The next section shows the actual statistical analysis. The number of trials run appears, followed by a summary of each statistical variable. The mean is the arithmetic average of all the trials run.

The Std. Dev. is the standard deviation of the mean, the measure of how close each value is to the calculated mean. The smaller this number, the more closely the values group around the mean.

The high value and low value in the sample are records of the highest and

lowest values the program calculated for that variable over all the trials. This gives you an idea of the range of values. As the number of trials increases, these numbers approach the worst case values calculated in the sensitivity analysis.

The minimum is the lower limit you set when you enter the statistical variable. The percent under is the percent of values that fell below the limit during calculation of this variable. The maximum and percent over are the upper limits and percent over that limit respectively.

The sample printout also shows a graphical representation of the statistical section. The program automatically calculates the range using the minimum and maximum limits.

The number right of the range shows the number of values less than or equal to that range but greater than the previous range. When you total them, these numbers should equal the number of trials run.

Following the graphical sample is a list of equations used in the calculations. Last is a list of constant or calculated variables.

Note that the numbers after Ratio and CVolt are not the numbers you initially entered because they're calculated variables. They appear on the right side of an equation. The number you see is the one the program calculated for this variable on the last trial run. This number might change, depending on other variables in the equation.

This information indicates that you have a large distribution of values over the entire range in question. Five percent is under your minimum limit, and 15 percent is over the maximum.

The lowest value recorded was $7E-04$ or .0007 and the highest number recorded was $1.3E-03$ or .0013—not that far from the limits of .0003 to .0010. A small change in the tolerance of your parts should get you in range.

A sensitivity analysis would reveal which of the two components affects

CONSTANT/CALCATED:	BATT,9	(Battery voltage)
	VOLT, 3	(Output voltage)
	RATIO, 0	(Intermediate)
	CVOLT, 0	(Intermediate)
DISTRIBUTED:	RES, 10000, 10, 10, 3	(Resistor)
	CAP, .22E-6, 50, 20, 2	(Capacitor)
STATISTICAL:	TIME, .8E-3, 1E-3	
EQUATIONS:	VOLT / BATT = RATIO	Output/Applied
	1 - RATIO = CVOLT	Parenthesis eval
	0 - LOG CVOLT * RES * CAP = TIME	

Table 2. Equations for electronic circuit problem.

Listing continued

```

8590 RETURN
8600 '
8610 '
8620 'GET DISTRIBUTION SUB
8630 SU=0
8640 IF DI=0 THEN R=1-2*RND(0):RETURN
8650 FOR T%=1 TO DI
8660 SU=SU+1-2*RND(0)
8670 NEXTT%
8680 R=SU/DI
8690 RETURN
8700 '
8710 '
8720 ' STAT SUB
8730 FOR N=1 TO S
8740 IF VA(N)<ST(N,1) THEN ST(N,2)=ST(N,2)+1
8750 IF VA(N)>ST(N,3) THEN ST(N,3)=VA(N)
8760 IF VA(N)<ST(N,4) THEN ST(N,4)=VA(N)
8770 ST(N,5)=ST(N,5)+VA(N)' SUM
8780 ST(N,6)=ST(N,6)+VA(N)[2' SUM OF SQUARES
8790 IF VA(N)>ST(N,7) THEN ST(N,8)=ST(N,8)+1
8800 FORX=1TO13
8810 IF VA(N)<SM(N,X) AND VA(N)>=SM(N,X-1) THEN SP(N,X)=SP(N,X)+
1
8820 NEXTX:SP(N,12)=SP(N,13)
8830 NEXTN
8840 RETURN
8850 '
8860 ' CLEANUP SUB
8870 FOR X=1 TO S
8880 SI(X)=ABS(ST(X,6)/NU-ME(X)[2]: IF SI(X) > -1 AND SI(X) < 1
THEN SI(X)=INT(SQR(SI(X))*10000)/10000 ELSE SI(X)=INT(SQR(SI(X))
*100)/100' STD DEV
8890 IF ST(X,5)/NU > -1 AND ST(X,5) < 1 THEN ME(X)=INT(ST(X,5)/N
U*10000)/10000 ELSE ME(X)=INT(ST(X,5)/NU*100)/100' MEAN
8900 IF ST(X,3) > -1 AND ST(X,3) < 1 THEN ST(X,3)=INT(ST(X,3)*10
000)/10000 ELSE ST(X,3)=INT(ST(X,3)*100)/100
8910 IF ST(X,4) > -1 AND ST(X,4) < 1 THEN ST(X,4)=INT(ST(X,4)*10
000)/10000 ELSE ST(X,4)=INT(ST(X,4)*100)/100
8920 NEXTX
8930 RETURN
8940 '
8950 ' INUM SUB
8960 A=0
8970 PRINT@960,CHR$(30);"INSERT LINE=Fraction - DELETE LINE=Null
- ABORT EDIT='ENTER'";
8980 PRINT@896,CHR$(30);:INPUT"Enter the number of the line to E
dit/Delete";A
8990 IF A>DV THEN 8960
9000 IF A>LI+1 THEN 8960
9010 IF A<=LI THEN 9030
9020 A=LI+1:LI=A
9030 RETURN
9040 '
9050 'SUBROUTINE TO INPUT Y/N RESPONSE
9060 A$=INKEY$:IF A$="" THEN 9060
9070 IF A$="Y" OR A$="y" THEN A$="Y":GOTO9100
9080 IF A$="N" OR A$="n" THEN A$="N":GOTO9100
9090 GOTO 9060
9100 PRINT@896,CHR$(30);:RETURN
9110 '-----

```

Listing continued

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```

9120 PRINT@960,"PRESS ANY KEY TO CONTINUE.";
9130 A$=INKEY$:IFA$=""THEN9130 ELSE RETURN
9140 ;
9150 'SUBROUTINE TO EDIT A STRING
9160 'RIGHT ARROW' MOVES CURSER RIGHT
9170 'LEFT ARROW' MOVES CURSER LEFT
9180 'UP ARROW' ENTERS/CANCELS INSERT MODE
9190 'DOWN ARROW' DELETES CHARACTER
9200 'CLEAR KEY' CLEARS LINE/STRING
9210 'SHIFT UP ARROW' QUIT W/NO CHANGE
9220 'SHIFT RIGHT ARROW' MOVES TO LINE END
9230 'SHIFT LEFT ARROW' HOMES CURSER
9240 ;
9250 PRINT@832,CHR$(31);
9260 E$=LEFT$(E$,64)
9270 L=LEN(E$)
9280 FOR X=1 TO L
9290 E$(X)=MID$(E$,X,1)
9300 NEXTX
9310 PRINT@896,E$;' OUTPUT LINE
9320 Q=1:PRINT@831+Q,CHR$(92);
9330 PRINT@895+Q,;' SET CURSER AT LINE BEGINNING
9340 A$=INKEY$:IF A$="" THEN 9340;' MAIN LOOP
9350 X=ASC(A$)
9360 IF X=13 THEN 10100;' DONE
9370 IF X=9 THEN 9550;' RIGHT
9380 IF X=8 THEN 9630;' LEFT
9390 IF X=10 OR X=26 THEN 9710;' DELETE
9400 IF X=31 THEN 10170;' CLEAR LINE
9410 IF X=27 THEN RETURN;' QUIT
9420 IF X=24 THEN Q=1:GOTO 9510;' HOME
9430 IF X=25 THEN Q=L:GOTO9510;' EOL
9440 IF X=91 THEN 9950;' SWITCH INSERT FLAG
9450 IF IQ THEN 9850
9460 ;
9470 E$(Q)=A$;' OVERWRITE CHARACTER
9480 PRINTA$;' ECHO CHARACTER
9490 IF Q>L THEN L=Q;' ADD TO LINE LEN
9500 Q=Q+1
9510 PRINT@832,CHR$(30);:PRINT@831+Q,CHR$(92);:PRINT@895+Q,;
9520 GOTO 9340
9530 ;
9540 'CURSER RIGHT
9550 GOSUB 10040;' INSERT OFF
9560 IF Q>63 OR Q>L-1 THEN 9340;' CANT GO RIGHT
9570 Q=Q+1
9580 PRINTCHR$(25);;' FORWARD SPACE
9590 PRINT@832,CHR$(30);:PRINT@831+Q,CHR$(92);:PRINT@895+Q,;
9600 GOTO 9340
9610 ;
9620 'CURSER LEFT
9630 GOSUB 10040;' INSERT OFF
9640 IF Q<2 THEN 9340;' CANT GO LEFT
9650 Q=Q-1
9660 PRINTCHR$(24);;' BACKSPACE
9670 PRINT@832,CHR$(30);:PRINT@831+Q,CHR$(92);:PRINT@895+Q,;
9680 GOTO 9340
9690 ;
9700 'DELETE
9710 GOSUB 10040
9720 IF L=0 THEN 9340

```

the answer more (is more sensitive). If possible, you should change that one.

Another Problem

Now, imagine a business decision problem in which you're trying to market a new product. You need to invest \$5,000 to bring this product to market. The three factors of uncertainty are selling price, variable cost, and annual sales volume. Each uniquely affects the profit from the product.

For the purposes of this example, assume the product has a one year life, and each of the factors is independent. You need two pieces of information from the analysis to make a more intelligent decision concerning this investment.

First, you need to know what kind of

average return on your investment you can expect from this product. You also need to know how much risk is involved based on the probabilities of achieving different profit levels.

Set the amount of the investment and the price as constant values. The variable cost and volume are unknown values, so they assume a probability distribution. Enter the variables of concern, the profit and return on investment, as statistical variables. The equations reflect the necessary calculations to obtain the profit and return on investment numbers (see Table 3).

After you enter this data, run a Monte Carlo analysis. Figure 17 is a sample printout of 10 trials; I used the same format as for the electronic circuit prob-

lem, but I'll briefly explain the data.

You see that a mean profit of about \$8,000 is what you expect. A mean return of about 60 percent is also within your limits. However, a 10 percent over limit figure appears on both values. The distribution is a little on the high side.

You'd be more competitive if you could cut your price but still maintain your minimum limits. Also, you should tighten your distribution on the profit, an indicator of the venture's riskiness. You can accomplish this by tightening the tolerances on your distributed variables.

Again, a sensitivity analysis would show the variables most sensitive to change and the absolute limits (worst case) of each variable. You should experiment with this problem to determine the optimum values for profit and return.

Remember that the benefit of Monte Carlo analysis over worst-case analysis is its ability to minimize risk through probability. It simulates the real world in a positive manner, instead of clouding your decision with unlikely pessimistic outcomes. ■

CONSTANT VARIABLES:	INVEST, 5000 PRICE, 4.75
DISTRIBUTED VARIABLES:	VARCOST, 4, 1, 10, 5 VOLUME, 10000, 20, 20, 0
STATISTICAL VARIABLES:	PROFIT, 10000, 5000 RETURN, 100, 25
EQUATIONS:	PRICE - VARCOST * VOLUME = PROFIT INVEST / INVEST - 1 * 100 = RETURN

Table 3. Set-up for Business decision problem.

Contact Ronald A. Cangro at 7628 Regina Drive, Fort Wayne, IN 46815.

Listing continued

```

9730 FOR X=Q TO L-1 ' SHIFT CHARACTERS
9740 E$(X)=E$(X+1)
9750 NEXTX
9760 E$(X)="";L=L-1'LAST CHAR
9770 PRINTCHR$(30);' CLEAR LINE
9780 FOR X=Q TO L' OUTPUT NEW LINE
9790 PRINTE$(X);
9800 NEXTX
9810 PRINT@895+Q,;' REPOSITION CURSER
9820 GOTO 9340
9830 '
9840 ' INSERT
9850 IF L>63 THEN GOSUB 10040;GOTO9340' STRING TO LONG
9860 FOR X=L TO Q STEP-1' MAKE ROOM
9870 E$(X+1)=E$(X)
9880 NEXTX
9890 E$(Q)=A$:L=L+1' ADD CHARACTER
9900 PRINTA$;:Q=Q+1
9910 PRINT@832,CHR$(30);:PRINT@831+Q,CHR$(92);:PRINT@895+Q,;
9920 GOTO 9770' OUTPUT LINE
9930 '
9940 ' SWITCH INSERT
9950 IF IQ THEN GOSUB 10040;GOTO9340
9960 IF IQ=0 THEN GOSUB 9980;GOTO9340
9970 '
9980 IQ=1' INSERT ON
9990 PRINT@960,"INSERT";
10000 PRINT@895+Q,;
10010 RETURN
10020 '
10030 ' INSERT OFF
10040 PRINT@960,CHR$(30);
10050 PRINT@895+Q,;
10060 IQ=0
10070 RETURN
10080 '
10090 'DON
10100 E$="";GOSUB 10040
10110 FOR X=1TOL
10120 E$=E$+E$(X)
10130 NEXTX
10140 RETURN
10150 '
10160 ' CLEAR
10170 FOR X=Q TO L
10180 E$(X)="";NEXTX
10190 L=Q-1;GOTO9770
10200 '
10210 '
10220 '
10230 'FILE ERROR HANDLING
10240 ER=ERR/2+1
10250 IF ER=54 THEN PRINT@960,"FILE NOT FOUND - TRY AGAIN";

ESUME490
10260 PRINT@960,"**** ERROR (";ERR(ER);") - PRESS ANY KEY TO TRY
AGAIN";
10270 A$=INKEY$;IPAS$=""THEN10270 ELSE PRINT@960,CHR$(30);
10280 RESUME NEXT
10290 '
10300 END

```

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What's the DIF?

by David Haan

Format and print financial statements in one step with the DIF (data-interchange format) file while avoiding typographical errors.

I recently became the caretaker of my church's financial records. One of my duties is to provide monthly statements, in a simple form, for each church leader.

This statement includes a breakdown of the month's receipts, expenditures, and a balance forward (see Fig. 1). I also have to prepare a quarterly state-

ment summarizing the monthly totals for credit and debits to date.

Generating a quarterly report that could be distributed to the general membership sounded difficult. In the past, this report had been typewritten using the general ledger. This method was time-consuming and error-prone; errors made had to be corrected and the

report often had to be retyped.

VisiCalc, the package I chose to keep the church's records, contains an optional data-save format called DIF (data interchange format). A data file can be generated that is directly accessible from a Basic program of your own design. Using this technique, a report can be formatted and printed in one step, with no chance of typographical errors or an incorrectly read entry. See the sample quarterly statement in Fig. 2.

When you save a VisiCalc file using the DIF file option, a specific format is generated that can be accessed by many different languages, such as Pascal, Fortran, and Basic. This format standard, established by Software Arts Inc., is made up of header blocks that indicate the type of information that is to follow (see Fig. 3).

Header Items

Some of the seven different header items are the Table, Vectors, Tuples, and Data headers. When I saved the quarterly report of Fig. 2 as a DIF file, the first part of the file was organized in the format as shown in Fig. 4. In Fig. 4, the first header item is called Table. This header allows verification that the file is a data table. The two numbers following must be a zero and a one with a title string following. In this case, the title

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April 1982	3,562.36	3,173.40	388.96	3,404.45
May 1982	4,258.42	3,966.75	291.67	3,668.54
June 1982	3,001.56	3,173.40	-171.84	3,440.22
	22,065.33	20,627.10	1,438.23	20,705.42
LESS: EXPENSES	-20,705.42			
GENERAL FUND BALANCE	1,359.91			
CASH ON HAND				
July 1 1982	1,359.91			

GENERAL FUND REPORT

	EXPENDED	BALANCE REMAINING ON BUDGET
Minister Salary	11,100.00	11,100.00
Sunday School	362.87	287.13
Choir	150.00	50.00
General Supplies	1,375.16	774.84
Secretary	1,827.00	1,827.00
Utilities	3,823.56	2,576.44
Repair & Maintenance	2,066.83	3,933.17
	20,705.42	20,548.58

Figure 1. Monthly statement.

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January		1850.00	0.00	25.00	122.45	304.50	805.31	204.98	3312.24	3966.75	4471.02	504.27
February		1850.00	17.34	0.00	264.89	304.50	798.43	188.67	3423.83	3173.40	3646.25	472.85
March		1850.00	6.75	25.00	202.55	304.50	688.80	378.54	3456.14	3173.40	3125.72	-47.68
April		1850.00	0.00	0.00	404.30	304.50	589.56	256.09	3404.45	3173.40	3562.36	388.96
May		1850.00	128.46	0.00	266.08	304.50	522.45	597.05	3668.54	3966.75	4258.42	291.67
June		1850.00	210.32	100.00	114.89	304.50	419.01	441.50	3440.22	3173.40	3001.56	-171.84
July												
August												
September												
October												
November												
December												
TOTAL 1st Quarter		5550.00	24.09	50.00	589.89	913.50	2292.54	772.19	10192.21	10313.55	11242.99	929.44
TOTAL 2nd Quarter		11100.00	362.87	150.00	1375.16	1827.00	3823.56	2066.83	20705.42	20627.10	22065.33	1438.23
TOTAL 3rd Quarter												
TOTAL 4th Quarter												
BUDGET REMAINING		11100.00	287.13	50.00	774.84	1827.00	2576.44	3933.17	20548.58	20626.90		

Figure 2. Quaterly statement.

The data in the DIF file has the following format:

Type Indicator, Value
String

The type indicators and meanings are as follows:

Type Indicator	Meaning
-1	This type indicates that this is a special type of data. It is either a BOT (beginning of tuple) or an EOD (end of data). BOT or EOD will be in the string field and the value field will be 0.
0	This type indicates that this is numeric data and the data will appear in the value field. The data can be noninteger, signed, and have exponentiation. The string field will contain a V.
1	This type indicates that this is string data. The string data will appear in the string field, with a 0 in the value field.
2	This indicator is a special case and is used to pass special information between programs.

Figure 3. DIF file type indicators.

numeric or string data. You will notice that the first piece of information is a -1,0 followed by BOT. The field where the -1 is located is called the type indicator. Valid type indicators are -1, 0, 1, and 2. Figure 3 contains an explanation of what each type indicator means. As seen in Fig. 3, the -1,0 followed by BOT indicates that this is the beginning of a tuple. This will occur at the beginning of each tuple. The next item in Fig. 4 is a 1,0 followed by the word donations. If you refer back to Fig. 2, you will see that donations is the first piece of data located at the coordinates of the first vector and the first tuple. The type indicator 1 indicates that the data is string data, not numeric, and the number value field equals zero. The next data item of Fig. 4 is preceded by a 1,0, which is followed by Needed/Wk. In Fig. 2, Needed/Wk is at the coordinates of the first tuple and the second vector.

The third data item in Fig. 4 is a 0,793.35 followed by a V. The zero indicates that the data item is numeric and 793.35 is the value. The V following also indicates that the data is a numeric value.

If you continued printing the data beyond the end of Fig. 4, you would see that the data is saved one tuple at a time in the format of tuple 1, vector 1; tuple 1, vector 2; tuple 1, vector 3; and so on, until the entire tuple is saved. The next tuples are saved in the same manner until all of the tuples are saved. The final entry in the file after all the tuples are saved would be a -1,0 followed by EOD indicating the end of data.

This is a brief explanation of the DIF file format, and is only meant to give you the basics. For a complete explana-

is null and the Table header will not be used for anything in this demonstration.

The next header item, Vectors, indicates that the information following will give the number of vectors in the data file. A vector can be thought of as either a row across the page or as a column down the page. Its definition depends on whether the data file is saved in rows or in columns.

I used the vector in its default state, where a vector is defined as a row of information across the page. The number of vectors is indicated by the second

number following the word vectors. In Fig. 2, there are 22 vectors.

The third header item, Tuples, indicates that the information following will show the number of tuples in the data file. As with a vector, a tuple can be a row across the page or a column down the page. In the default condition, a tuple is a column of information. The number of tuples is indicated by the second number following the word tuples and in Fig. 2 it is 13.

The fourth header item, Data, indicates that the following data is either

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5 1/4" dbl-side dbl-den. 3 50	5 1/4" dbl-side dbl-den. 4 45	5 1/4" dbl-side dbl-den. 3 25
5 1/4" sin-side quad 3 45	5 1/4" sin-side quad 4 45	8" sin-side sin-den. 2 45
5 1/4" dbl-side quad 4 45	5 1/4" dbl-side quad 4 95	8" sin-side dbl-den. 3 00
8" sin-side sin-den. 2 95	8" sin-side sin-den. 3 45	8" dbl-side dbl-den. 3 95
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8" dbl-side dbl-den. 3 95	8" dbl-side dbl-den. 4 95	

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tion, you should obtain a supplemental information bulletin from Radio Shack entitled "Programmer's Guide to the Data Interchange Format."

The Listing

The Basic Program Listing accesses the data file, formats it, and prints it. Of particular note are lines 140-510. Lines 150-210 read the DIF file until the Vectors header type is found. (The Label header will be bypassed.) Once the Vectors header type is found (line 180), the number of vectors will be extracted, put in the variable NV and printed on the screen.

Next it searches for the tuples header type. Once it is found (line 190), the number of tuples will be extracted, put in the variable NT and printed on the CRT.

Finally, the Data header type is searched for and when found (line 200), control is passed to a routine that will read in the data (line 350). Here, two loops (one inside the other) are formed using the variables NT and NV to read all the data and place it into variables that will be used for printing the required report. Lines 360-390 look for the BOT while lines 400-450 pick up the actual data.

If at any time an error in the DIF file is detected, an appropriate message will be printed on the screen and execution of the program will be aborted.

You might have noticed that in assigning the data from the DIF file to variables, I did not test to see whether the type of data being accessed was a numeric or string value by checking the type indicator. This was because I knew the vector and tuple location of each string or numeric value by looking at the layout of Fig. 2, and knew that this layout was not expected to change in the foreseeable future. This allowed the code in the demonstration program to be simplified.

If the layout of the DIF file is unknown, or if it will change now and then, you will have to test the type indicator of each piece of data and assign the data to appropriate variables. The remaining portion of the program formats and prints the data. The resultant report printed from this sample DIF file is shown in Fig. 5. A neat and consistent format is printed without the need for typing or corrections. ■

David Haan lives at 4361 Estes St., Littleton, CO 80123.

A portion of the DIF file used in this example is listed below. A portion of the data is missing because it is repetitious and this figure is meant only to demonstrate the basic format of the DIF file.

```

TABLE      This header is bypassed by the program
0,1
VECTORS
0,22      The number of vectors in the file.
TUPLES
0,13      The number of tuples in the file.
DATA      Start of data block.
0,0
-1,0
BOT       Indicates beginning of tuple.
1,0
Donations First data item. Tuple 1 vector 1.
1,0
Needed/Wk Second data item. Tuple 1 vector 2.
0,793.35  First numeric item. Tuple 1 vector 3.
V
.
.
.
.
1,0
TOTAL 3rd Data item. Tuple 1 vector 20.
1,0
TOTAL 4th Data item. Tuple 1 vector 21.
1,0
BUDGET    Last data item. Tuple 1 vector 22.
1,0
BOT       Indicates beginning of next tuple.
****The rest of the DIF file would follow here.....

```

Figure 4. DIF file format.

1982	Donations	Cash	Cash	Minister	Sunday		General	Operating		
JUNE	Needed/Wk	Credits	Debits	Salary	School	Choir	Supplies	Secretary	Utilities	Maint.
DEPOSITS	793.35 Bal. Frwd	1798.57		12950.00	497.45	150.00	889.73	2131.50	2995.45	4374.67
Date	Descript. of Expense									
June 6	General Fund	726.37								
June 13	General Fund	844.21								
June 20	General Fund	639.89								
June 27	General Fund	791.09								
Deposits	Subtotal	3001.56								
Date	Descript. of Expense									
June 2	Gas/Elec Company	3245	364.45						364.45	
June 7	Church Choir	3246	100.00			100.00				
June 10	Williams Stationery	3247	74.89				74.89			
June 10	Citywide Rubbish	3248	22.50							22.50
June 15	Central Bell	3249	54.56						54.56	
June 15	Southwest Rentals	3250	94.50							94.50
June 17	Bookstore	3251	210.32		210.32					
June 22	Phillip Thompson	3252	200.00							200.00
June 25	U.S. Postmaster	3253	40.00				40.00			
June 25	John R. Franklin	3254	304.50					304.50		
June 26	Capitol Electric	3255	124.50							124.50
June 30	Minister	3256	1850.00	1850.00						
	Subtotals	4800.13	3440.22	1850.00	210.32	100.00	114.89	304.50	419.01	441.50
Balance	Forward	1359.91		11100.00	287.13	50.00	774.84	1827.00	2576.44	3933.17

Figure 5. Quarterly report to be distributed.

Program Listing. Basic program to generate report for general distribution.

```

10 REM THIS PROGRAM WILL ACCESS A DIF FILE GENERATED BY VISICALC A
ND
20 REM PROCESS THE DATA SO THAT A QUARTERLY REPORT CAN BE GENERAT
ED.
30 CLEAR 2000:DEFDBL D,E,O,R,S,T,V
40 BS="###,###.##"
50 DIM T(50),SU(50),FS$(50),V(50),V$(50),RE(50):REM ALLOWS 50 VECT
ORS & TUPLES.
60 DIM M$(15),OS(50),RQ(50),DO(50),ET(50)
70 CLS:PRINT"THIS ROUTINE WILL GENERATE A QUARTERLY REPORT OF YOUR
CHOICE."
80 PRINT:INPUT"ENTER YEAR";YR
90 PRINT:INPUT"ENTER THE QUARTERLY REPORT REQUIRED (1, 2, 3, 4).";
Q:IF Q<1 OR Q>4 GOTO 90
100 REM *****
110 REM THE DIF FILE IS OPENED AND THE NECESSARY HEADER ITEMS SEAR
CHED FOR.
120 REM *****
130 PRINT:INPUT"ENTER THE DIF FILENAME THE REPORT IS TO USE.";F$
140 OPEN "I",1,F$
150 INPUT #1,T$
160 INPUT #1,S,N
170 INPUT #1,S$
180 IF T$="VECTORS" THEN 220
190 IF T$="TUPLES" THEN 270
200 IF T$="DATA" THEN 350
210 GOTO 150
220 NV=N
230 PRINT"THE FILE HAS ";NV;"VECTORS"
240 IF NV<51 THEN 150:REM MAKES SURE FILE NOT TOO BIG.
250 PRINT"TOO MANY VECTORS TO HANDLE."
260 CLOSE 1:STOP
270 NT=N
280 PRINT"THE FILE HAS ";NT;"TUPLES."
290 IF NT<51 THEN 150:REM MAKES SURE FILE NOT TOO BIG.
300 PRINT"TOO MANY TUPLES TO HANDLE."
310 CLOSE 1:STOP
320 REM *****
330 REM GET DATA FROM DISK STARTING WITH FIRST TUPLE.
340 REM *****
350 FOR I=1 TO NT
360 INPUT #1,T1,V1
370 INPUT #1,S$
380 IF T1<>-1 GOTO 1050
390 IF S$<>"BOT" GOTO 1070
400 FOR K=1 TO NV:REM GET ALL VECTORS IN TUPLE.
410 INPUT #1,T1,V1
420 INPUT #1,S$
430 IF T1=-1 GOTO 1090:REM MAKE SURE IT'S NOT BOT OR EOD.
440 V(K)=V1:V$(K)=S$:T(K)=T1
450 NEXT K
460 IF I=1 GOSUB 1110:REM GET MONTHS OF YEAR FROM FIRST TUPLE.
470 IF I>2 GOSUB 1150:REM GET NUMERIC DATA.
480 IF I<(NT-3)GOTO 500
490 ON (NT-I+1) GOSUB 1170,1210,1250,1290
500 NEXT I
510 CLOSE 1
520 REM *****
530 REM THIS SECTION FORMATS THE DATA AND PRINTS THE REPORT
540 REM *****
550 IF Q=1 THEN Q$="FIRST"
560 IF Q=2 THEN Q$="SECOND"
570 IF Q=3 THEN Q$="THIRD"
580 IF Q=4 THEN Q$="FOURTH"
590 LPRINT TAB(23)"ANYONE'S CHURCH, ANYWHERE, USA."
600 LPRINT TAB(25)Q$;" QUARTER REPORT";YR
610 LPRINT:LPRINT TAB(29)"DONATIONS";TAB(45)"REQUIRED";TAB(59)"OVE
R/SHRT";TAB(72)"EXPENSES"
620 LPRINT TAB(29)"-----";TAB(44)"-----";TAB(59)"-----
";TAB(72)"-----":LPRINT
630 IF Q=1 GOTO 680
640 LPRINT"THRU ";M$(Q*3-3);YR;TAB(28)USING B$;DO(12+Q);
650 LPRINT TAB(41)"-";TAB(43)USING B$;RQ(12+Q);
660 LPRINT TAB(55)"=";TAB(58)USING B$;OS(12+Q);
670 LPRINT TAB(70)USING B$;ET(12+Q)
680 LPRINT M$(Q*3-2);TAB(10)YR;TAB(28)USING B$;DO(Q*3-2);
690 LPRINT TAB(41)"-";TAB(43)USING B$;RQ(Q*3-2);
700 LPRINT TAB(55)"=";TAB(58)USING B$;OS(Q*3-2);
710 LPRINT TAB(70)USING B$;ET(Q*3-2)
720 LPRINT M$(Q*3-1);TAB(10)YR;TAB(28)USING B$;DO(Q*3-1);
730 LPRINT TAB(41)"-";TAB(43)USING B$;RQ(Q*3-1);
740 LPRINT TAB(55)"=";TAB(58)USING B$;OS(Q*3-1);
750 LPRINT TAB(70)USING B$;ET(Q*3-1)
760 LPRINT M$(Q*3);TAB(10)YR;TAB(28)USING B$;DO(Q*3);
770 LPRINT TAB(41)"-";TAB(43)USING B$;RQ(Q*3);
780 LPRINT TAB(55)"=";TAB(58)USING B$;OS(Q*3);

```

Listing continued



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```

790 LPRINT TAB(70) USING B$; ET(Q*3)
800 LPRINT TAB(29) "-----"; TAB(44) "-----"; TAB(59) "-----"
; TAB(71) "-----"
810 LPRINT TAB(28) USING B$; DO(13+Q);
820 LPRINT TAB(43) USING B$; RQ(13+Q);
830 LPRINT TAB(58) USING B$; OS(13+Q);
840 LPRINT TAB(70) USING B$; ET(13+Q)
850 TE=ET(13+Q); LPRINT"LESS:  EXPENSES"; TAB(28) USING B$; -TE
860 LPRINT TAB(29) "-----"
870 LPRINT"GENERAL FUND BALANCE"; TAB(28) USING B$; DO(13+Q) -TE
880 LPRINT:LPRINT"CASH ON HAND"
890 IF Q=4 THEN Q=0: YR=YR+1
900 LPRINT M$(Q*3+1); " 1"; YR; TAB(28) USING B$; DO(13+Q) -TE
910 LPRINT:LPRINT:LPRINT
920 LPRINT TAB(30) "GENERAL FUND REPORT"
930 LPRINT TAB(30) "-----"
940 LPRINT TAB(51) "BALANCE REMAINING"
950 LPRINT TAB(31) "EXPENDED"; TAB(55) "ON BUDGET"
960 LPRINT TAB(31) "-----"; TAB(55) "-----"
970 LPRINT:FOR I=1 TO NT-6
980 LPRINT F$$ (I); TAB(29) USING B$; SU (I);
990 LPRINT TAB(54) USING B$; RE (I)
1000 NEXT I
1010 LPRINT TAB(30) "-----"; TAB(55) "-----"
1020 LPRINT TAB(29) USING B$; ET(Q+13);
1030 LPRINT TAB(54) USING B$; RE(NT-5)
1040 CLS:PRINT@448,"QUARTERLY REPORT COMPLETED":END
1050 PRINT"NOT BEGINNING OF TUPLE INDICATOR"
1060 STOP
1070 PRINT"NO 'BOT' "
1080 STOP
1090 PRINT"END OF DATA INDICATOR"
1100 STOP
1110 FOR C=1 TO 12
1120 M$(C)=V$(C+4)
1130 NEXT C
1140 RETURN
1150 SU (I-2) =V(NV-5+Q) : RE (I-2) =V(NV) : F$$ (I-2) =V$(1)
1160 RETURN
1170 FOR C=1 TO 17
1180 OS(C)=V(C+4)
1190 NEXT C
1200 RETURN
1210 FOR C=1 TO 17
1220 DO(C)=V(C+4)
1230 NEXT C
1240 RETURN
1250 FOR C=1 TO 17
1260 RQ(C)=V(C+4)
1270 NEXT C
1280 RETURN
1290 FOR C=1 TO 17
1300 ET(C)=V(C+4)
1310 NEXT C
1320 RETURN

```

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- The TAB function will now tab 255 columns on a printer. (BASIC cannot tab past column 64.)
- NEWDOS 80 2.0 USERS can use the CMD "dos command" function! (DOSPLUS may use name "dos command")
- NEW and EASIER to use USER COMMANDS.
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ZBASIC 2.2 DOES NOT SUPPORT THESE BASIC COMMANDS:

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

ZBASIC 2.2 SPEED COMPARISON DEMO

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

ZBASIC 2.2 DEMO PROGRAM

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

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

```

10 ***** ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST*****
20 CLS: CLEAR 100: DEFINT A-X: DEFSTR Z: DIM AA(64,24), Z(150): RANDOM
30 AA=100: BB=-1000: CC=3: DD=-3: EE=-9999: ST$="START TIME "+TIME$
40 FOR I=1 TO 127 STEP 2: FOR J=47 TO 1 STEP -3: XX=POINT(I,J): SET(I,J)
50 XX=(I-J)/CC*(7+I+J): XX=ABS(INT(RND(I*J)-AA)+7): RESET(I,J)
60 XX=PEEK(I+J): POKE 15360+I+J, J: OUT 255, J AND (3*J): XX=INP(I)
70 AB$=STR$(I+J): BA$=LEFT$(AB$, 2): AA(I/2, J/2)=VAL(BA$)+AA*3
80 BA$=BA$+RIGHT$(BA$, AND(3)): XX=INSTR(1, BA$, "9"): XX=SQR(I*J)
90 BA$=MID$(BA$, 2, 2): MID$(BA$, 1, 1)=Z: IF XX THEN 100 ELSE CLS
100 IF LEN(BA$) > 3 OR SGN(XX)=1 AND ASC(BA$)=32 THEN PRINT "+++"
110 IF POS(0) > 62 THEN TRON: TROFF: PRINT ELSE XX=NOT(RND(99))+100
120 A$=INKEY$: IF A$="Y" OR A$="y" AND 1 < 20 THEN PRINT "TRUE.."
130 RESTORE : READ A, C, Z(I,J), D: GOSUB 170: GOSUB 170: GOT0 210
140 NEXT : PRINT "*": NEXT I: CLS: PRINT 0512, ST$, "STOP TIME "+TIME$
150 STOP ***** END OF MAIN TEST LOOP *****
160 DATA 12345, -1, "TEST", -9999
170 ON RND(16) GOTO 180, 190, 200, 180, 190, 200
180 RETURN
190 RETURN
200 RETURN
210 ON RND(9) GOSUB 180, 190, 200, 180, 190, 200, 180, 190, 200
220 GOTO 140
    
```

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Saving Strings

by David M. Keil

If you type faster than INKEY\$ routines accept data, this program is for you. It keeps pace with even the fastest typists.

When you answer INKEY\$ routine prompts, characters typed in too fast aren't recorded. No matter how tight you make the routine, it never seems to keep up with the average typist. This is because the Model I/III takes time to verify each character, display it, and then add it to the input string. While the computer goes through this process, you might type in another character, which the computer doesn't register. That's the problem; here's the solution.

How It Works

The computer keeps track of the cursor's location and line 110 PEEKs it out of memory and puts it into Z1. Then it puts a block cursor at the present cursor position.

Lines 120 and 130 check whether a character has been input. The charac-

ter is then converted to its ASCII value and stored in A. Numeric variables are faster to work with than strings.

The program then determines if you've pressed enter. If not, it checks for a valid character. If you've input no character or an invalid one, the program returns control to line 120. If the character is valid, the program POKEs a space into the current cursor position and continues to line 140.

Line 140 subtracts 15360 from Z1 to make it a Print @ location and compares it to LC. LC is the starting position of the input. If LC and Z1 are equal, the back arrow is an invalid input.

Then Z1 is compared to LC+IP. IP is the maximum number of characters allowed. If LC+IP and Z1 are equal, all characters except the back arrow are invalid.

If either condition is met, the character is not printed and control returns to line 110. Otherwise, the character prints and control returns to line 110.

Values are stored only on the screen. To put a character into memory, you just move the value from the screen into a string. You could PEEK the value from the screen one character at a time but a long string (20 characters or more) takes a while.

Line 150 is the line that makes this routine different. POKe a space into the current cursor position and add 15360 to LC to make it a memory address so you can compare it to Z1 (the cursor's memory address). Next, use a little-known instruction called VARPTR, which loads the memory address of where A\$'s address is

The Key Box

Model I and III
4K RAM
Cassette Basic

```

5 CLS
10 LC=512 : IP=10 : PRINT @LC,; : GOSUB 100
20 END
100 REM INKEY INPUT ROUTINE
110 Z1=PEEK(16417)*256+PEEK(16416) : POKE Z1,143
120 A$=INKEY$ : IF A$="" THEN 120 ELSE A=ASC(A$) : IF A=13 THEN
150
130 IF A<>8 AND A<32 OR A>90 THEN 120 ELSE POKE Z1,32
140 Z1=Z1-15360 : IF Z1=LC AND A=8 THEN 110 ELSE IF Z1=LC+IP AND
A<>8 THEN 110 ELSE PRINT A$; : GOTO 110
150 POKE Z1,32 : LC=LC+15360 : A=VARPTR(A$) : POKE A,Z1-LC : POK
E A+1,LC-INT(LC/256)*256 : POKE A+2,INT(LC/256) : IP$=A$
160 RETURN

```

Program Listing



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INSTANT ASSEMBLER 2.1

The **Instant Assembler** is a powerful assembly language development system for the TRS-80, and our new version is better than ever. If you are already an assembly language programmer, its unique design will greatly increase your productivity. If you are just getting started, there is no better assembler to help you learn machine language programming. Some of its unique features are immediate assembly, which detects syntax errors as source is entered, and a compact source format that allows you to write programs nearly three times as large as other assemblers in the same amount of memory. It produces relocatable code modules that can be saved on disk or tape and linked together in memory for large or modular assemblies. It will also assemble to disk, tape, or directly to memory for immediate debugging with the built-in debugger. You can quickly switch from assembler to debugger without losing your source. The built-in debugger will step through your programs one instruction at a time, showing each disassembled instruction and its effect on the registers and memory. It can even use the symbols in your source code when stepping or disassembling. Our new version will load or save both conventional source files and its own condensed source format.

The **Instant Assembler** package includes six separate programs. The assembler itself includes the editor and built-in debugger. The **Linking Loader** is included in several versions for different memory sizes. A stand-alone version of the debugger (**MicroMind**) is also included. **MicroMind** can be relocated in memory and has commands to single-step, set breakpoints, display or alter registers or memory, find bytes or words, disassemble to screen or printer, convert between hex and decimal numbers, and write SYSTEM tapes. The **Instant Assembler** comes with a comprehensive 65 page instruction manual with many examples. Specify Model I or Model III. **TAPE INTASM 2.1** \$39.95 on tape
Specify Model I or Model III. **DISK INTASM 2.1** \$49.95 on disk

INSIDE LEVEL II

The Programmers Guide to the TRS-80 ROMS

INSIDE LEVEL II is a comprehensive reference guide to the Model I and Model III ROMs which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the SYSTEM command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer including tape formats, RAM usage, relocation of Basic programs, USR call expansion, creating SYSTEM tapes of your own programs, interfacing of Basic variables directly with machine code, and special precautions for disk systems. **INSIDE LEVEL II** was reviewed in the April 1982 issue of 80 Micro which said "The book has no flaws; it is a perfect gem." Byte Magazine said "I recommend this book to serious machine language programmers."

Includes updates for Model III. **INSIDE LEVEL II** \$15.95

DEMON DEBUGGER

DEMON (for DEbugger and MONitor) is a new and sophisticated tool with which you can explore and debug machine language programs. It has two modes of operation. In the STEP mode, it "emulates" the operation of the Z-80 and allows you to step through any machine language program one instruction at a time, showing you the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. This ability is extremely useful not only in debugging your own programs, but also for examining how other people's programs work. It will even follow program flow right into the ROMs. **DEMON** leaves the video screen unaltered so that the program you are stepping through can perform its display functions unobstructed. STEP mode commands include step (trace), step to a branch, run in step mode at a variable rate, run for a specified number of steps, change flags or registers, execute a CALL or RST, set breakpoints in RAM or ROM, and break when a number in a defined range appears in any double register. Commands in the MONITOR mode (all of which are available from the STEP mode) include hex arithmetic, hex to decimal conversion, block move, fill memory, find bytes, jump to address, disassemble to screen or printer, load memory from disk or tape, write memory to disk or tape, full screen memory edit in hex or ASCII, and relocate other programs or itself. **DEMON** also includes a labelling disassembler with EDTASM format output to either disk or tape. This will generate source code from programs in memory which can then be altered and reassembled with your assembler. Screen displays may be routed to your line printer for hard copy. Includes a comprehensive 40 page manual with many examples.

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Make duplicate copies of almost any tape including Basic, SYSTEM, data lists, assembler source, or "custom loaders". The file name, load address, entry point, and every byte (in ASCII format) are displayed on the video screen. Model III version allows changing tape speed so you can make 1500 baud copies of 500 baud programs like SCRIPSIIT.

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TELCOM

Mumford Micro offers two telecommunications programs. **TELCOM I** has most of the features needed to communicate with bulletin boards, time share systems, or for file transfers between two disk-based micros over modems or direct wire. It is menu driven and extremely simple to use. Functions include transmit a disk file, receive a disk file, save received data on disk, examine and modify UART parameters, 8 programmable log-on messages, automatic checksum verification of accurate transmission and reception, and many more user conveniences. Supports line printers, lowercase characters, Xor/Xoff protocol, and programmable character keys.

TELCOM II is an expanded version of this program for the most demanding telecommunications applications. It maintains the same ease of operation and all the features of our original program, but includes many enhancements. The terminal mode now has a help menu and a large spooler for simultaneous printer output at high baud rates. You can load disk files into the memory buffer from within the terminal mode, type into the buffer, transmit the buffer with a single command, and send files a line at a time. You can even view the buffer or data that has already scrolled off the screen. **TELCOM II** has 10 different 40 character programmable messages that can each be sent with a single command for auto log-on or auto dialing, and the messages can include control codes and delays. It also has 5 different character translation tables for filtering and compatibility with different systems.

TELCOM II also includes an error correction file transfer mode which is compatible with the LYNC program available on CP/M systems and the IBM PC. **TELCOM II** will exchange disk files with any computer running this protocol (including another TRS-80 running **TELCOM II**), and will automatically detect and correct errors in transmission. Files can be sent to or fetched from an unattended computer. The extreme ease of use **TELCOM I** is known for has not been compromised. Reconfiguration of the programmable features is done internally from clear menus for fast, easy operation. Both versions of **TELCOM** come with complete instruction manuals, which are available separately for \$5 to help you decide which program is best suited to your needs.

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stored into A.

Now for the fun. You are going to POKE new values into A\$'s memory addresses to move the contents of video memory into A\$. First you POKE the difference between Z1 and LC into memory addressed by A. This holds the length of A\$, which is 0-255. Next, A+1 and A+2 hold the least-significant byte and the most-significant byte of where A\$ is stored in memory. You now POKE the address where the string is stored in video memory into A\$'s memory addresses.

That's it. Now A\$ contains the values in video memory. In fact, A\$ is actually stored in video memory. All you have to do is assign A\$ to some other variable (in my program, IP\$) and return.

All this seems to be a long process but to the computer it is fast and easy. You have eliminated string addition and subtraction and given your input routine a block cursor. All this makes for a very fast and powerful INKEY\$ routine.

How to Use It

Using this program is easier than knowing how it works. Load LC

where you wish your input to be. Then load IP with the maximum number of characters to be input. Now move the cursor to the correct location on the screen by printing at LC.

The program listed clears the screen and allows input at screen position 512.

“This program will work with any INKEY\$ routine and eliminate those lost characters.”

When you press the enter key the program ends. When it ends, type the following:

```
PRINT A$,IP$
```

and press the enter key. Whatever you typed should print twice. To find out if A\$ is stored in video memory, list the program and print A\$ again. A\$ contains whatever is on the screen at posi-

tion 512. Now you see why you have to assign A\$ to another variable before returning.

Here are a few more things you need to know before you use this program. Once A\$ is reassigned it will be stored in high memory. So don't worry about using A\$ anywhere else in your program. You can locate lines 110-160 anywhere in your program.

Don't be afraid to modify this program. Only the way of moving the input from the screen is new, so experiment. With a few changes this program allows you to use the shift right and left arrows to let the cursor move over characters without erasing them.

If you want to stop character loss in programs containing other INKEY\$ routines I have another solution. A machine-language buffer utility will allow you to key ahead of your program. This program will work with any INKEY\$ routine and eliminate those lost characters. ■

David Keil (10 W. Wilburn Ave., Greenville, SC 29611) is employed by the Better Software Assoc., where he is vice president in charge of software development.

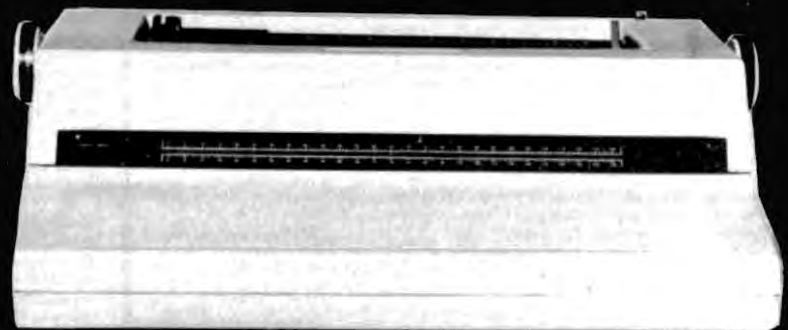
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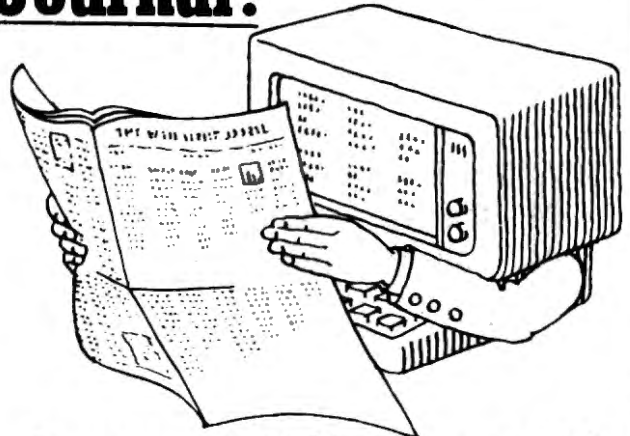
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The Versatile Microprism

by Bradford N. Dixon
80 Micro Technical Editor

The IDS 480 Microprism provides the best features of a dot-matrix tabletop printer and adds the option of near-letter-quality output.

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The Microprism Printer
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Previously, you had to make a choice

between these two types of printers. But the Microprism IDS 480, a dot-matrix printer with a near-letter-quality mode, gives you the flexibility to satisfy most of your printer needs.

Physical Description

The IDS 480 printer (see Photo 1) is an 18.7-pound tabletop unit nearly 16 inches wide, 11½ inches deep, and 4½ inches high. It accommodates 9½-inch fanfold paper, cut sheet paper, and roll paper (mounted on a roller at the rear of the printer). The stepper motor feeds paper at a maximum rate of 3½ inches per second.

The Microprism's case is white with a black dust cover and a clear plastic window for watching text and graphics as they are printed. The dust cover comes

off to facilitate ribbon replacement and to set the DIP (dual in-line package) switches.

When the IDS 480 is viewed from the front (see Photo 2), the printer control panel is on the right. It features a red power indicator light, a green on-line/fault indicator, an on-line/off-line switch, a form-feed switch, and a line-feed/self-test switch.

As you look at the top of the printer with the dust cover removed, you can see the print head strike control lever within easy reach. The snap-in ribbon cartridge and mode-select DIP switches are also accessible.

The platen release lever is at the right rear of the printer's top surface. The power switch and a 25-pin EIA (Electronic Industries Association) interface connector are on the Microprism's rear panel. You can connect this plug to your computer via a serial EIA interface, RS-232C, or a parallel TTL (transistor-transistor logic), Centronics-compatible interface.

Performance

The IDS 480 Microprism is loaded with useful print controls that you won't find in many comparably priced dot-matrix printers.

As a serial printer, the Microprism offers switch-selectable data rates of 300, 1,200, or 9,600 bits per second. It also provides an automatic multiple-line buffer of approximately 1,400 bytes.

The IDS 480 supports the full 96-character ASCII set with true upper- and lowercase characters. Characters are available in two fonts, near-letter-quality and draft quality, at the flip of a switch.

The printer formats the 96 characters in a 24- by 9-dot matrix in the normal mode, 48- by 9-dot in the enhanced mode (double width). You can print up



Photo 1. The Microprism Printer.

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ACCOUNTS RECEIVABLE provides **instant, on-line customer account information (both current and aged)**, with complete, timely invoicing, including open-item (or balance forward) and statement capabilities. It makes the entire billing process **fast, easy, and efficient**. It quickly identifies your overdue accounts, **helps speed collections**, helps control your cash flow, and assists you in making better financial decisions. Both detailed and summary **customer activity and aging reports** are instantly available. ● **Preprinted forms** available for **Invoices and statements**. ● **Detailed audit trail** ● **Maintains comprehensive customer data files** ● **Produces 8 reports and documents** ● **Includes automatic periodic customer/client billing option** which is ideal for service businesses ● **Itemized monthly transactions** ● **Master File capacity: 400 Customers** ● **Monthly Transactions capacity: 800 with 200K diskette, 3,500 with 500K diskette, 7,000 per Megabyte with a Hard Disk.**

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Accounts Receivable 1. Daily Transactions Report 2. Invoices (with or without preprinted forms) 3. Statements (with or without pre-printed forms) 4. Summary Aging Report 5. Detailed Aging Report 6. Itemized Monthly Transactions 7. Detailed Customer Activity Report 8. Summary Customer Account Report

Accounts Payable 1. Daily Voucher Report 2. Daily Credit Report 3. Checks with Detailed stubs 4. Check Register 5. General Ledger Transfer Report 6. Cash Requirements Report 7. Transaction Register 8. Open Voucher Report 9. Aged Payables Report 10. Detailed Vendor Activity Report 11. Summary Vendor Account Report

Payroll 1. Federal Tax Tables 2. State Tax Tables 3. Payroll checks with stubs 4. Payroll Check Register 5. Monthly Payroll Summary 6. Quarterly Payroll Summary 7. General Ledger Transfer Report 8. Detailed Employee File Listing 9. Produces 941 Worksheet 10. Prints annual W-2 Forms

System Requirements: Either CP/M® or MS-DOS (PC-DOS) ● Microsoft BASIC ● 64K RAM ● Two disk drives or hard disk ● 132 column wide carriage printer, or an 8 1/2"x11" printer with compressed print mode (an Epson MX-80 or similar printer).

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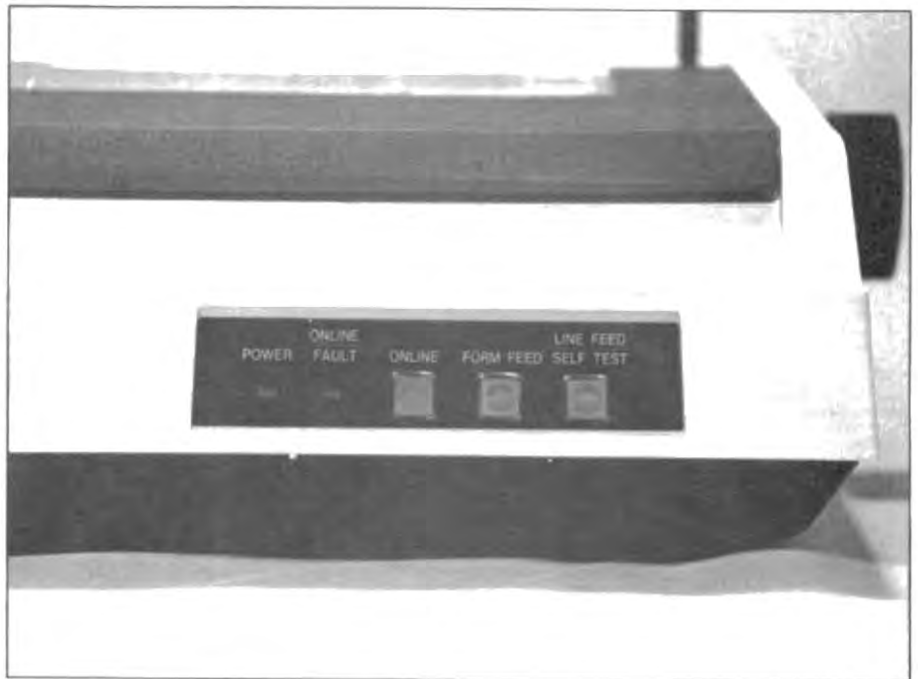


Photo 2. Front view of the IDS 480.

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKL
MNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
vwxyz{|}~■
```

10 cpi normal

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKL
MNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
vwxyz{|}~■
```

10 cpi expanded

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKL
MNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
vwxyz{|}~■
```

12 cpi normal

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKL
MNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
vwxyz{|}~■
```

12 cpi expanded

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKL
MNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
vwxyz{|}~■
```

16.8 cpi normal

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKL
MNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
vwxyz{|}~■
```

16.8 cpi expanded

Figure 1. Draft quality ASCII character set.

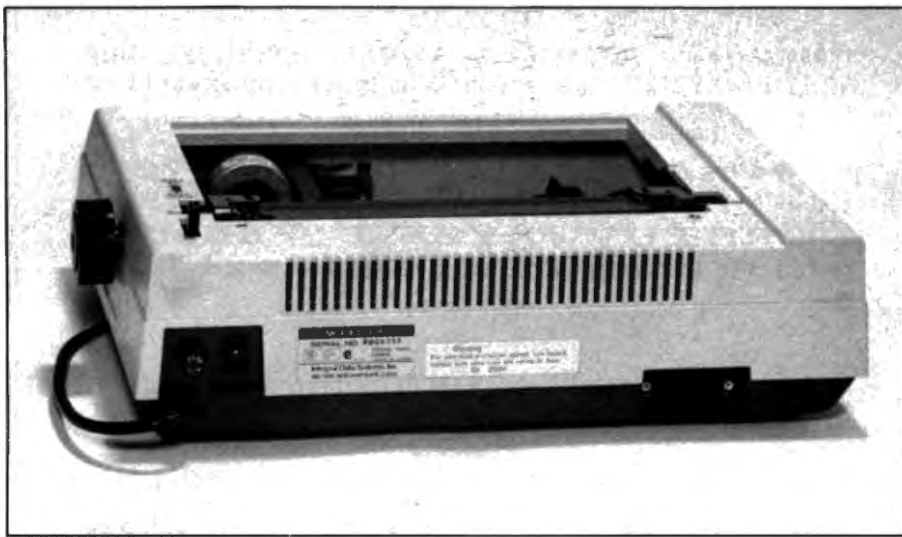


Photo 3. The Microprism's rear panel.

versatile tool for written documents. I wouldn't use the Microprism for important professional correspondence, resumes, or publication purposes.

But it seems perfectly suited for personal correspondence, interoffice memoranda, manuscripts, reports (with or without graphics), and other written material where letter-quality printing is not a necessity.

The Microprism printer can be completely software controlled; this is far and away its most significant selling feature. Software control is accomplished with special ASCII control characters.

Program-embedded functions might include character density changes, fixed proportional spacing, automatic text justification, line spacing, page length, margin positions, graphics data, double-width characters, and horizontal and vertical tabs.

The Owner's Manual

Care and feeding of the IDS 480 is a relatively simple matter. All normal maintenance is described in the owner's manual. It contains suggestions such as semiannual cleaning with a lint-free cloth or soft brush and lubrication with a high grade machine oil to keep the

to 110 characters per second (cps) in the near-letter-quality font.

Using the printer's DIP switches, you can select character densities of 10, 12, and 16.8 characters per inch (cpi). See Figs. 1 and 2 for examples of print types.

Maximum line length varies from 80 to 134 characters per 8-inch line, depending on the pitch setting. You can fit more characters on a line by opting for pro-

portional spacing. The printer optionally inserts line spaces as small as 1/48 inch; normal line spacing is 1/12 inch.

Page formatting is software and DIP-switch selectable. Under software control, you can set top and bottom margins in 1/48-inch increments and left and right margins in 1/120-inch increments.

The wide variety of page formats and the quality of print make the IDS 480 a

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unit like new.

Replacing worn ribbon cartridges is a snap because the dust cover comes off for easy access. However, since ribbon life for the Microprism is estimated at more than 1½ million characters, you won't have to do this often.

The manual is a well-written explanation of how to take full advantage of the printer's features. You should carefully study the manual to become cognizant of the valuable features you can call through software control.

The manual is divided into five sections, and provides specific information on running the printer. In addition, it has a handy quick-reference index and a glossary.

Conclusions

With a price tag of only \$649, the IDS Model 480 is a printer well worth the investment. Near-letter-quality characters provide acceptable correspondence text, while the graphics are comparable to or better than other dot-matrix printers in the same price range.

The manual is clear. Service and repair procedures at the Integral Data Systems Inc.'s home office have the customer in mind.

The only problem I encountered during testing was with the printer cable. IDS doesn't have a finished parallel printer cable that connects the printer to a TRS-80 Model I or III.

The cable provided for this review had an adapter card attached that was supposed to fit into the slot where the 25-pin male connector is located. It didn't fit.

At this time, the only way to use the Microprism on a Model I or III is to file

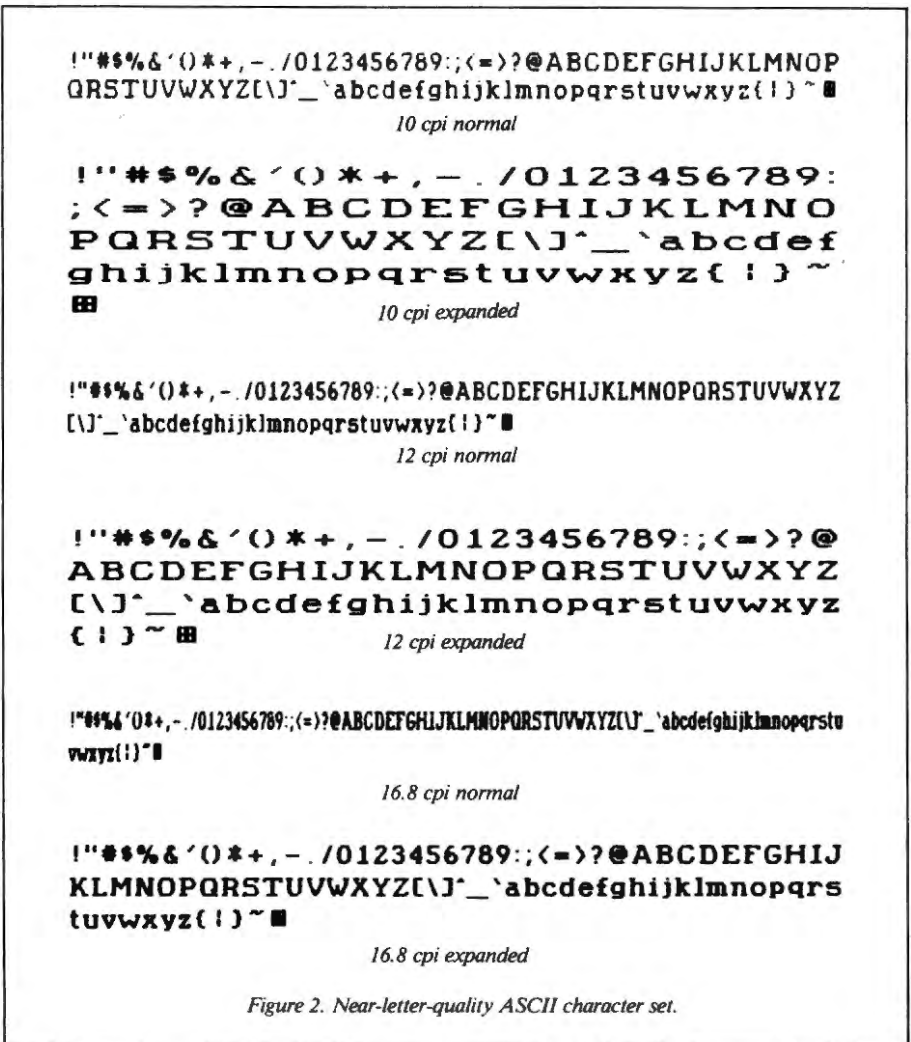


Figure 2. Near-letter-quality ASCII character set.

down the card edges to make a tight connection.

The people at IDS are aware of this cable problem and have assured me that it should be remedied before you read this review. You must order the proper

cable for your computer separately.

Aside from the problems I encountered in trying to interface the printer, the Microprism performed well. It is a valuable acquisition if you need a small, reasonably priced, tabletop printer. ■

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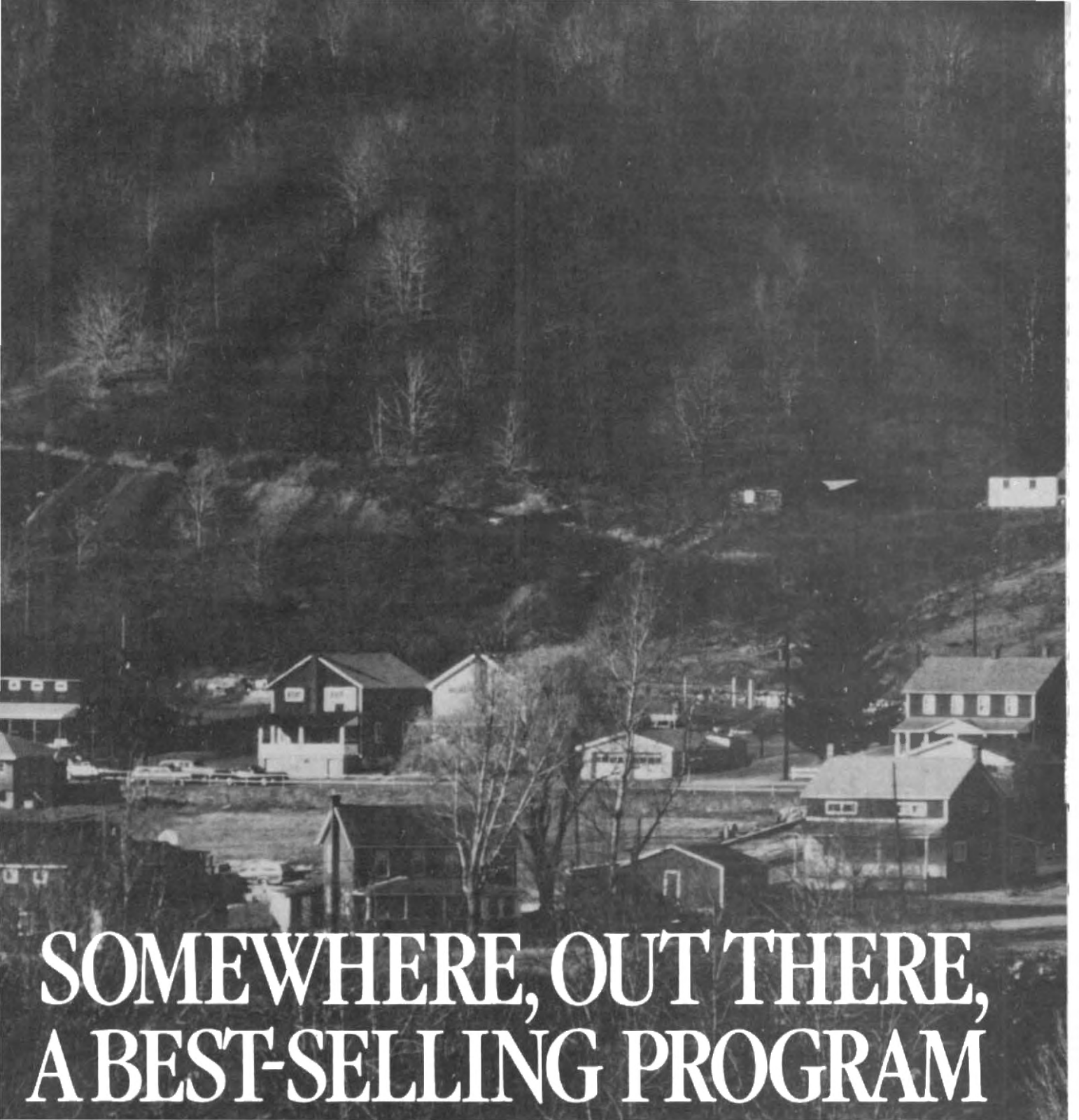
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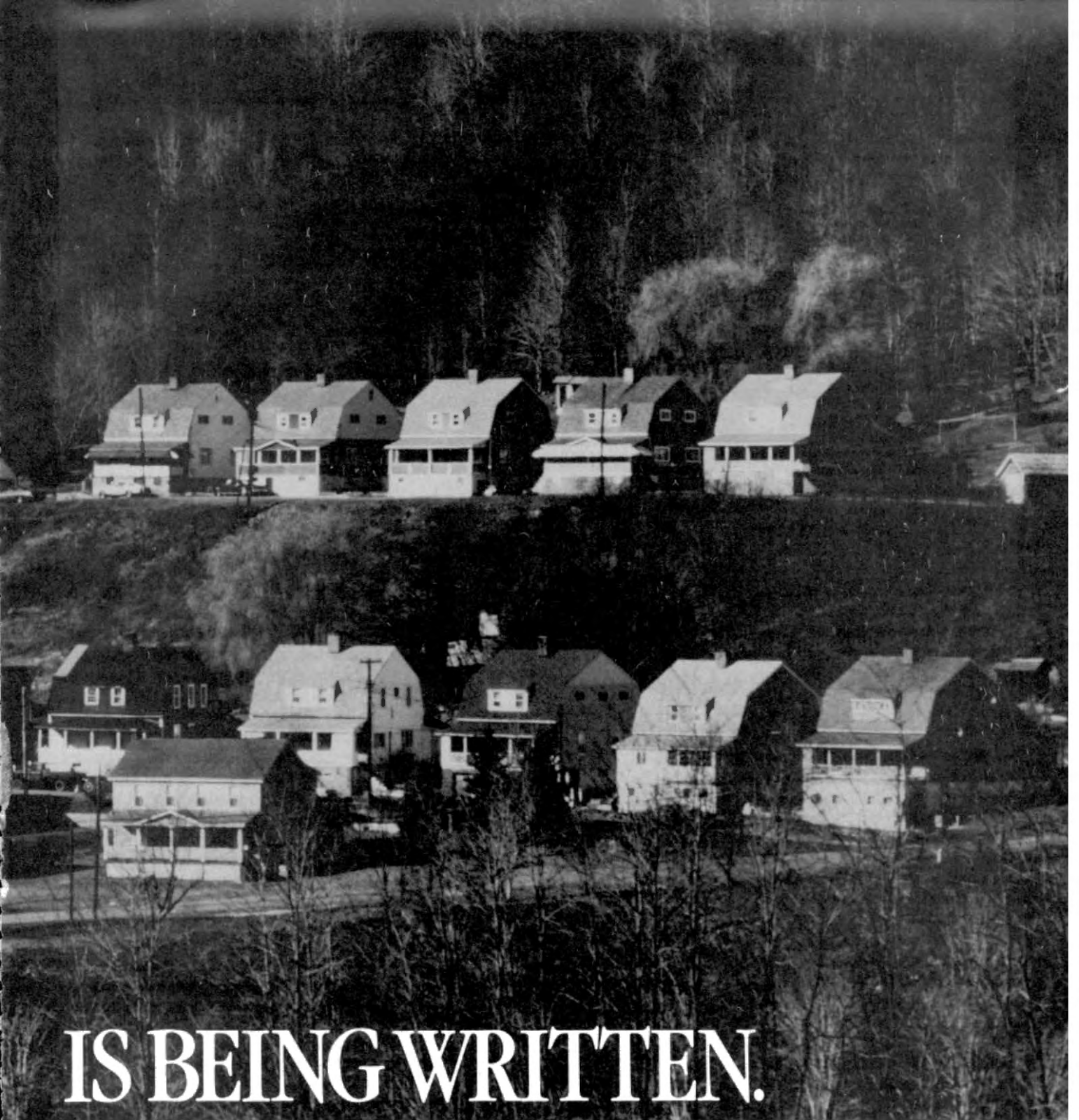
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Project Assessment Technique

by David A. Plyer

Should you buy that roll-top desk and install new carpeting in the office? This program helps you appreciate depreciation in advance.

Project Assessment		
* 1	Non-depreciable capital	750.00
2	Depreciable capital	4925.00
3	Expense (A)	3500.00
4	Expense (B)	75.00
5	Product inventory	
6	Net salvage	
7	First year net income	7500.00
8	Second year net income	8000.00
9	Third year net income	9500.00
10	Fourth year net income	9500.00
11	Fifth year net income	9500.00
12	Income tax rate (%)	43.00
13	Investment credit (%)	10.00
14	IRR (%)	58.10

Figure 1. Sample worksheet.

```

Program Listing

1000 ' PROJECT ASSESSMENT TECHNIQUE
1010 ' SOFTWARE TECHNOLOGIES
1020 '
1030 '
1040 ' THIS PROGRAM COMPUTES INTERNAL RATE OF RETURN
1050 '
1060 '
1070 CLS
1080 CLEAR 150
1090 DIM V(14)
1100 V(12) = 43.00
1110 V(13) = 10.00
1120 AS = CHR$(230)
1130 TTLS = "PROJECT ASSESSMENT"
1140 A = -1
1150 I = 1

```

Listing continued

Project Assessment Technique (PAT) is a Level II Basic program for the TRS-80 Model I/III computer equipped with 16K of memory. It calculates the rate of return on an investment and lets you play "what if" games that help you choose between several business alternatives.

PAT displays a worksheet of 14 lines. You enter data about your project into the first 13 lines. PAT then computes the internal rate of return (IRR) based on your information and puts the answer in line 14. This number is a summary of the facts of your proposal, which you can compare with the IRRs of other projects. The larger the percent, the more desirable your venture.

PAT makes these assumptions:

- The project must prove itself within five years.
- All start-up expenditures occur at the same time.
- Capital is recovered at the rate of 20 percent per year.
- Product inventory is recovered fully in year five.

The Worksheet

PAT displays the worksheet shown in Fig. 1.

The mode indicator is < >. In addition to AUTO, there is MANL for

The Key Box

Model I or III
16K RAM
Cassette or Disk Basic

manual mode, PRNT for printing, and CALC for calculating the IRR percent. See the commands section for an explanation of these indicators.

The asterisk is the marker. It tells you where next to enter data. In the Auto mode the marker automatically advances to the next line when you press the enter key. You may move it up and down with the appropriate arrows (see Commands).

You can enter a title of up to 35 characters long. The title is automatically centered when you hit the enter key.

Line 1, Non-depreciable Capital, is the sum of all non-depreciable capital associated with a project. Examples include buildings and land improvements (items that do not wear out).

Line 2, Depreciable Capital, is the sum of all depreciable capital needed to start a project. This includes tools, furniture or machinery (items that wear out). The total is fully recovered in a straight-line fashion over five years.

Line 3, Expense (A), is the sum of all development costs, supplies, and so on necessary to initiate a project. Line 4, Expense (B), is the same as line 3. PAT adds Expenses A and B and treats them as one. They are shown as separate items for your convenience.

Line 5, Product Inventory, is the sales value of items produced but not yet sold. This is an annual average assumed to remain fixed during the five-year life of the project. It is non-depreciable and is fully recovered in year five.

Line 6, Net Salvage, is the difference between the value received for facilities made obsolete by the new project and the cost to remove them. If cost exceeds value received then enter a negative number.

Lines 7-11, Net Income, are the forecast of the income this project will generate. The amount entered in each line is the difference between income and expenses for wages, taxes, and so on in the corresponding year.

Line 12, Income Tax Rate (percent), is the corporate tax rate on income. Unless you enter another value, PAT uses 43 percent. Consult the IRS for the latest information.

Line 13, Investment Credit (percent), is a one-time tax deduction based upon the amount of depreciable capital invested in line 2. PAT assumes a tax credit of 10 percent. Consult the IRS for the current tax credit on capital having a five-year life.

Line 14, IRR (percent), is your barometer for the project. It summarizes the first 13 lines of the worksheet. The

Listing continued

```

1160 I1 = 1
1170 K = 1
1180 K1 = 0
1190 K2 = 0
1200 K3 = 1
1210 K4 = 0
1220 '
1230 '
1240 ' TITLE PAGE
1250 PRINT@276,"PROJECT ASSESSEMENT TECHNIQUE";
1260 PRINT@351,"P A T";
1270 PRINT@795,"A PRODUCT OF"
1280 PRINT@854,"SOFTWARE TECHNOLOGIES";
1290 PRINT@926,"1981";
1300 '
1310 FOR J = 1 TO 100
1320 M$ = INKEY$
1330 IF M$ <> "" GOTO 5870
1340 NEXT J
1350 K3 = K3 * -1
1360 IF K3 > 0 GOTO 1400
1370 PRINT@ 532, CHR$(250);
1380 GOTO 1310
1390 '
1400 PRINT@ 532, "PRESS SPACE BAR TO CONTINUE";
1410 GOTO 1310
1420 '
1430 '
1440 ' DISPLAY WORKSHEET
1450 PRINT@(INT(((35-LEN(TL$))/2))+9,TL$
1460 PRINT@ 70," 1 NON-DEPRECIABLE CAPTL : "
1470 PRINT@134," 2 DEPRECIABLE CAPITAL : "
1480 PRINT@198," 3 EXPENSE (A) : "
1490 PRINT@262," 4 EXPENSE (B) : "
1500 PRINT@326," 5 PRODUCT INVENTORY : "
1510 PRINT@390," 6 NET SALVAGE : "
1520 PRINT@454," 7 1ST YEAR NET INCOME : "
1530 PRINT@518," 8 2ND YEAR NET INCOME : "
1540 PRINT@582," 9 3RD YEAR NET INCOME : "
1550 PRINT@646," 10 4TH YEAR NET INCOME : "
1560 PRINT@710," 11 5TH YEAR NET INCOME : "
1570 PRINT@774," 12 INCOME TAX RATE(%): "
1580 PRINT@838," 13 INVESTMENT CREDIT(%): "
1590 PRINT@902," 14 IRR(%): "
1600 '
1610 '
1620 ' INITIALIZE VALUES IN WORKSHEET
1630 FOR I=1TO 14
1640 PRINT@ (64 * I + 35), A$;
1650 IF V(I) = 0 GOTO 1730
1660 IF I <> 14 GOTO 1710
1670 PRINT@ 931, ;
1680 PRINTUSING "#####.# "; V(14);
1690 GOTO 1730
1700 '
1710 PRINT@ (64 * I + 35), ;
1720 PRINTUSING "#####.##"; V(I);
1730 NEXT I
1740 '
1750 ' POSITION MARKER (*)
1760 I = I1
1770 GOTO 1810
1780 '
1790 I = 1
1800 '
1810 PRINT@ (64 * I + 7), "***;
1820 '
1830 ' DETERMINE MODE <>
1840 IF A > 0 GOTO 1880
1850 PRINT@ 58, "<AUTO>";
1860 GOTO 1930
1870 '
1880 PRINT@ 58, "<MANL>";
1890 GOTO 1930
1900 '
1910 '
1920 ' KEYBOARD SCAN ROUTINE
1930 M$ = INKEY$
1940 IF M$ <> "" GOTO 2090
1950 GOSUB 2000
1960 GOTO 1930
1970 '
1980 '
1990 ' MARKER FLASH SUBROUTINE
2000 FOR X = 1 TO 20
2010 NEXT X
2020 K3 = K3 * -1
2030 IF K3 < 0 GOTO 2070
2040 PRINT@ (64 * I + 7), " ";
2050 RETURN
2060 '
2070 PRINT@ (64 * I + 7), "***;
2080 RETURN

```

Listing continued

The following are multi-key commands. Key in amount then press
 enter to save amount keyed in
 clear to erase amount keyed in
 + - */ to modify a value by amount keyed in
 I to inflate income from * to year five by amount keyed in

The following are single key commands. Just press
 A to disable or enable automatic mode
 C to compute IRR (%)
 D to duplicate income from * to year five
 E to end program and clear screen
 H to recall instructions—press space bar to continue
 P to print contents of screen
 R to reset all values to 0 or default amounts
 T to revise title
 Up/Down arrow to move * up and down

Table 1. PAT commands.

larger the value, the more attractive the proposal is. If you were to take each year's income, adjust it for taxes and tax credits (lines 12 and 13), discount it by the IRR (percent), and add them together, their sum would equal your total investment in lines 1-6.

Entering Data

PAT operates in the Auto mode unless you tell it otherwise (see Commands). In this mode all entries are made by keying in a number and then hitting enter. The value is automatically right-justified and the marker (*) moved to the next line. To skip a line just hit enter. Continue entering data until you reach line 13. Now when you hit enter, PAT computes the IRR,

Listing continued

```

2090 '
2100 '
2110 FOR X% = 48 TO 57 : '*** ( 0-9 ) ***
2120 IF M$ <> CHR$(X%) GOTO 2150
2130 K = K + 1
2140 GOTO 4380
2150 NEXT X%
2160 '
2170 IF M$ <> "." GOTO 2240: ' *** ( . ) ***
2180 IF K1 <> 0 GOTO 1930: '
2190 K1 = 1
2200 K2 = 1
2210 K = 1
2220 GOTO 4460
2230 '
2240 IF M$ <> "T" GOTO 2400: ' *** ( T ) ***
2250 K = 0
2260 K1 = 1
2270 K2 = 0
2280 I1 = I
2290 I = 0
2300 T$ = ""
2310 PRINT@ (64 * I1 + 7), " ";
2320 IF V(I1) <> 0 GOTO 2360
2330 PRINT@ (64 * I1 + 35), AS;
2340 GOTO 6570
2350 '
2360 PRINT@ (64 * I1 + 35), ;
2370 PRINTUSING "*****.##"; V(I1);
2380 GOTO 6570
2390 '
2400 IF M$ = "E" GOTO 7000: ' *** ( E ) ***
2410 IF M$ <> CHR$(31) GOTO 2590: ' ** (CLEAR) **
2420 IF T$ = "" GOTO 1930
2430 PRINT@ (64 * I + 35), AS;
2440 IF V(I) = 0 GOTO 2530
2450 IF I <> 14 GOTO 2500
2460 PRINT@ 931, ;
2470 PRINTUSING "*****.## "; V(14);
2480 GOTO 2530
2490 '
2500 PRINT@ (64 * I + 35), ;
2510 PRINTUSING "*****.##"; V(I);
2520 '
2530 GOSUB 4720
2540 K2 = 0
2550 '
2560 IF I = 14 AND A < 0 GOTO 1790
2570 GOTO 1930
2580 '
2590 IF M$ <> "H" GOTO 2630: ' *** ( H ) ***
2600 GOSUB 4720
2610 GOTO 5870
2620 '
2630 IF M$ <> "C" GOTO 2700: ' *** ( C ) ***
2640 PRINT@ (64 * I + 7), " ";
2650 PRINT@ 58, "<CALC>";
2660 GOSUB 4720
2670 I1 = I
2680 GOTO 4860
2690 '
2700 IF M$ <> "R" GOTO 2830: ' *** ( R ) ***
2710 I1 = 1

```

Listing continued

“Unlike the multi-key commands... single-key commands are immediate.”

displays the answer in line 14, and returns the marker to line 1. This is the simplest way to use PAT. Refer to the next section, Commands, for a more versatile approach.

Commands

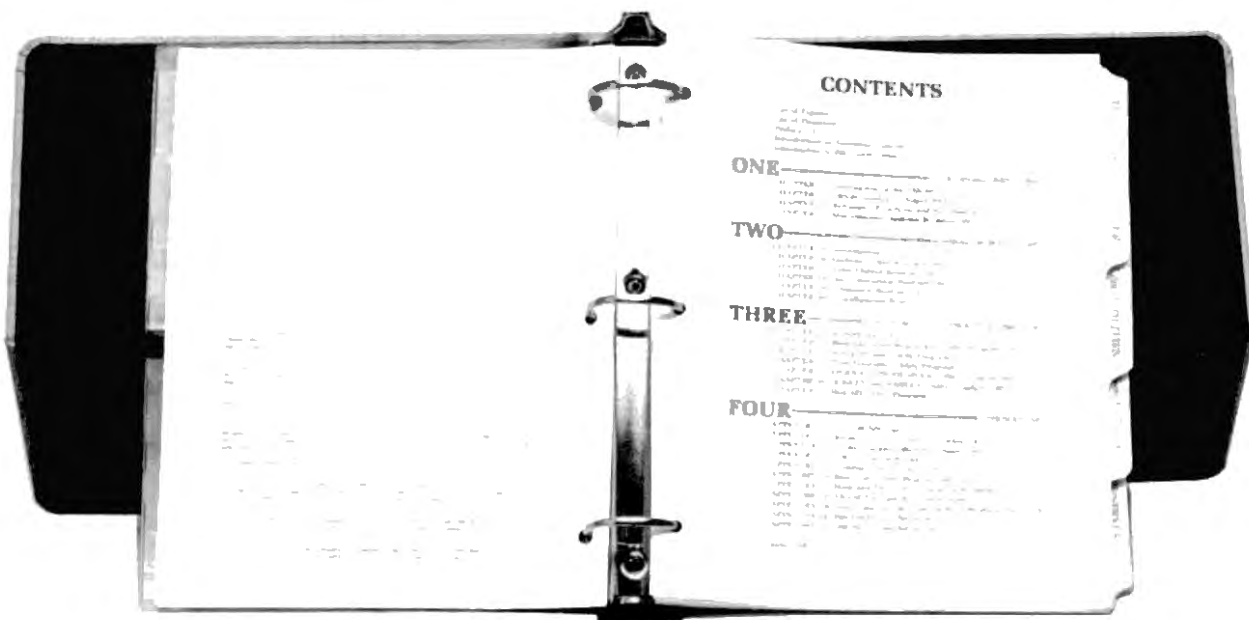
PAT recognizes 17 commands. They are summarized in Table 1 and can be recalled at any time by typing H for help.

Use multi-key commands when entering data. They are multi-key because you first type DATA, then press the enter key to accept the value keyed in. This also advances the marker in the Auto mode.

Press clear to erase the value keyed in and reinstate the current amount.

Press + - */ to modify a value by an amount just keyed in. For example, if line 9 is currently 2,500 and you wish to reduce it by 25 percent just type .75*. PAT automatically multiplies 2,500 by .75 and displays 1,875. Addition, subtraction, and division work the same way: Key in the operator, then the modifier. You don't have to use the shift key for multiplication or addition.

Press I to inflate income forecasts (lines 7-11) from the marker to the fifth year (line 11). For example, if the forecast in lines 7-11 is to be inflated by 2 percent annually, first put the



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- how to write easy-to-use programs
- how to perform arithmetic operations
- how to use the undocumented Z80 instructions

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marker on line 7. Then type 2 and press I. PAT automatically calculates the inflated amount (compounds annually) and displays the new values in lines 8-11. The line addressed by the marker is assumed to be year zero in the compound interest formula and does not change.

Unlike the multi-key commands that require a two-step operation, the single-key commands are immediate. Just press one of these keys (do not press enter).

Press A to change from the automatic mode to the manual mode and back. Each time you press A the message in the upper right corner of the screen confirms the new mode. For example, AUTO tells you that you are in the automatic mode. Pressing the A key puts PAT into the manual mode and MANL appears in the upper right corner of the display. In the manual mode the only way to move the marker is with the up and down arrows. The manual mode allows you to move the marker to line 14. This lets you enter a desired IRR percent while PAT computes and displays the net incomes necessary to achieve it in lines 7-11. Pressing A again returns you to AUTO.

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Listing continued

```

2720 GOSUB 4720
2730 A = -1
2740 FOR X = 1 TO 11
2750 V(X) = 0
2760 NEXT X
2770 V(12) = 43.00
2780 V(13) = 10.00
2790 V(14) = 0
2800 PRINT@ (64 * I + 7), " ";
2810 GOTO 1620
2820
2830 IF M$ <> CHR$(10) GOTO 3170: ' **DN ARROW*
2840 IF T$ = "" GOTO 2870
2850 PRINT@ (64 * I + 35), A$;
2860
2870 IF I <> 14 GOTO 2930
2880 IF V(14) = 0 GOTO 2930
2890 PRINT@ 931, ;
2900 PRINTUSING "#####.##"; V(14);
2910 GOTO 2970
2920
2930 IF V(I) = 0 GOTO 2970
2940 PRINT@ (64 * I + 35), ;
2950 PRINTUSING "#####.##"; V(I);
2960
2970 PRINT@ (64 * I + 7), " ";
2980
2990 IF A > 0 GOTO 3070
3000 IF I <> 13 GOTO 3070
3010 IF M$ <> CHR$(13) GOTO 3070
3020 PRINT@ 839, " ";
3030 I = 1
3040 M$ = "C"
3050 GOTO 2630
3060
3070 I = I + 1
3080 GOSUB 4720
3090
3100 IF A > 0 GOTO 3140
3110 IF I <= 13 GOTO 1810
3120 GOTO 1790
3130
3140 IF I > 14 GOTO 1790
3150 GOTO 1810: '
3160
3170 IF M$ <> CHR$(91) GOTO 3430: ' **UP ARROW*
3180 IF T$ = "" GOTO 3210
3190 PRINT@ (64 * I + 35), A$;
3200
3210 IF I <> 14 GOTO 3270
3220 IF V(14) = 0 GOTO 3270
3230 PRINT@ 931, ;
3240 PRINTUSING "#####.##"; V(14);
3250 GOTO 3310
3260
3270 IF V(I) = 0 GOTO 3310
3280 PRINT@ (64 * I + 35), ;
3290 PRINTUSING "#####.##"; V(I);
3300
3310 PRINT@ (64 * I + 7), " ";
3320 I = I - 1
3330 GOSUB 4720
3340
3350 IF I >= 1 GOTO 1810
3360 IF A >= 0 GOTO 3400
3370 I = 13
3380 GOTO 1810
3390
3400 I = 14
3410 GOTO 1810
3420
3430 IF M$ <> "D" GOTO 3610: ' *** ( D ) ***
3440 IF T$ <> "" GOTO 3610
3450 IF I < 7 GOTO 3840
3460 IF I > 11 GOTO 3840
3470 FOR X = I TO 11
3480 V(X) = V(I)
3490 PRINT@ (64 * X + 35), A$;
3500 IF V(X) = 0 GOTO 3530
3510 PRINT@ (64 * X + 35), ;
3520 PRINTUSING "#####.##"; V(X);
3530 NEXT X
3540 PRINT@ 932, A$;
3550
3560 IF A > 0 GOTO 1810
3570 PRINT@ (64 * I + 7), " ";
3580 I = 11
3590 GOTO 1810
3600
3610 IF M$ <> "I" GOTO 3840: ' *** ( I ) ***
3620 IF I < 7 GOTO 1930
3630 IF I > 11 GOTO 1930

```

Listing continued

```

3640      PRINT@ 931, A$;
3650      V = VAL(T$) / 100
3660      FOR X = I TO 11
3670          V(X) = V(X) * ((1 + V) [ (X - I) ]
3680      NEXT X
3690
3700      PRINT@ (64 * I + 7), " ";
3710      FOR X = I TO 11
3720          PRINT@ (64 * X + 35), ;
3730          IF V(X) = 0 GOTO 3760
3740          PRINT@ (64 * X + 35), ;
3750          PRINTUSING "#####.###"; V(X);
3760      NEXT X
3770
3780      GOSUB 4720
3790
3800      IF A > 0 GOTO 1810
3810          I = 11
3820          GOTO 1810
3830
3840      IF K = 1 GOTO 4020: '          BEGIN SIGN TESTS
3850      IF MS <> "+" AND MS <> "; " GOTO 3890: '(ADD)***
3860          V(I) = V(I) + VAL(T$)
3870          GOTO 4540
3880
3890      IF MS <> "-" GOTO 3930: '          *** (SUB) ***
3900          V(I) = V(I) - VAL(T$)
3910          GOTO 4540
3920
3930      IF MS <> "*" AND MS <> "; " GOTO 3970: '(MLT)***
3940          V(I) = V(I) * VAL(T$)
3950          GOTO 4540
3960
3970      IF MS <> "/" GOTO 4020: '          *** (DIV) ***
3980          IF VAL(T$) = 0 GOTO 2420
3990          V(I) = V(I) / VAL(T$)
4000          GOTO 4540
4010
4020      IF MS = "-" GOTO 4050: '          *** ( - ) ***
4030      IF MS <> "+" AND MS <> "; " GOTO 4090: '( + ) ***
4040          MS = "+"
4050          IF K2 <> 0 GOTO 1930
4060          K2 = 1
4070          GOTO 4460
4080
4090      IF MS <> "A" GOTO 4220: '          *** ( A ) ***
4100          A = A * -1
4110          IF A < 0 GOTO 4150
4120          PRINT@ 58, "<MANL>";
4130          GOTO 4180
4140
4150          PRINT@ 58, "<AUTO>";
4160          GOTO 4180
4170
4180          IF I <> 14 GOTO 1930
4190          PRINT@ 903, " ";
4200          GOTO 2430
4210
4220      IF MS <> "P" GOTO 4310: '          *** ( P ) ***
4230      IF PEEK(14312) >= 128 GOTO 1930
4240          K = 1
4250          K1 = 0
4260          T$ = ""
4270          PRINT@ (64 * I + 7), " ";
4280          PRINT@ 58, "<PRNT>";
4290          GOTO 6320
4300
4310      IF MS <> CHR$(13) GOTO 1930: '          ** (ENTER) **
4320          IF T$ = "" GOTO 4540
4330          V(I) = VAL(T$)
4340          GOTO 4540
4350
4360
4370      CONSTRUCT DIGIT STRING
4380      IF K <= 7 GOTO 4460
4390          T$ = "TOO BIG! "
4400          PRINT@ (64 * I + 35), T$;
4410          K = 1
4420          K1 = 0
4430          K2 = 0
4440          GOTO 1930
4450
4460      IF T$ <> "TOO BIG! " GOTO 4490
4470          T$ = ""
4480
4490          T$ = T$ + M$
4500          PRINT@ (64 * I + 35), A$;
4510          PRINT@ (64 * I + 35), T$;
4520          GOTO 1930
4530
4540          PRINT@ (64 * I + 35), A$;
4550          PRINT@ 931, A$;

```

Listing continued

Press C to compute the IRR percent at any time and from any line. When you press C the marker disappears, CALC replaces the mode in the upper right corner of the screen, and a series of numbers flashes in line 14. When the correct IRR percent is found the display remains fixed, the upper right corner again displays the mode, and the marker reappears. This takes about 10 seconds.

Press D to duplicate, through year five (line 11), an income addressed by the marker. For an example, the income level in year two will remain constant through year five. Rather than entering that value over and over, just move the marker to year two (line 8) and press D. PAT automatically places that amount in years 3-5.

Press E to end the session and clear the screen. When you press E the screen clears and Ready appears. You can now enter other programs or run PAT. Pressing the break key has the same effect but does not clear the screen.

Press H to recall the command list. You may press H at any time. Doing so clears the screen and replaces the worksheet with a list and brief descrip-

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tion of all commands. Then, pressing the space bar reinstates the worksheet as it was before you called for help. If you press H while entering a value, that value is automatically cleared just as though you had pressed C.

Press P to print the screen's contents. You can call for a copy of the worksheet or list of commands at any time. When PAT is printing, PRNT appears in the upper right of the screen.

"You can call for a copy of the worksheet ... at any time."

Press R to reset all values to zero and default amounts. Pressing R at any time sets the values of lines 1-11 and line 14 to zero (zeros appear as blanks). At the same time, the percentages in lines 12 and 13 become 43 and 10, respectively. Finally, the marker is returned to line 1 and PAT shifts to the Auto mode.

Press T to revise the title. Pressing T at any time moves the marker to the title

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Listing continued

```

4560 IF I <> 14 THEN V(14) = 0
4570 IF I = 14 GOTO 4590
4580 IF V(I) = 0 GOTO 4680
4590 IF I <> 14 GOTO 4640
4600 PRINT@ 931, ;
4610 PRINTUSING "#####.##"; V(14);
4620 GOTO 4680
4630 '
4640 PRINT@ (64 * I + 35), ;
4650 PRINTUSING "#####.##"; V(I);
4660 GOTO 4680
4670 '
4680 GOSUB 4720
4690 GOTO 4800
4700 '
4710 '
4720 K = 1
4730 K1 = 0
4740 K2 = 0
4750 TS = ""
4760 RETURN
4770 '
4780 '
4790 '
4800 ' BEGIN CALCULATIONS FOR ANNUAL INCOME REQUIREMENTS AND IRR
%
4810 IF I = 14 GOTO 4850
4820 IF A < 0 GOTO 2840
4830 GOTO 1930
4840 '
4850 PRINT@ 903, " ";
4860 T2 = V(2) * (V(12) / 500) : 'ANNUAL DEPRECIATION OV
ER 5 YEARS
4870 T3 = 1 - (V(12) / 100) : 'NET TAX RATE
4880 T(1) = (V(3) + V(4)) * (V(12) / 100) : 'INVESTMENT CREDIT($
4890 T(1) = T(1) + (V(2) * (V(13) / 100)) : 'TOTAL TAX CREDIT($
4900 V7 = V(1) + V(2) + V(3) + V(4) + V(5) - V(6) : 'TOTAL EXPENDI
TURES
4910 '
4920 IF M$ = "C" GOTO 5290
4930 IF V7 > 0 GOTO 4990
4940 PRINT@ 931, A$;
4950 V(14) = 0
4960 GOTO 1810
4970 '
4980 ' CALCULATE EQUAL ANNUAL INCOME REQUIREMENTS FOR GIVEN IRR%
4990 S = 0
5000 FOR Y = 1 TO 5 : 'ADD DISCOUNT FACTORS F
OR EACH OF 5 YRS
5010 S = S + 1 / ((1 + V(14) / 100) [ Y]
5020 NEXT Y
5030 T = (V7 - T2 * S - T(1) / (1 + V(14) / 100)) / S : 'TOTAL GR
OSS INCOME
5040 TX = T / T3 : 'TOTAL NET INCOME
5050 IF V(5) > 0 GOTO 5090 : 'CALCULATE PRODUCT INVE
NTORY EFFECT
5060 P1 = 0
5070 GOTO 5120
5080 '
5090 P1 = V(5) / T3
5100 GOTO 5120
5110 '
5120 FOR Y = 7 TO 10
5130 V(Y) = TX
5140 PRINT@ (64 * Y + 35), ;
5150 IF V(Y) = 0 GOTO 5180
5160 PRINT@ (64 * Y + 35), ;
5170 PRINTUSING "#####.##"; V(Y);
5180 NEXT Y
5190 '
5200 V(11) = TX - P1 : 'SUBTRACT INVENTORY FRO
M YR 5 INCOME
5210 PRINT@ 739, A$;
5220 PRINT@ 739, ;
5230 PRINTUSING "#####.##"; V(11);
5240 GOTO 1810
5250 '
5260 '
5270 '
5280 ' COMPUTE IRR% USING BINARY SEARCH METHOD
5290 IF V7 > 0 GOTO 5350
5300 PRINT@ 931, "INDETERMINANT";
5310 I = 11
5320 V(14) = 0
5330 GOTO 1810
5340 '
5350 FOR Y = 1 TO 5
5360 S(Y) = V(Y + 6) * T3 : 'COMPUTE NET INCOME
5370 R(Y) = S(Y) + T(Y) + T2 : 'ADD TAX CREDITS AND DEP
RECIATION
5380 NEXT Y
5390 '

```

Listing continued

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In order to provide the lowest possible price to the end user, **MICRO MAINFRAME** does not accept credit cards. You may either pre-pay your shipment, or we will ship COD. All orders over \$600 require a 10% deposit upon placement. All non-certified funds will be held a minimum of 3 weeks to allow them to clear. Shipping and handling charges are extra and are not included in the prices above. **MODEL-III ** COMPUTERS** are shipped by truck only. Please phone MMF to obtain shipping and handling fees to your location.

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11325 Sunrise Gold Circle
Building A
Rancho Cordova, CA 95670
(916) 635-3997

```

5400 IF V(5) <= 0 GOTO 5450:' ACCOUNT FOR INVENTORY
5410 S(5) = S(5) + V(5)
5420 R(5) = S(5) + T(5) + T2
5430 GOTO 5450
5440 '
5450 LO = 0 : 'SET LOW LIMIT FOR IRR
5460 HI = 10 : 'SET HI LIMIT FOR IRR
5470 I = 5 : 'FIRST GUESS AT IRR
5480 P = 0 : 'SET TOTAL DISCOUNTED CA
SH FLO TO 0
5490 FOR Y = 1 TO 5
5500 P(Y) = R(Y) / ((1 + I) [ Y] : 'DISCOUNT ANNUAL CASH FL
O
5510 P = P + P(Y) : 'CUMULATE DISCOUNTED CAS
H FLO
5520 NEXT Y
5530 IF ABS(V7 - P) > .01 GOTO 5610:' TEST DCF AGAINST TOTAL
INVESTMENT
5540 V(14) = I * 100 : 'PASS IF DIFFERENCE WITH
IN .01 OF 0
5550 PRINT@ 931, A$;
5560 PRINT@ 931, ;
5570 PRINTUSING "#####.## "; V(14);
5580 I = I1
5590 GOTO 1810
5600 '
5610 IF (V7 - P) < 0 GOTO 5650:' SET NEW VALUES FOR HI
AND LO
5620 HI = I
5630 GOTO 5680
5640 '
5650 LO = I
5660 GOTO 5680
5670 '
5680 I = ((HI - LO) / 2) + LO : 'NEXT GUESS AT IRR
5690 PRINT@ 931, A$;
5700 PRINT@ 931, I; : 'DISPLAY IRR IN LINE 14
5710 '
5720 IF I <= 9.99 GOTO 5780:' TEST UPPER LIMIT OF IRR

5730 PRINT@ 932, " >1000% ";
5740 I = I1
5750 V(14) = 0
5760 GOTO 1810
5770 '
5780 IF I >= .001 GOTO 5480:' TEST LOWER LIMIT OF IRR

5790 PRINT@ 932, " <.1% ";
5800 I = I1
5810 V(14) = 0
5820 GOTO 1810
5830 '
5840 '
5850 '
5860 ' DISPLAY LIST OF COMMANDS
5870 CLS
5880 PRINT"THE FOLLOWING ARE MULTI-KEY COMMANDS. KEY IN AMOUNT T
HEN PRESS"
5890 PRINT" ENTER TO SAVE AMOUNT KEYED IN"
5900 PRINT" CLEAR TO ERASE AMOUNT KEYED IN"
5910 PRINT" +-* / TO MODIFY A VALUE BY AMOUNT KEYED IN"
5920 PRINT" I TO INFLATE INCOME FROM * TO YR 5 BY AMOUNT
KEYED IN"
5930 PRINT"THE FOLLOWING ARE SINGLE KEY COMMANDS. JUST PRESS"
5940 PRINT" A TO DISABLE OR ENABLE AUTOMATIC MODE"
5950 PRINT" C TO COMPUTE IRR(%)"
5960 PRINT" D TO DUPLICATE INCOME FROM * TO YR 5"
5970 PRINT" E TO END PROGRAM AND CLEAR SCREEN"
5980 PRINT" H TO RECALL INSTRUCTIONS - PRESS SPACE BAR T
O CONTINUE"
5990 PRINT" P TO PRINT WORKSHEET OR THIS LIST"
6000 PRINT" R TO RESET ALL VALUES TO 0 OR DEFAULT AMOUNT
S"
6010 PRINT" T TO REVISE TITLE"
6020 PRINT" UP/DN ARROW TO MOVE * UP AND DOWN"
6030 '
6040 FOR J = 1 TO 100
6050 M$ = INKEY$
6060 IF M$ <> "" GOTO 6160
6070 NEXT J
6080 K3 = K3 * -1
6090 IF K3 < 0 GOTO 6130
6100 PRINT@ 676, CHR$(219);
6110 GOTO 6040
6120 '
6130 PRINT@ 676, "PRESS SPACE BAR TO CONTINUE";
6140 GOTO 6040
6150 '
6160 IF M$ <> "P" GOTO 6210
6170 IF PEEK(14312) >= 128 GOTO 6240

```

Listing continued

line. You may then key in any string of alphanumeric characters of up to 35 characters. Use the left arrow to backspace. When the string is complete press enter. PAT automatically centers the title and returns the marker to the line it addressed when you pushed T. When you are changing the title PAT recognizes only enter and clear.

Press the up or down arrows to move the marker up and down the worksheet. Pressing the up arrow when the marker is at line 1 moves the marker to line 14 in the manual mode and line 13 in the automatic mode. Similarly, pressing the down arrow when the marker is at line 13 repositions it at line 1 in the automatic mode and from line 14 to line 1 in the manual mode.

Error Messages

There are only two error conditions. Both involve the number of digits in a value and neither is serious. TOO BIG! appears when you attempt to key in more than the limit of six significant digits. The next keystroke clears the message.

The percent sign indicates that the result of a calculation exceeds the six significant-digit limit. The answer is correct but it will be preceded by % and the decimal points will not line up. In this case you may wish to divide all values by 10 or 100. As long as all amounts have the same relative magnitude the IRR percent does not change.

Sample Problems

We plan to buy office furniture for \$1,125, incur miscellaneous expenses of \$75, add soundproofing to the ceiling of our office at a cost of \$750, and install a personal computer valued at \$2,300 and a printer priced at \$1,500. We also plan to develop software for this machine that will speed order processing. The cost of this development effort is \$3,500. We expect to generate \$7,500 in additional net income the first year, \$8,000 the next, and \$9,500 in years 3-5. How does this proposal compare with another having an IRR percent of 27.8?

First, be sure that PAT is in the automatic mode; Auto should appear in the upper right corner of the screen. If MANL is there press A to change to Auto and use the up or down arrows to position the marker at line 1.

Next, identify all non-depreciable expenses. There is only one, the new ceiling. Key in 750 and press enter. Since the office furniture, computer and printer are depreciable capital, PAT

treats them the same. So we add them and enter 4925. Alternatively you could put PAT into manual, use the plus (+) command, then return to automatic.

The third and fourth items on the worksheet are expenses. We have development and miscellaneous costs. PAT treats them the same so we could enter their sum. However, they are so obviously different that we will keep them separate. Therefore, we enter 3,500 and then 75. The marker is now on line 5, but we have nothing to type here or on line 6 so we skip them by pressing enter once to advance from line 5 to line 6 and again to move to line 7. Now we enter the net incomes as 7500, 8000, 9500, 9500, and 9500. There is no change in line 12, so again press enter. This brings us to line 13. Once more there is nothing to alter so hit enter.

When you press enter at line 13, the marker disappears, <CALC> replaces the mode in the upper right corner of the screen, and numbers flash in line 14. After about 10 seconds 58.1 remains in line 14, the marker returns to line 1, and Auto reappears. The completed worksheet appears in Fig. 2. This project's IRR is much larger than the other project's 27.8, so we'll take this one.

What if development costs go up 15 percent or sales drop by half? Is this project still sound? Try these alternatives and see. You don't have to enter all new information. Simply change the lines that apply. The manual mode may be helpful here and you might want to title each successive "what if." ■

Contact David Plyer at 733 Crescent Parkway, Westfield, NJ 07090.

Project Assessment	
* 1 Non-depreciable capital	:
2 Depreciable capital	:
3 Expense (A)	:
4 Expense (B)	:
5 Product inventory	:
6 Net salvage	:
7 First year net income	:
8 Second year net income	:
9 Third year net income	:
10 Fourth year net income	:
11 Fifth year net income	:
12 Income tax rate (%)	: 43.00
13 Investment credit (%)	: 10.00
14 IRR (%)	:

Figure 2. Sample completed worksheet.

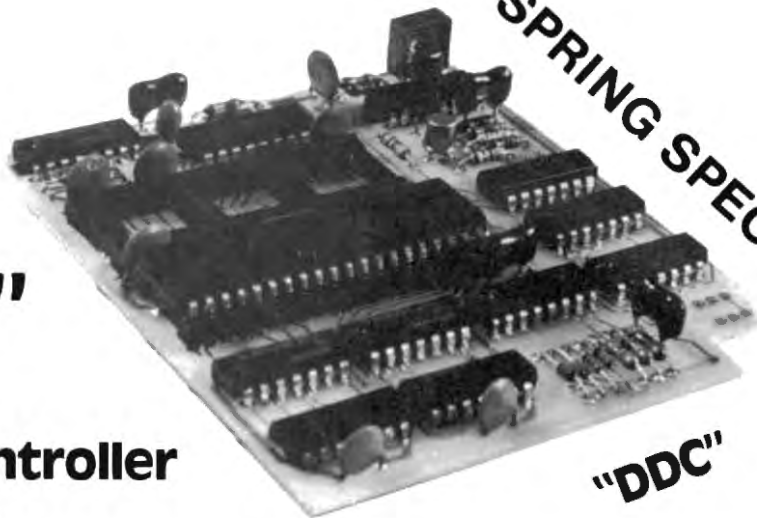
Listing continued

```

6180 K4 = 1
6190 GOTO 6310
6200 '
6210 IF M$ = "E" GOTO 7000
6220 IF M$ = "H" GOTO 6040
6230 '
6240 CLS
6250 I1 = I
6260 GOTO 1450
6270 '
6280 '
6290 '
6300 ' LINE PRINT ROUTINE CAN BE CALLED FROM HELP LIST OR WORKS
HEET
6310 PRINT@ (64 * I + 7), " ";
6320 FOR X=15360 TO 16320 STEP 64 : 'CHECK ALL VIDEO MEMORY
ADDRESSES
6330 FOR Z = 0 TO 63
6340 Z1 = PEEK(X + Z) : 'EXAMINE CONTENTS OF VI
DEO MEMORY
6350 IF Z1 < 32 THEN Z1 = Z1 + 64 : 'ADDS MSB 4TH BIT
6360 IF Z1 = 60 AND X < 15424 GOTO 6390 : 'AVOID PRINTING
<PRNT>
6370 LPRINT CHR$(Z1); : ' PRINT CONTENTS
6380 NEXT Z : 'MOVE TO NEXT MEMORY LO
CATION
6390 LPRINT : 'MOVE PAPER UP ONE LINE
: 'MOVE TO NEXT LINE OF V
6400 NEXT X
IDEO MEMORY
6410 IF K4 = 0 GOTO 6450
6420 K4 = 0
6430 GOTO 6040
6440 '
6450 I1 = I
6460 '
6470 IF A > 0 GOTO 6510
6480 PRINT@ 58, "<AUTO>";
6490 GOTO 1810
6500 '
6510 PRINT@ 58, "<MANL>";
6520 GOTO 1810
6530 '
6540 '
6550 '
6560 ' TITLE ENTRY AND CENTER ROUTINE
6570 PRINT@ 7, "***";
6580 PRINT@ 9, CHR$(95);
6590 PRINT CHR$(240);
6600 TTL$ = ""
6610 M$ = INKEY$
6620 IF M$ <> "" GOTO 6660
6630 GOSUB 2000
6640 GOTO 6610
6650 '
6660 IF M$ = CHR$(9) GOTO 6610
6670 IF M$ = CHR$(10) GOTO 6610
6680 FOR X = 24 TO 27
6690 IF M$ = CHR$(X) GOTO 6610
6700 NEXT X
6710 IF M$ <> CHR$(8) GOTO 6790
6720 IF LEN(TTL$) - 1 = -1 GOTO 6610
6730 TTL$ = LEFT$(TTL$, (LEN(TTL$) - 1))
6740 PRINT@ (LEN(TTL$) + 1) + 8, " ";
6750 PRINT@ (LEN(TTL$) + 1) + 8, CHR$(95);
6760 K = K - 1
6770 GOTO 6610
6780 '
6790 IF M$ = CHR$(31) GOTO 6580
6800 IF M$ = CHR$(13) GOTO 6920
6810 IF LEN(TTL$) = 35 GOTO 6610
6820 IF M$ <> " " GOTO 6860
6830 IF K = 0 GOTO 6610
6840 GOTO 6860
6850 '
6860 TTL$ = TTL$ + M$
6870 PRINT@ LEN(TTL$) + 8, M$;
6880 PRINT CHR$(95);
6890 K = K + 1
6900 GOTO 6610
6910 '
6920 PRINT@ 6, CHR$(244);
6930 K = 1
6940 L = (INT((35 - LEN(TTL$))/2)) + 9
6950 PRINT@ L, TTL$;
6960 GOTO 1760
6970 '
6980 '
6990 '
7000 CLS
7010 END

```

Aerocomp's Proven Best-By Test! The "DDC"



SPRING SPECIAL

"DDC"

Double Density Controller

★ Technical Superiority

At last! A double density controller for Model I with HIGHER PROBABILITY OF DATA RECOVERY THAN WITH ANY OTHER DOUBLE DENSITY CONTROLLER ON THE MARKET TODAY! The "DDC" from Aerocomp. No need to worry about the problems that keep cropping up on existing products. AEROCOMP'S new analog design phase lock loop data separator has a wider capture window than the digital types currently on the market. This allows high resolution data centering. The finest resolution available with digital circuitry is 125 ns (nano seconds). The "DDC" analog circuit allows infinitely variable tuning. Attack and settling times are optimum for 5-1/4 inch diskettes. The units presently on the market use a write precompensation circuit that is very "sloppy". Board to board tolerance is extremely wide - in the order of ± 100 ns. The "DDC" is accurate to within ± 20 ns. The bottomline is state of the art reliability!

★ Test Proven

Tests were conducted on AEROCOMP'S "DDC", Percom's "Doubler A" and "Doubler II" and LNW's "LNDOUBLER" using a Radio Shack TRS80 Model I, Level 2, 48 K with TRS80 Expansion Interface and a Percom TFD100 disk drive (Siemens Model 82). Diskette was Memorex 3401. The test diskette chosen was a well used piece of media to determine performance under adverse conditions. The various double density adapters were installed sequentially in the expansion interface.

The test consisted of formatting 40 tracks on the diskette and writing a 6DB6 data pattern on all tracks. The 6DB6 pattern was chosen because it is recommended as a "worst case" test by manufacturers of drives and diskettes. An attempt was then made to read each sector on the disk once - no retries. Operating system was Newdos/80, Version 1.0, with Double Zap, Version 2.0. Unreadable sectors were totalled and recorded. The test was run ten times with each double density controller and the data averaged. Test results are shown in the table.

★ Features

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

★ Value **\$119.95**

for the Best DD Controller on the market.

★ TEST RESULTS ★

MFR & PRODUCT	SECTORS LOCKED OUT (AVG)
AEROCOMP "DDC"	0
PERCOM "DOUBLER II"	18
PERCOM "DOUBLER A"	250
LNW "LNDOUBLER"	202

Note: test results available upon written request. All tests conducted prior to 8-25-81

Aerocomp's 14 day money back guarantee applies to hardware only. Specials will be prorated. Shipping \$2.00 in Cont. US. See opposite page for details

SPRING SPECIAL
"DDC" and LDOS

\$169.95

\$149.95 for "DDC" with DOSPLUS 3.3D (limited quantity)

Data Separators

The advances that make the "DDC" great are incorporated in the new AEROCOMP Single Density Data Separator ("SDS") and Double Density Data Separator ("DDS").

★ Has your original manufacturer left you holding the bag?

If you already own a Percom "Doubler A", "Doubler II" or LNW "LNDOUBLER" or Superbrain, the AEROCOMP "DDS" will make it right. Look at the test results:

MFR. & PRODUCT	SECTORS LOCKED OUT	
	WITHOUT "DDS"	WITH "DDS"
PERCOM "DOUBLER II"	18	1
PERCOM "DOUBLER A"	250	0
LNW "LNDOUBLER"	202	0

Note: Same test procedures as "DDC".
* Trademark of Percom Data Co.
** Trademark of LNW
*** Trademark of Tandy Corporation

**Plugs directly into your existing
Double Density Controller.**

★ "DDS" **\$49.95**
(Use 1791 chip from your DD Controller)

★ "DDS" with disk controller
chip included **\$79.95**

★ Disk controller
chip **\$34.95**

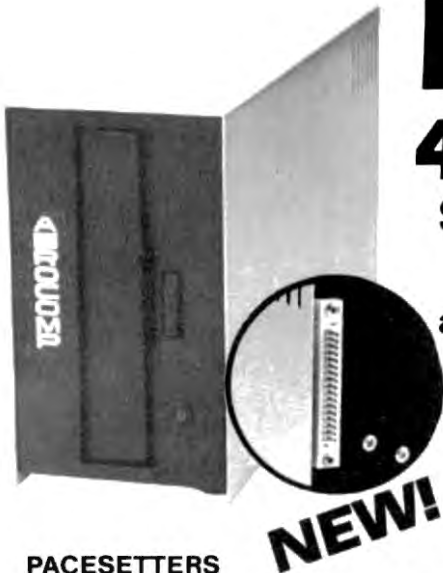
(Shipping \$2.00 Cont. US - see opposite
page for details)

Do you need a Single Density Data Separator?

The internal data separator in the WD1771 chip (R/S Expansion Interface) is NOT recommended by WD for reliable data transfer. Do you have any of these problems: Lost data, tracks locked out, CRC errors, disk retry? YOU NEED ONE!

★ "SDS" **\$29.95**
(For Mod. I; shipping \$2.00)

**See opposite
page** ▶▶▶▶▶



DISK DRIVES

40 & 80 TRACK

SINGLE & DOUBLE SIDED

as low as **\$169**

NEW!

PACESETTERS

Aerocomp leads the way to the BEST value in disk drives on the market. Quality, performance, reliability, warranty, service plus free trial - that's what you get from the leader.

AEROCOMP!

BEST FEATURES

- ★ Fast 5 ms. track-track access
- ★ Single or double density
- ★ Easy entry door
- ★ "Flippy" feature allows read-write to the back of the diskette to cut media cost in half!
- ★ Disk ejector (MPI)
- ★ External drive cable connection (no need to remove the cover to hook up the cable)

NEW!



HALF-HIGH DRIVES

Two complete drives in the space of one. Complete with power supply & enclosure.

- ★ Two 40 track SS \$389
- ★ Two 40 track Dual Head \$539
- ★ Two 80 track SS \$419
- ★ Two 80 track Dual Head \$579

COMPLETE DRIVES

TRS80 Mod. I & III, IBM PC & TI 99/4A. Power supply & enclosure. Specify silver or almond. MPI or Tandon. 5.25 in.

- ★ 40 track single side \$199
- ★ 40 track SS "Flippy" \$239
- ★ 40 track Dual Head \$279
- ★ 80 track SS \$299
- ★ 80 track SS "Flippy" \$329
- ★ 80 track Dual Head \$379
- ★ APPLE compatible w/cable (Shugart) ... \$279
- ★ APPLE compatible disk controller. \$89

Shipping & Handling \$5.00 Per Drive

BARE DRIVES

Internal drives for TRS80 Mod. III, IBM PC, TI 99/4A, 5.25 in. (controller required)

- ★ 40 track Single Side \$169
- ★ 40 track Dual Head \$249
- ★ 80 track SS \$269
- ★ 80 track Dual Head \$339 (add \$30 for "Flippy" modification)
- ★ 8 inch Single Side Thinline \$399
- ★ 8 inch Dual Head Thinline \$499

Shipping & Handling \$4.00 Per Drive

MODEL III DRIVES

Convert your cassette Mod. III to disk. Complete internal drive kits with 40 track SS drives, disk controller, power supply, mounting towers, hardware & cables.

- ★ Drive Kit Only (no drives) \$199
- ★ One Drive System Kit \$369
- ★ Two Drive System Kit \$539

Shipping & Handling \$8.00 Per System

MODEL I STARTER PACKAGE

One 40 track SS drive, 2-drive cable, TRSDOS 2.3 disk & manual, freight & insurance.

\$249

MISCELLANEOUS GOODIES

- ★ TRSDOS 2.3 disk & manual \$20
- ★ LDOS (Mod. I or III) \$119
- ★ NEWDOS/80, 2.0 (Mod. I or III) \$129
- ★ DOSPLUS 3.5 \$129
- ★ Diskettes (10 in library box) \$23
- ★ MX80 ribbons \$9
- ★ 5.25" Drive Power Supply & case \$59
- ★ 2-Drive Cable \$24
- ★ 4-Drive Cable \$34
- ★ Extender Cable \$13

Shipping & Handling \$2.00

TRS80 Color Computer Drives

First Drive \$399
Includes controller, cable (2-D) and Book

Additional Drives \$199

FREE TRIAL OFFER

Use your AEROCOMP drive for up to 14 days. If you are not satisfied for ANY REASON (except misuse or improper handling), return in the original shipping container for a full purchase price refund. Applies to hardware only. Sorry, we cannot refund on software. We have confidence in our products and we know you will be satisfied.

WARRANTY

We offer a six months warranty on parts and labor against defects in materials and workmanship. In the event service becomes necessary for any reason, our service department is fast, friendly and cooperative. Our goal is 48 hour turnaround on all warranty or repair drives!

100% TESTED

AEROCOMP disk drives are 100% subjected to burn-in and bench test. We even enclose a copy of the test check list, signed by the test technician, with each drive. AEROCOMP means reliability!

ORDER NOW!

Order by mail or call TOLL FREE TO THE NUMBERS BELOW. Please note toll free lines will accept orders only. We accept VISA or MASTERCARD. Be sure to include card number and expiration date. We will not charge your card until the day we ship. Order by mail with credit card or send check or money order. Please allow: 2 weeks for personal checks to clear our bank. Order COD. No deposit required but all COD's will arrive cash, certified check or money order only. We'll send a card showing the exact COD amount before your shipment arrives. Shipping is **not** included in the prices shown. Texas residents add 5% sales tax. NEXT DAY SHIPMENT on all in stock items.

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TOLL FREE LINES WILL ACCEPT ORDERS ONLY!

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Dallas, TX 75224

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Financial Transactions Recorder

by Jim Barbarello

Here's a Model II/16 data base with a difference— it organizes financial transactions into categories and prints tally sheets for each or all.

Program Listing

```

1 REM**      Financial Transactions Recorder
2 REM**      NAME: FTR
3 REM**      LATEST UPDATE: 09, 30 DEC 1982 (Auto Check Numbers)
4 REM**      c 1982 by J.J. Barbarello
5 REM**

10 CLEAR 5000:DEFSTR A,B,D:DIM A(100),GT$(1),T$(1):DR=CHR$(26):DN=CHR$(25):DLN=S
TRINGS(79,150)
20 CLS:PRINT@(10,35),DR;" WAIT... ";DN;:RDS=MIDS(DATES,7,2)+" "+MIDS(DATES,4,3)+
" "+MIDS(DATES,9,4)
21 P(1)=9:P(2)=11:P(3)=13:P(4)=15:P(5)=17:P(6)=19:DF="###"+CHR$(175)+"###"+CHR$(17
5)+"###"
30 ON ERROR GOTO 15000:DEFUSR0=4HF000:SYSTEM"LOAD FRMS"
40 ADAT="31283130313031303130313031":BC(1)="START":BC(2)="FINISH"
50 OPEN"D",1,"BUSINESS/DAT",64:GOSUB 11510
60 OPEN"D",2,"CATEGORY/DAT",30:FIELD 2,30 AS ACAT:IF LOP(2)<100 THEN LSET ACAT=
"":FOR I=1 TO 100:PUT 2,I:A(I)="":NEXT:GOTO 500
70 FOR I=1 TO 100:GET 2,I:A(I)=ACAT:NEXT
500 CLS:PRINT@(3,9),CHR$(2);"F I N A N C I A L   T R A N S A C T I O N S   R E C
O R D E R":PRINTDLN:PRINT@(22,27),"c 1982 By J.J. Barbarello";
510 PRINT@(6,20),"TASKS:";
520 PRINTTAB(30);DR;" 1 ";DN;" ADD Data":PRINT
530 PRINTTAB(30);DR;" 2 ";DN;" MODIFY Data":PRINT
540 PRINTTAB(30);DR;" 3 ";DN;" PRINT Tally Sheet":PRINT
550 PRINTTAB(30);DR;" 4 ";DN;" DEFINE Categories":PRINT
560 PRINTTAB(30);DR;" 5 ";DN;" PRINT Category Definitions":PRINT
570 PRINTTAB(30);DR;" 6 ";DN;" END"
580 PRINT@(19,25),"Press ";DR;" NUMBER ";DN;" of TASK desired...";CHR$(1);
590 A=INPUTS(1):IF VAL(A)<1 OR VAL(A)>6 THEN 590
600 ON VAL(A) GOSUB 1000,2000,3000,4000,5000,6000:GOTO 500
1000 CLS:PRINTTAB(25);"T A S K # 1: A D D   D A T A":PRINTDLN
1010 GOSUB 11000:IF A="R" THEN RETURN
1020 RN=LOF(1)+1:SR=1:GOSUB 11510:GOSUB 12750
1021 X=1:GOSUB 12000
1190 GOSUB 11020:IF A="R" THEN RETURN ELSE 1020
2000 CLS:PRINTTAB(20);"T A S K # 2: M O D I F Y   D A T A":PRINT DLN
2010 GOSUB 11000:IF A="R" THEN RETURN
2020 PRINT@(2,0),CHR$(24);:PRINT@(3,0),"Enter ";DR;" FILE NUMBER ";DN;" of Trans
action to be Changed: ";
2030 LINE INPUT FILES:RN=VAL(FILES):IF RN<1 OR RN>LOF(1) THEN PRINT@(5,25),"** I
NVALID ENTRY **":GOSUB 11020:IF A="R" THEN RETURN ELSE 2020
2040 GOSUB 11510:GET 1,RN:SR=2:GOSUB 12750:X=1
2050 PRINT@(9,30),ANAM
2060 PRINT@(11,30);:PRINTUSING"###/###/###";ASC(MOS);ASC(DAY);ASC(YEARS)
2070 PRINT@(13,29);:PRINTUSING"5#####.##";CVD(AMT)
2080 PRINT@(15,30),STR$(ASC(CAT$));" - ";A(ASC(CAT$))
2090 PRINT@(17,30);:CHKS
2100 PRINT@(19,30),STATUSS
2110 PRINT@(9,30);:GOSUB 12000
2120 GOSUB 11020:IF A="R" THEN RETURN ELSE 2020
3000 CLS:PRINTTAB(15);"T A S K # 3: P R I N T   T A L L Y   S H E E T":PRINT
DLN
3010 GOSUB 11000:IF A="R" THEN RETURN ELSE ERASE GT$,T$:DIM GT$(99),T$(99):GT#=0
:T#=0
3020 PRINT@(3,0),CHR$(24):PRINT@(10,8),"Press ";DR;" F1 ";DN;" for Hard Copy, or
";DR;" F2 ";DN;" key for video...";
3030 A=INPUTS(1):IF ASC(A)<>1 AND ASC(A)<>2 THEN 3030ELSE FL=66:FC=80:SW=ASC(A):
GOSUB 11230:IF SW=1 THEN PRINT@(10,25),"Bring Paper to Top of Page."
3040 GOSUB 11020:IF A="R" THEN RETURN ELSE T=0:GT=0:CG=0
3050 PRINT@(3,0),CHR$(24);"Print ";DR;" F ";DN;"ull Tally Sheet or a ";DR;" P ";
DN;"ortion...";
3060 A=INPUTS(1):GOSUB 11400:IF A<>"P" AND A<>"P" THEN 3060ELSE PRINT A
3070 IF A="*" THEN PR=1:LR=LOF(1):CG=0:CG(1)=1:CG(2)=99:GOTO 3150
3080 PRINT@(8,0),"Start File Number...";CHR$(23);:LINE INPUT A:IF VAL(A)<1 OR VA
L(A)>LOF(1) THEN 3080ELSE PR=VAL(A)

```

Listing continued

Your finances probably involve more than a simple checking account. You may have a small business with revenue in checks and cash, you may receive payment for professional services, or you may want to track office or other miscellaneous expenses. A detailed record of these transactions, broken down into your own predefined categories, would be a bookkeeping boon, especially at tax time.

FTR (Financial Transactions Recorder) is an automated transaction system for the Model II/16 TRSDOS 2.0 operating system that lets you post financial transactions to one of 99 different user-defined categories. You can obtain a tally sheet for any single category or a contiguous range of categories. In addition, you can opt to see all transactions posted, or only a limited range of transactions (such as only those made since your last tally sheet was printed). In both cases, the tally sheet provides you with a report total (a total of all the transactions in the report) and a grand total (a total of all the transactions on file for each category).

How FTR Works

In the following example of FTR, assume you are a self-employed professional with a secretary, a small office, and the standard expenses (office supplies, insurance, and professional fees, for example). You might also have additional outside expenses and in-

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64K RAM
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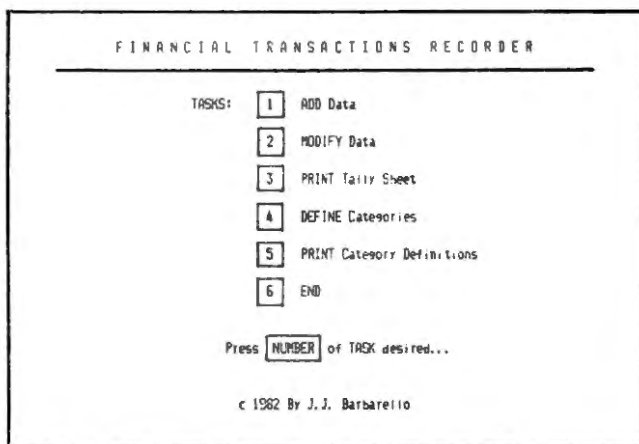


Figure 1. FTR's main menu (screen 1).

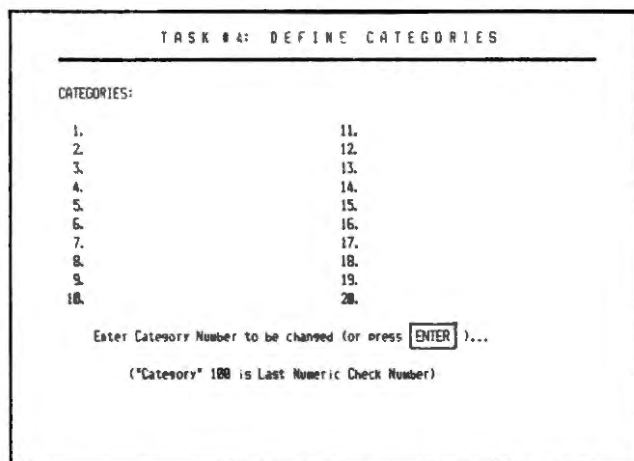


Figure 3. The working screen for category definition (screen 3).

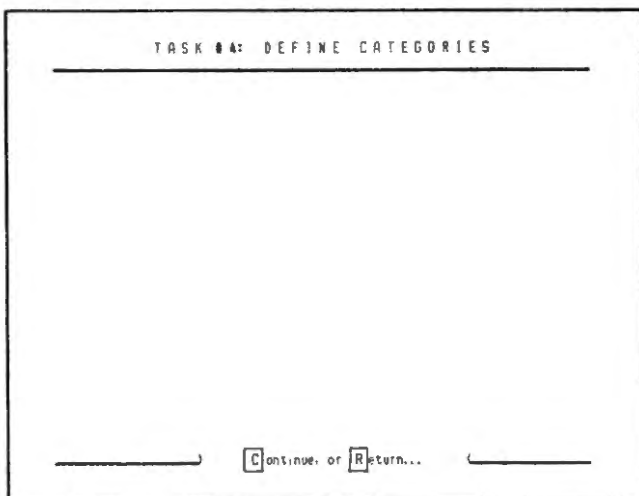


Figure 2. Task identification screen (screen 2). In this case, the task chosen from the main menu was option 4, Define Categories.

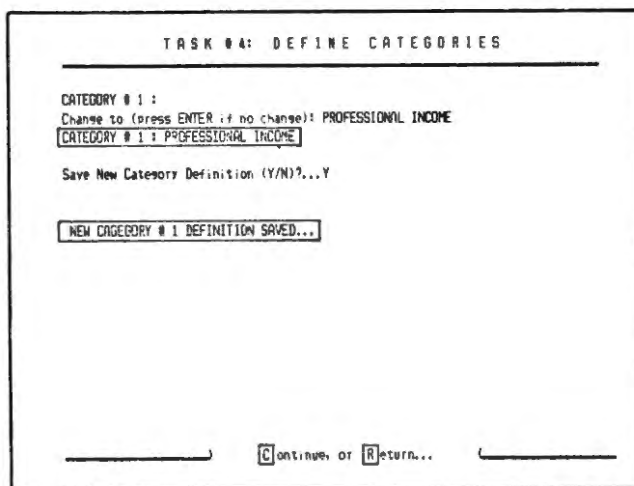


Figure 4. A category chosen from screen 3 appears on this screen (screen 4), along with any previous definitions for that category.

come, such as those from lecturing or freelance writing.

You can keep track of your financial status and document income tax returns using FTR's tally sheet printouts.

You might divide your transactions into these categories:

- | | |
|------------------------|----------------------------------|
| 1. Professional income | 3. Office expenses |
| 2. Employee wages | 4. Insurance |
| | 5. Related professional expenses |
| | 11. Lecture fees |
| | 12. Lecture expenses |
| | 16. Author fees |
| | 17. Author expenses |

The three major areas of income listed above form three contiguous groups.

Note that the numbers 1, 11, and 16 start each related financial category. Should your activities increase, you can add categories later on.

Program Overview

FTR is menu-driven. The first screen (main menu) asks whether you want to add or modify data, print a tally sheet, define your categories, print category

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The MBIP in-line parallel buffer works with almost any computer/printer combination utilizing a Centronics type parallel interface. Available with up to 256K of RAM for data buffering, the MBIP can accept very large files for buffering as fast as your computer can send it.

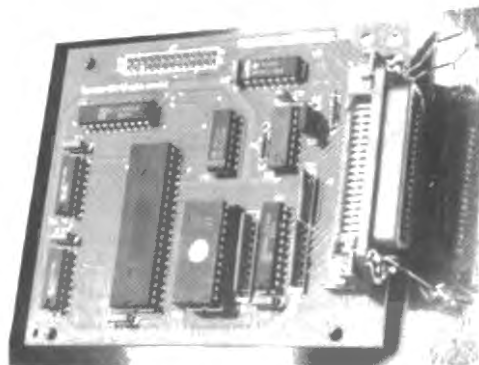
Saves Time

Most computers are able to send data to the printer at very high speeds, usually much faster than the printer can print it. The MBIP, placed between the computer and the printer, accepts this data as fast as the computer can send it, stores it in its own memory and then sends it on to the printer at the printer's own speed. Under normal circumstances without a MBIP the computer could be tied up for hours on a large file being dumped into the printer costing you valuable time and money.

Improves Efficiency

Using the MBIP's touch sensitive front panel controls, multiple copies of your document can be made without tying up the computer any further. Printing may be halted at any point and continued where it left off later. You can even turn your computer off and the MBIP will continue until the print job is complete.

The MBIP requires no user modifications of software and installs in seconds with virtually any computer (including TRS-80, ATARI, IBM-PC, APPLE, OSBORNE, NEC etc.) and any printer (including EPSON, CENTRONICS, NEC, C.ITOH, IDS, ANADEx, OKIDATA, IBM PERSONAL etc.), dimensions are 5 $\frac{1}{2}$ "W x 7 $\frac{3}{4}$ "D x 1 $\frac{1}{2}$ "H.



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The MBP is an intelligent Centronic-Compatible parallel interface for the Epson MX-80, MX-80 F/T, and MX-100 printers, with 16K, 32K, 64K bytes of on-board RAM for data buffering. FX80 and FX100 compatible.

Eliminates Printer Bottleneck

The buffering capability of the MBP increases your data processing efficiency by eliminating the wait normally experienced while printing. An Epson printer prints at 80 characters per second; at this speed it takes about five minutes to print a 16,000 character document. During most of this time the computer is waiting for Epson to finish one line so it can send the next. By using the MBP it takes the computer only *four seconds* to send a 16,000 character document. The Practical Peripherals MBP interface typically accepts data as fast as the computer can send it, until full, returning use of the computer to you while it handles the printing. You can continue with other processing while simultaneously printing data from a previous job, gaining all the time you normally would have spent waiting for the printer to finish. Any program that involves printed output will be speeded up using the MBP.

The MBP supports all standard Epson Commands, is compatible with GRAFTRAX-80, and is plug compatible with the standard Epson cable. THE MBP does not require any user software for control.

Installs In Minutes

The MBP is easy to install — it simply plugs into the existing auxilliary interface connector inside the Epson without modification of the printer.

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definitions, or end the program (see Fig. 1).

When you select a task, a new screen replaces the menu and identifies the task you selected at the top of the screen (see Fig. 2). A prompt to continue (C) or return to the main menu (R) appears along the bottom of the screen. Pressing C brings up a third screen, the screen on which you perform the task you selected.

I will go through each of the tasks and describe the screens associated with them.

Defining Categories

The first thing to do in developing the data base is define your transaction categories. When you choose this option from the menu (option 4), the task identification screen appears (see Fig. 2). If you press C, the third (working) screen appears with space for 20 categories and a prompt (see Fig. 3). You define your categories on this screen.

When you select a category number, a fourth screen appears (see Fig. 4). If you selected a number where a category was previously defined, the old category appears along with a prompt asking you if you want to retain the old category or

Listing continued

```

3090 PRINT@(10,0),"Finish File Number (Enter ";DR;" E ";DN;" for End of File)...
";CHR$(23);:LINE INPUT A;GOSUB 11400:IF A="E" THEN LR=LOP(1):GOTO 3110
3100 LR=VAL(A);IF LR>LOP(1) THEN 3090
3110 FOR S2=1 TO 2:PRINT@(10+S2*2,0),"Enter ";BC(S2);" Category # (or ";DR;" A "
";DN;" for All categories)...";CHR$(23);
3120 LINE INPUT A;GOSUB 11400:IF A="A" THEN CG=0:CG(1)=1:CG(2)=99:GOTO 3140ELSE
CG(S2)=VAL(A):CG=100
3130 IF CG(S2)<1 OR CG(S2)>99 THEN 3110ELSE NEXT S2
3140 GOSUB 11020
3150 IF SW=2 THEN CLS:GOTO 3180ELSE PRINT@(3,0),CHR$(24);"FIRST RECORD TO BE PRINTED: ";FR;TAB(40);"LAST RECORD TO BE PRINTED: ";LR
3160 IF CG<>0 THEN PRINT@(5,20),"START CATEGORY #:";CG(1);"- ";A(CG(1));PRINT@(7,19),"FINISH CATEGORY #:";CG(2);"- ";A(CG(2)) ELSE PRINT@(5,30),"CATEGORY #: ALL
"
3170 GOSUB 11020:IF A="R" THEN RETURN ELSE PRINT@(22,0),CHR$(24);:PRINT@(10,25),DR;" PRINTING TALLY SHEET... ";DN;
3180 IF FR=1 THEN 3210
3190 FOR I=1 TO FR-1:GET 1,I:IF STATUS<>"D" AND CG(1)<=ASC(CATS) AND CG(2)>=ASC(CATS) THEN GT#(ASC(CATS))=GT#(ASC(CATS))+CVD(AMT)
3200 NEXT
3210 PG=1:NL=1:GOSUB 3500
3220 FOR I=FR TO LR:GET 1,I:IF STATUS<>"D" AND ASC(CATS)>=CG(1) AND ASC(CATS)<=CG(2) THEN LPRINT USING"#####";I; ELSE 3270
3230 LPRINT ANAM;:LPRINT USING"##/##/##";ASC(MOS);ASC(DAY);ASC(YEAR);:LPRINT USING"#####.##";CVD(AMT);
3240 GT#(ASC(CATS))=GT#(ASC(CATS))+CVD(AMT);T#(ASC(CATS))=T#(ASC(CATS))+CVD(AMT)
3250 LPRINT CHK$;:LPRINT USING"##";ASC(CATS)
3260 NL=NL+1:IF NL=50 THEN LPRINT:LPRINT:NL=0:PG=PG+1:SYSTEM"TAB(45)";GOSUB 3500
3270 NEXT:I=LR-LOP(1) THEN 3300
3280 FOR I=LR+1 TO LOP(1):GET 1,I:IF STATUS<>"D" AND CG(1)<=ASC(CATS) AND CG(2)>=ASC(CATS) THEN GT#(ASC(CATS))=GT#(ASC(CATS))+CVD(AMT)
3290 NEXT
3300 SYSTEM"TAB(45)";PG=PG+1:NL=0
3310 GOSUB 3320:GOTO 3360
3320 LPRINT TAB(20);"T A L L Y S H E E T -";RD$;TAB(70);"PAGE";PG
3330 LPRINT TAB(20);"-----";:LPRINT
3340 LPRINT"CATEGORY";TAB(45);"REPORT TOTAL";TAB(60);"GRAND TOTAL"
3350 LPRINTSTRINGS(35,45);TAB(45);"-----";TAB(60);"-----";:LPRINT:RE
TURN
3360 FOR I=1 TO 99:IF I<CG(1) OR I>CG(2) THEN 3420
3370 IF T#(I)=0 AND GT#(I)=0 THEN 3420
3380 LPRINT USING"##";I;:LPRINT" ";A(I);TAB(45);
3390 LPRINT USING"###,###,###";T#(I);:LPRINT TAB(60);:T#-T#+T#(I)
3400 LPRINT USING"###,###,###";GT#(I);:GT#-GT#+GT#(I)
3410 NL=NL+1:IF NL=50 THEN NL=0:PG=PG+1:SYSTEM"TAB(45)";GOSUB 3320
3420 NEXT:IF CG(2)-CG(1)=0 THEN 3460
3430 LPRINTTAB(45);"-----";TAB(60)"-----"
3440 LPRINT TAB(43);:LPRINT USING"###,###,###";T#;
3450 LPRINT TAB(58);:LPRINT USING"###,###,###";GT#
3460 SYSTEM"TAB(45)";SW=SW*10+2:IF SW=22 THEN PRINT:PRINT

```

Listing continued

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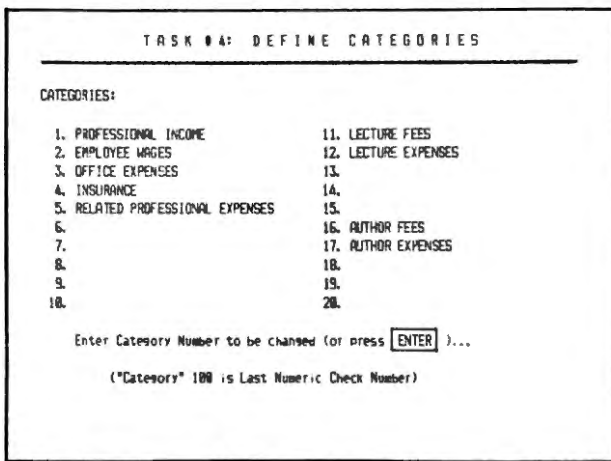


Figure 5. Screen 5 (above) lists all the categories defined. If you enter 100 at the cursor, your checks are automatically numbered.

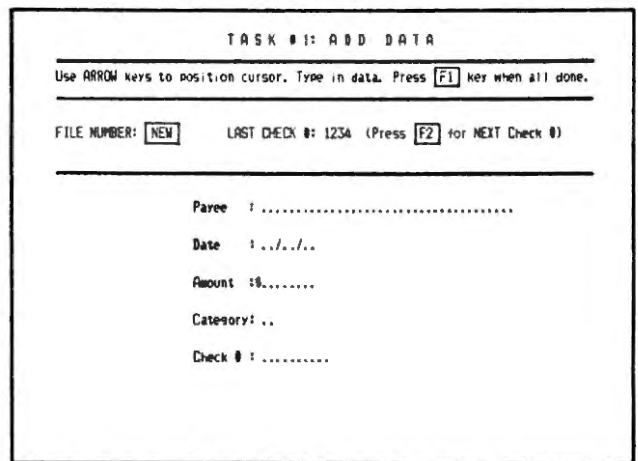


Figure 7. Enter financial transactions on this screen (screen 7).

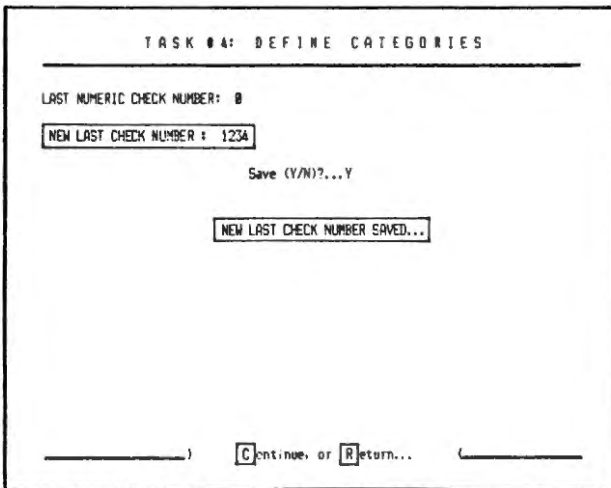


Figure 6. Status of the check-numbering routine (screen 6).

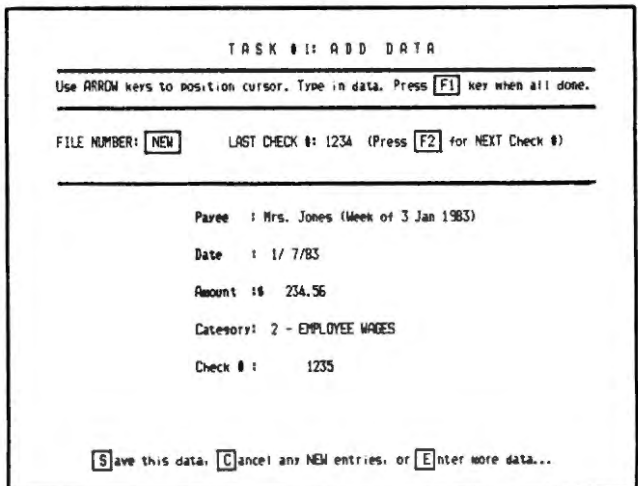


Figure 8. Above is an example of screen 7 completed, with options to save data, cancel new entries, or enter more data (screen 8).

Listing continued

```

3470 PRINT@ (SW,10),"Report Completed. Press ANY key to return to menu...";CHR$(2
3);
3480 A=INPUT$(1):RETURN
3490 REM** TOP OF PAGE TITLING UTILITY
3500 LPRINT TAB(20);"T A L L Y S H E E T - ";RD$;TAB(70);"PAGE";PG
3510 LPRINT TAB(20);"-----"
3520 LPRINT TAB(26);:IF CG(2)-CG(1)<>0 THEN LPRINT USING"(CATEGORIES: ## TO ##)";
CG(1);CG(2) ELSE LPRINT USING"(CATEGORY: ##)";CG(1)
3530 LPRINT:LPRINT"FILE#.DESCRIPTION";TAB(46);"DATE";TAB(56);"AMOUNT";TAB(66);"C
HECK NO. ";TAB(76);"CAT"
3540 LPRINT"-----";STRINGS(37,"-");TAB(44);"-----";TAB(53);"-----";TAB(
65);"-----";TAB(76);"-----"
3550 LPRINT:RETURN
3560 RETURN
4000 CLS:PRINTTAB(15);"T A S K # 4: D E F I N E C A T E G O R I E S":PRINTD
LN:NN=1
4010 GOSUB 11000:IF A="R" THEN RETURN
4020 PRINT@ (3,0),CHR$(24);"CATEGORIES: ";PRINT:CN=0:NCS="":CN$=""
4030 FOR I=NN TO NN+9:PRINTUSING"###";I;PRINT". ";A(I);TAB(40);:PRINTUSING"###"
;I+10;PRINT". ";A(I+10):NEXT
4040 PRINT@ (18,10),(");CHR$(34);"Category";CHR$(34);" 100 is Last Numeric Check
Number");CHR$(23):PRINT@ (16,5),"Enter Category Number to be changed (or press ";
DR;" ENTER ";DN;" )...";
4050 LINE INPUT CNS:IF LEN(CNS)<>0 THEN 4080
4060 GOSUB 11020:IF A="R" THEN RETURN
4070 NN=NN+20:IF NN>99 THEN NN=1:GOTO 4020ELSE 4020
4080 CN=VAL(CNS):IF CN<1 OR CN>100 THEN 4040
4095 IF CN=100 THEN PRINT@ (3,0),"LAST NUMERIC CHECK NUMBER: ";VAL(A(100));CHR$(2
4);:GOTO 4170
4090 PRINT@ (3,0),"CATEGORY #";CN;" ";A(CN);CHR$(24);
4100 PRINT:PRINT"Change to (press ENTER if no change)";
4110 LINE INPUT A:IF LEN(A)=0 THEN GOSUB 11020:IF A="R" THEN RETURN ELSE 4020
4120 NCS=LEFT$(A,30):PRINT@ (5,0),DR;"CATEGORY #";CN;" ";A(CN);CHR$(23)
4130 PRINT:PRINT"Save New Category Definition (Y/N)?...";
4140 GOSUB 11200:IF A="N" THEN PRINT@ (10,0),DR;" NEW CHANGE CANCELLED... ";DN:GO
TO 4160
4150 PRINT@ (10,0),DR;" NEW CATEGORY #";CN;"DEFINITION SAVED...";DN:LSET ACAT=NCS
:PUT 2,CN:A(CN)=NCS
4160 GOSUB 11020:IF A="R" THEN RETURN ELSE 4020
4170 PRINT@ (5,0),"Change to (press ENTER if no change)";

```

Listing continued

replace it with a new one.

If you want to enter a new category, type it in and answer yes to the save prompt. You can enter more categories or return to the main menu.

Once you've finished entering all your categories, screen 5 appears, listing all the categories (see Fig. 5). Enter 100 to initialize FTR's numeric check tracker. This feature lets you define the starting check number and thereafter automatically increments and posts that number.

FTR accepts string input of check numbers to accommodate money orders or items with numbers and letters or you can make short notes, such as denoting a cash payment. The procedure to implement this system appears in Fig. 6.

Entering Transactions

Once you've set up all your categories, you can begin entering data into them. To enter a transaction, select option 1 from the main menu and answer C (to continue) in response to the task

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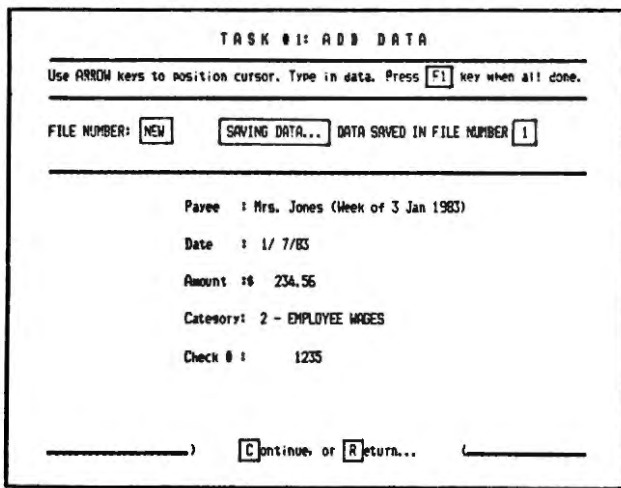


Figure 9. Screen 9 (above) appears when FTR is storing data. Note the assignment.

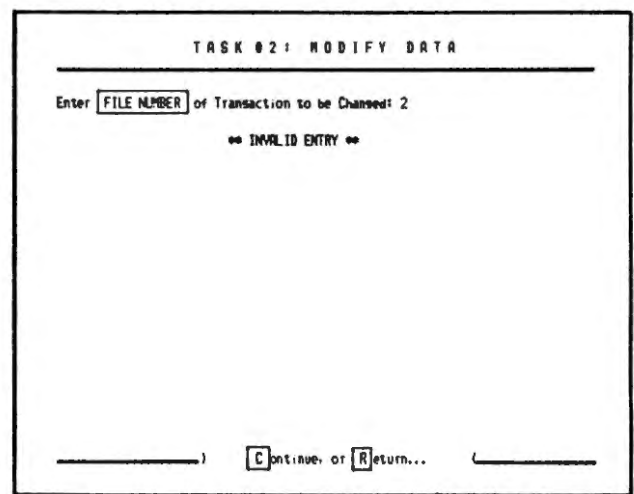


Figure 10. This screen (screen 10) appears when you try to locate a nonexistent file.

Listing continued

```

4180 LINE INPUT A:IF LEN(A)=0 THEN GOSUB 11020:IF A="R" THEN RETURN ELSE 4020
4190 IF VAL(A)=0 THEN GOSUB 11020:IF A="R" THEN RETURN ELSE 4020
4200 NCS=STR$(VAL(A)):PRINT(5,0),DR;" NEW LAST CHECK NUMBER ";DN;" ";NCS;CHR$(
23)
4210 PRINT(7,30),"Save (Y/N)?...";
4220 GOSUB 11200:IF A="N" THEN PRINT(10,28),DR;" NEW CHANGE CANCELLED... ";DN;GO
TO 4160
4230 PRINT(10,25),DR;" NEW LAST CHECK NUMBER SAVED...";DN:LSET ACAT=NCS:PUT 2,1
00:A(100)=NCS:GOTO 4160
5000 CLS:PRINTTAB(5);" T A S K # 5: P R I N T C A T E G O R Y D E F I N I
T I O N S":PRINT DLN
5010 GOSUB 11000:IF A="R" THEN RETURN
5020 PRINT(3,0),CHR$(24):PRINT(10,10),"Bring Paper up to Top of Page. Press ";
DR;" F1 ";DN;" key when ready...";
5030 A=INPUT$(1):IF ASC(A)<1 THEN 5030ELSE FL=66:PC=00:GOSUB 11230
5040 GOSUB 11020:IF A="R" THEN RETURN
5050 PRINT(3,0),CHR$(24):PRINT(10,23),DR;" PRINTING CATEGORY DEFINITIONS...";
DN;
5060 LPRINTTAB(30);"CATEGORY DEFINITIONS":LPRINTTAB(30);"-----";L
PRINT
5070 FOR I=1 TO 50:LPRINT USING"###";I:LPRINT". ";A(I);TAB(39);
5080 LPRINT USING"###";I+50:LPRINT". ";A(I+50)
5090 NEXT:SYSTEM"T"
5100 PRINT(10,23),"Printing Completed. Press ANY key to continue...";
5110 A=INPUT$(1):RETURN
6000 CLS:PRINTTAB(30);" T A S K # 6 : E N D":PRINT DLN
6010 GOSUB 11000:IF A="R" THEN RETURN
6020 PRINT(10,35),DR;" WAIT... ";DN:PRINT(12,35);:SYSTEM"DUAL OFF":PRINT(11,
0),CHR$(24)
6030 CLOSE:PRINT(10,32),DR;" PROGRAM ENDED...";DN:PRINT:PRINT:END
10000 REM** DATE CONVERSION SUBROUTINE **
10010 IF VAL(DTE)=0 THEN MO=0:DAY%=0:YEAR=0:RETURN
10020 MO=VAL(LEFT$(DTE,2)):YEAR=VAL(RIGHT$(DTE,2)):IF INSTR(DTE,"/")<>0 THEN DAY
%=VAL(MID$(DTE,INSTR(DTE,"/")+1,2)) ELSE DAY%=VAL(MID$(DTE,INSTR(DTE,".")+1,2))
10030 MAX=VAL(MID$(ADAT,(MO-1)*2+1,2)):IF INT(YEAR/4) =YEAR/4 AND MO=2 THEN MAX=2
9
10040 IF DAY%>MAX OR YEAR>99 OR YEAR<1 OR MO>12 OR MO<1 THEN MO=99:DAY%=99:YEAR=
99:DTE="99.99.99"
10050 RETURN
11000 REM** CONTINUE/RETURN QUERY SUBROUTINE
11010 PRINT(2,0),CHR$(24)
11020 PRINT(22,0),CHR$(23);STRINGS(21,150);">";PRINT(22,60),"<";STRINGS(18,15
0);PRINT(22,28),DR;" C ";DN;"continue, or ";DR;" R ";DN;"return...";
11030 A=INPUT$(1):IF ASC(A)>96 THEN A=CHR$(ASC(A)-32)
11040 IF A<>"C" AND A<>"R" THEN 11020ELSE PRINT(22,0),CHR$(23);PRINT(2,0);:R
ETURN
11100 REM** PRESS ANY KEY UTILITY **
11110 PRINT"Press ANY key to continue...";
11120 A=INPUT$(1):RETURN
11200 REM** YES/NO ANSWER UTILITY
11210 A=INPUT$(1):NU=ASC(A):IF NU>96 THEN NU=NU-32:A=CHR$(NU)
11220 IF A<>"Y" AND A<>"N" THEN 11210ELSE PRINT A:RETURN
11230 REM** FORMS SET - ENTER WITH PL=# LINES, PC=# COLUMNS (PAGE=66 LINES) **
11300 REM** MACHINE LANGUAGE PROGRAM MUST BE LOADED BEFORE USING FORMS SET **
11310 IF SW=2 THEN PRINT:SYSTEM"FORMS D":SYSTEM"DUAL ON":PRINT(2,0),CHR$(24);:R
ETURN
11320 SYSTEM"DUAL OFF":PRINT(2,0),CHR$(24);
11330 A=PL*256+PC:X=USR0(A):RETURN
11400 REM** LOWER/UPPER CASE SHIFT UTILITY - SHIFT STRING=A **
11410 FOR XX=1 TO LEN(A):NU=ASC(MID$(A,XX,1)):MID$(A,XX,1)=CHR$(NU+(MID$(A,XX,1)
>"2")*32):NEXT
11420 RETURN
11500 REM** CLEAR BUFFER AND FIELD
11510 FIELD 1,64 AS ANAM:MID$(ANAM,1,64)=SPACES(64):FIELD 1,37 AS ANAM,8 AS AMT,
1 AS CATS,1 AS STATUS,10 AS CHKS,1 AS MOS,1 AS DAY,1 AS YEARS:RETURN
12000 REM*** ADD/MODIFY DATA SUBROUTINE
12010 A=INPUT$(1):IF ASC(A)>2 AND ASC(A)<32 THEN GOSUB 12250:GOTO 12010ELSE IF A
SC(A)=1 THEN 12340 ELSE IF ASC(A)=2 AND X<>5 THEN 12010
12020 PRINTDR:ON X GOSUB 12030,12090,12150,12190,12210,12230:GOTO 12010
12030 NU=37
12040 PRINT(P(X),30),STRINGS(NU,46):AI=SPACES(NU):ST=32:PI=127:GOSUB 12440
12060 LSET ANAM=AI:PRINT(P(X),30),ANAM:GOSUB 12560:RETURN
12090 NU=8

```

Listing continued

screen prompt. This calls up screen 7 (see Fig. 7).

Notice that the cursor appears to the right of the payee category. As you type in the dollar amount, the characters appear in reverse video. Press the enter key to record the figure and the numbers revert to normal video, indicating that the figure is saved.

Use the down-arrow key to position the cursor at the date category. Enter dates in the format 9.1.83 or 9/1/83. Should you make an error, 99/99/99 appears.

Hit the down-arrow key again, position the cursor by the amount category, and fill that in.

Afterward, bring the cursor to the check number category. If you are making a payment by personal check, press the F2 key and the check number is automatically posted.

If you've made any errors in the entries, use the up-arrow key to position the cursor beside the category containing the mistake and make the correction.

When you are satisfied that all your entries are correct, press the F1 key. Screen 8 appears with all the entries you've made displayed and with three options, listed at the bottom of the screen (see Fig. 8).

Pressing E lets you enter new data. If you press C, all new entries are cancelled and the program displays a message indicating that. You start off with a clean slate, so to speak.

Pressing S saves the data you enter. This operation is indicated in screen 9 (Fig. 9) and FTR assigns a number to that file.

A fourth option (not listed on the screen), R, brings you back to the main menu.

TASK 02: MODIFY DATA

Use ARROW keys to position cursor. Type in data. Press **[F1]** key when all done.

FILE NUMBER: **1** LAST CHECK #: 1235 (Press **[F2]** for NEXT Check #)

Parce : Mrs. Jones (Week of 3 Jan 1983)

Date : 1/ 7/83

Amount :\$ 234.65

Category: 2 - EMPLOYEE WAGES

Check # : 1235

Status (A=Active,D=Deleted) : A

Figure 11. Modify data using this screen (screen 11).

T A L L Y S H E E T - 01 Jan 1983 PAGE 1

(CATEGORIES: 1 TO 5)

FILE#	DESCRIPTION	DATE	AMOUNT	CHECK NO.	CAT
10.	H. Reese	1/15/83	\$275.00	CASH	1
11.	T. Johnston	1/15/83	\$125.00	186	1
12.	Coast Office Supplies	1/15/83	-\$15.29	1240	3
13.	Mauntanu Professional Society (DUES)	1/17/83	-\$50.00	1241	5
14.	Mrs. Jones	1/21/83	-\$24.65	1242	2
15.	J. Hancock	1/21/83	\$450.75	11-A-2370	1
16.	Coast Office Supplies	1/27/83	-\$19.47	1243	3
18.	W. Green	1/29/83	\$975.00	8799	1
19.	Home Assurity (Office Insurance)	1/30/83	-\$250.00	1245	4
20.	Mrs. Jones	1/31/83	-\$24.65	1246	2

Figure 12. A sample tally sheet.

Modifying Data

If you record an error from one of the screens and need to go back to correct it, select option 2, modify data, from the main menu and answer C to the continue/return prompt at the bottom of the task ID screen. The program asks you for the file number to be modified. Should you enter a nonexistent file number, screen 10 appears (see Fig. 10). Press C to try again. An appropriate response calls up screen 11 (see Fig. 11).

Screen 11 is almost identical to screen 8. The differences are that the file number is displayed and a status indicator appears (A for active, D for delete) that lets you keep or remove a record from your tally sheet. It doesn't delete the record, but ignores that file during a tally. Make your correction and press S to save the modified data.

Printing Category Definitions

You will need a permanent record of category definitions, obtained through menu option 5. After answering C at the task ID screen, you see the message "Bring Paper to Top of Page." Press the F1 key. FTR uses a machine-language utility to format reports at 66

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Listing continued

```

12100 GOSUB 12540:AI=SPACES(NU):ST=46:FI=58:GOSUB 12440
12110 IF ASC(AI)=13 THEN DTE=" " ELSE DTE=LEFT$(AI,J)
12120 GOSUB 10000:LSET MOS=CHRS(MO):LSET DAY=CHRS(DAY%):LSET YEARS=CHRS(YEAR):PR
INT@(P(X),30),:PRINTUSINGDF,ASC(MOS);ASC(DAY);ASC(YEARS):GOSUB 12560
12130 RETURN
12150 NU=9
12160 GOSUB 12540:AI=SPACES(NU):ST=45:FI=58:GOSUB 12440
12170 LSET AMT=MKD$(VAL(AI)):PRINT@(P(X),29),:PRINTUSING"$#####.###";CVD(AMT)
12180 GOSUB 12560:RETURN
12190 NU=2:PRINT@(P(X),30),DN;CHRS(23);DR:GOSUB 12540:AI=SPACES(NU):ST=48:FI=58:
GOSUB 12440:LSET CATS=CHRS(VAL(AI))
12200 PRINT@(P(X),30),:PRINTUSING"###";ASC(CATS):PRINT" - ";A(ASC(CATS)):GOSUB
12560:RETURN
12210 IF ASC(A)=2 THEN AI=STR$(VAL(A(100))+1):J=LEN(AI):SV=1:PRINTDN; ELSE NU=10
:SV=0:GOSUB 12540:AI=SPACES(NU):ST=32:FI=90:GOSUB 12440
12220 RSET CHKS=LEFT$(AI,J):PRINT@(P(X),30),CHKS:GOSUB 12560:RETURN
12230 NU=1:GOSUB 12540:AI=" ":ST=65:FI=68:GOSUB 12440:IF AI<>"D" THEN AI="A"
12235 LSET STATUS=AI:PRINT@(P(X),30),AI:GOSUB 12560:RETURN
12240 REM** SCREEN CURSOR MOVEMENT
12250 P=ASC(A):IF P=30 THEN X=X-1 ELSE IF P=31 THEN X=X+1
12260 IF X=0 THEN X=1 ELSE IF X=7 THEN X=6
12320 IF SR=1 AND X>5 THEN X=5:GOTO 12560 ELSE 12560
12340 REM** SAVE DATA ROUTINE
12350 PRINT@(22,5),DN;CHRS(24);DR;" S ";DN;"ave this data,";DR;" C ";DN;"ancel
any NEW entries, or ";DR;" E ";DN;"nter more data...";A=INPUT$(1):GOSUB 11410
12360 IF A="E" THEN PRINT@(22,0),CHRS(24):GOSUB 12560:GOTO 12010
12370 IF A="C" THEN PRINT@(5,25),CHRS(23);DR;" ** ALL NEW ENTRIES CANCELLED ** "
;DN;GOSUB 11510:RETURN
12380 IF A<>"S" THEN 12350 ELSE PRINT@(5,25),DR;" SAVING DATA...";DN;SPACES(18);
12390 IF SR=1 THEN LSET STATUS="A"
12400 PRINT@(5,42),"DATA SAVED IN FILE NUMBER ";DR;RN;DN;CHRS(23):PUT 1,RN:IF S
V=1 THEN LSET ACAT=STR$(VAL(CHKS)):A(100)=ACAT:PUT 2,100
12402 RETURN
12410 PRINT@(22,5),CHRS(23);CHRS(2);:FOR I=1 TO 5:PRINT@(22,10),MSG$;FOR Z=1 TO 900:
EXT:PRINT@(22,10),CHRS(23);:FOR Z=1 TO 200:NEXT:PRINTCHRS(1):GOTO 12350
12440 REM** INPUT SUBROUTINE
12450 J=0:GOTO 12470
12460 IF J=NU THEN 12530 ELSE A=INPUT$(1)
12470 IF ASC(A)=13 THEN 12520 ELSE IF ASC(A)=2 THEN A=CHRS(163):GOTO 12500
12480 IF ASC(A)=8 AND J>0 THEN J=J-1:A=CHRS(174):GOTO 12500 ELSE IF ASC(A)=8 THEN
12460
12490 IF ASC(A)<ST OR ASC(A)>FI THEN GOSUB 12540:GOTO 12460
12500 J=J+1:MID$(AI,J,1)=A:PRINT@(P(X),29+J),A;IF A=CHRS(174) THEN J=J-1:PRINT@
(P(X),30+J),:
12510 GOTO 12460
12520 FOR Z=J+1 TO NU:MID$(AI,Z,1)=" ":NEXT
12530 PRINTDN;:RETURN
12540 REM** CLEAR POSITION OF BAD DATA
12550 PRINT@(P(X),30),STRINGS(NU,46)
12560 PRINT@(P(X),30),:RETURN
12740 REM** ADD/MODIFY SCREEN DRAWING SUBROUTINE
12750 PRINT@(2,0),CHRS(24);"Use ARROW keys to position cursor. Type in data. Pre
ss ";DR;" F1 ";DN;" key when all done.";PRINTDLN
12755 PRINT@(5,0);"FILE NUMBER: ";DR;:IF SR=1 THEN PRINT" NEW ";DN ELSE PRINTRN;
DN
12757 PRINT@(5,25),"LAST CHECK #:";VAL(A(100));" (Press ";DR;" F2 ";DN;" for NEX
T Check #)"
12760 PRINT@(7,0),DLN:PRINT@(9,20),"Payee : ";STRINGS(37,".")
12770 PRINT@(11,20),"Date : ../.."
12780 PRINT@(13,20),"Amount : $....."
12790 PRINT@(15,20),"Category: .."
12800 PRINT@(17,20),"Check # : ....."
12810 IF SR=2 THEN PRINT@(19,0),"Status (A=Active,D=Deleted) : ."
12820 PRINT@(9,30),:RETURN
15000 REM** ERROR TRAPPING ROUTINE
15010 PRINT DR:CLS:PRINT@(9,25),"ERROR #";ERR;"OCCURRED IN LINE #";ERL
15020 IF ERR=56 THEN PRINT@(10,25),"Printer Not Available"
15030 PRINT@(11,25),"Press ANY Key to Continue...";
15040 A=INPUT$(1):PRINT DN:RESUME 500

```

lines long and 80 characters wide. The continue and return prompt reappears as a last-minute opportunity to make any changes you want.

Pressing C prints the list of category definitions to be generated. If an error occurs, the program displays an error message and returns you to the main menu. When the categories are printed, the message "Printing Completed. Press ANY key to continue." appears.

Printing Tally Sheets

FTR's primary purpose is compiling tally sheets. Select task 3 from the main menu and answer C to the task identification screen. When the next screen appears, press the F1 key to get the tally sheet printed out or F2 to have the tally sheet displayed on the video screen. In either event, the continue and return to main menu options are displayed at the bottom of the screen.

If you press F1, the message "Bring Paper to Top of Page" appears. If you then press C, the screen clears and the prompt Print (F)ull Tally Sheet or a (P)ortion appears. A full tally sheet contains all records on file, a portion lets you select a range of records and a range of categories.

If you select a portion of a tally sheet, the program prompts you for starting and ending records. You are then asked the start and ending points for tally sheet categories. See Fig. 12 for a sample tally sheet.

Getting Started

Enter the program in Listing 1 and save it under the name FTR. FTR uses a short, machine-language utility, FRMS, to automatically set forms. Since you'll be in Basic, type SYSTEM and press the enter key. When TRSDOS READY appears, type DEBUG ON. Type MF000 and press the F1 key. The standard Debug display appears on the first video (F000) line. Now type 56234E06423E 11CFC9. Check all characters for accuracy. Then press the F2 and escape keys and press the O key. Type DUMP FRMS (START = F000, END = F000). When TRSDOS READY again appears, your directory should show a new file, FRMS. You're now ready to keep track of your financial transactions. ■

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Chicago, Illinois 60656
(312) 399-0273

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The large numbers and letters fill the screen with color. Children enter single key stroke responses and get immediate visual and musical feedback. Hints are provided when appropriate. Beyond just teaching children basic skills, EARLY GAMES makes them feel comfortable as they control the computer. Designed for children ages 2½ to 6 years old.

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Pamela Bach, Director
Youth World Day Care Center

I took EARLY GAMES home for my kids and they really liked it! It held their attention and they learned from it!

Jeanette Fritze
Computer Saleswoman

EARLY GAMES can help children learn new concepts, information, and skills and also introduce them to the joys and benefits of home computers.

Peter Clark, faculty
Institute of Child Development
University of Minnesota

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Minneapolis, MN 55426
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Business Bazaar

They are nightmares common to all business managers at one time or another: an employee's paycheck gets lost in an overflow of paperwork in the manager's office; a client's file is overlooked, resulting in delayed payment; the bookkeeper leaves you muttering, "Where did all the money go?"

More and more companies and small businesses use microcomputers to help them maintain and process vast amounts of valuable information. To meet the demand, software manufacturers have written business software that satisfies just about any office requirement.

This Buyer's Guide provides a sampling of the various business packages available to TRS-80 owners. Besides payroll, general ledger, accounts payable/receivable, invoice, and inventory programs, there's quite a selection of software for both unusual applications and specific industries.

Among the programs that passed our desks were software designed to test and evaluate manager response to different situations, a bookkeeping system developed specifically for gas stations, a construction template program to help contractors determine accurate estimates, an aircraft maintenance program, and several software packages designed for use by Amway distributors.

For each software manufacturer that submitted programs to this guide, we've written a brief summary of what the program does, how much it costs, TRS-80 compatibility, and, where necessary, the program's limitations (listed in parentheses at the beginning of the program description).

Some software manufacturers produce several business programs, so we've included only one or two samples of their product line. You should contact these companies for a catalog and further information regarding their software.

For those of you who already have an inkling of the type of business software you need, quick-reference charts are provided. Listed under each are the names of the manufacturers who make relevant software. Refer to the text for further descriptive information concerning those programs, and for the company's address and phone number.

When reading through this Buyer's Guide, please remember that these listings are based on information supplied by the manufacturer. We have not tested or reviewed these products, and cannot guarantee manufacturer claims. Also, the price of some of these software packages may change by the time you read this issue, so contact the manufacturer for updates on newly released software programs and for revised program prices. ■

BLECHMAN ENTERPRISES

7217 Bernadine Ave.
Canoga Park, CA 91307
213-346-7024

SMALL HOME BUSINESS PROGRAMS

(Model I Level II and Model III)

These six programs are designed for the entrepreneur who operates small home-based businesses like Amway and Avon distributorships, and mail-order, insurance, and real estate businesses. All programs are provided on one cassette for \$49.95. Documentation is included. Listings and documentation can be purchased for \$20.

SPEED LETTER: A crash-proof program that generates letters and forms. There are only 10 commands, with

seven of them in a screen menu. Features include review text, save text, read text, add or delete lines, left margin control, automatic paging with numbers, print all or part of text, upper- and lowercase letters, and holds up to 150 lines of text in 16K of memory.

LEDGER: A 12-column ledger that prints out income or expenses with page, month, and grand totals on standard 8½-inch-wide paper. Column 1 is the income or expense amount. The user assigns the other 11 column headings.

MAILING LABELS: Handles 220 names and addresses. Data is sorted on entry by zip code, name, city, or user-defined code. Labels are printed three across, four lines each on either self-adhesive stock or plain paper.

AUTO-DIALER/TIMER: Stores up

to 500 names and phone numbers. User types in the name to be dialed through a \$3 Radio Shack interface relay. Elapsed time is displayed on the screen, and the computer redials the last number entered. Schematic to connect phone is included, and no computer modifications are required.

TOLL CHARGE: Real-time display of phone charges by the second.

INVOICE: Products and prices are stored in memory. The program does all the necessary calculations. A standard 80-column printer is required.

Blechman Enterprises also makes business-related software for Amway distributors. Software packages include Order Verification/Generation, Monthly Bonus Calculation, Monthly Gross Profit, Distributor Family Tree, Ledger, and much more.

**C. F. KERCHNER &
ASSOCIATES INC.**
5507 Louise Lane-E. Allen Twp.
Northampton, PA 18067
215-262-1276

**MANUFACTURING INVENTORY
CONTROL (Models I, II, and III)**

A menu-driven, user-friendly, four-level inventory control system that reduces the time and expense of inventory control for the small manufacturer. This system helps control parts, subassemblies, assemblies, and finished goods. It assists in inventory control, purchasing control of parts orders, accounting reports, and material requirements planning. Features of this system include inventory-level reports, below-minimum reports, parts lists, accounting reports, work sheets, on-order reports, parts pick lists/pull sheets, bills of material processing, and much more. Model I/III versions cost \$299.95, and the Model II version sells for \$349.95. Neither comes with a warranty, but you can purchase a sample test data disk for \$29.95 to determine whether or not it's compatible with your needs.

**PURCHASING AIDES PACK 01
(Models I, II, and III)**

A programmed approach to determine the recommended purchase quantity of an item given a certain set of facts. It prompts you for information concerning the buy choices, order processing costs, freight costs, inventory carrying costs, financing costs, the desired return on investment, and so forth. The output summarizes all these facts and then, using several equations, determines the recommended purchase quantity. Cassette versions are available for \$19.95, and disks sell for \$39.95. If you have a Model I, you must specify whether it is a Level I or II.

**PRODUCTIVITY AND QUALITY
ANALYSIS (Models I and III)**

This system determines a productivity index and quality level index for work performed by assembly or production workers in a small manufacturing firm. It sorts data typed in from simple job cards and quality control inspection tickets to tell you which workers and which jobs are above, on, or below standard. When updated daily, this lets supervisors keep an objective daily pulse on the shop. Plotting the daily reports by worker gives you an objective measuring tool to discuss

workers' performance. Cassettes of this system cost \$29.95 and disks cost \$39.95.

**COLOR SOFTWARE SERVICES
P.O. Box 1708
Greenville, TX 75401
214-454-3674**

**SERIES I: BEING BOSS
(Color Computer)**

Comprises six programs. Being Boss is the first in an ongoing series of computer-assisted management development tools. These programs provide information and guidance for those who are new to management or who want to improve managerial skills. The program contains the following management development aids: Reflections, a self evaluation guide; Assertiveness, learning to take control as a leader; Management Styles, how to approach the leadership role; Decision Making, how to handle decision making; Counseling, helping others solve personal problems; and Stress Control, learning to take care of yourself. Each of these programs is in a multiple-choice questionnaire format where the user is queried on his response to certain situations. A printed evaluation of your performance is provided after you complete the entire questionnaire. This program, which comes on cassette, sells for \$89.95.

**ACCOUNTS RECEIVABLE (Color
Computer) (16K Extended Basic)**

Provides the user with detailed audit trails and history files on all transactions by a customer. It also prepares invoices, mailing labels, aging lists, customer history reports, and an alphabetized customer listing. The user can define discount/net terms for commercial accounts, and finance charges and minimum payments for revolving accounts. This program is suited for integration into the Colorsoft Small Business Accounting Package, and costs \$89.95.

**SMALL BUSINESS ACCOUNTING
(Color Computer) (16K Extended
Basic)**

An integrated ledgerless accounting package for a small business. The package includes Accounts Payable, Accounts Receivable, Sales, and Purchase Order programs. It produces income statements, balance sheets, check

**Quick reference chart
to listed software
packages.**

**ACCOUNTING AND
GENERAL LEDGER**

Blechman Enterprises
Color Computer Software
Color Software Services
Computer Systems Research Inc.
Computronics Inc.
Custom Data
Eltech Associates
G&G Cunningham, CPAs
Holman Data Processing
Howe Software
Lizcon Trading
Micro Architect Inc.
ProSoft
Shawmut Systems
Small Business Systems Group
Taranto & Associates Inc.
TSASA Inc.
Univair International

**BILLING/ACCOUNTS
RECEIVABLE & PAYABLE**

Color Computer Software
Color Software Services
Computer Systems Research Inc.
Computerware
Computronics Inc.
Custom Software Services
Holman Data Processing
Micro Architect Inc.
Shawmut Systems
Small Business Systems Group
Southwest Systems
Taranto & Associates Inc.
The Software Establishment
The Software Terminal
TSASA Inc.
Univair International

BUDGET AND FORECAST

C.F. Kerchner & Associates
Computronics Inc.
Howe Software
Micro 80 Inc.
Southwest Systems
TSASA Inc.

CASH MANAGEMENT

Computerware
Computronics Inc.
Demi-Software
Micro Architect Inc.
Taranto & Associates Inc.
TSASA Inc.

Continued

DATA-BASE MANAGEMENT

Color Computer Software
Data Management Systems
Howard W. Sams & Co. Inc.
Howe Software
Micro Architect Inc.
Micro 80 Inc.
Universal Data Research Inc.
XYZT Computer Dimensions Inc.

FINANCIAL ANALYSIS

Computronics Inc.
Howard W. Sams & Co. Inc.
ProSoft
R.R. Belanger, Ph.D.

INVENTORY CONTROL

C.F. Kerchner & Associates
Color Computer Software
Computer Systems Research Inc.
Computerware
Computronics Inc.
Eltech Associates
Lizcon Trading
Micro Architect Inc.
Small Business Systems Group
Taranto & Associates Inc.
The Software Terminal
TSASA Inc.
Univair International

INVESTMENT ANALYSIS

Computronics Inc.
Good Software Corp.
TSASA Inc.

INVOICE CONTROL

Blechman Enterprises
Computer Systems Research Inc.
Eltech Associates
Lizcon Trading
Small Business Systems Group
Southwest Systems
Taranto & Associates Inc.

PAYROLL

Color Computer Software
Computerware
Computronics Inc.
Custom Software Services
Micro Architect Inc.
Shawmut Systems
Small Business Systems Group
Southwest Systems
Taranto & Associates Inc.

Continued on p. 157

registers, accounts payable and receivable status lists, and accounts payable and receivable aging reports. The program handles sales of up to \$1 million and approximately 800 accounts payable/receivable during each user-defined accounting period. Accounts are automatically numbered and each transaction is carried separately such that an account number will correspond to a specific purchase rather than a specific vendor/customer. This system is available for \$89.95.

GENERAL LEDGER (Color Computer) (16K Extended Basic)

An integrated, journal-type double entry accounting package for a small business that includes the General Ledger, Accounts Payable, and Accounts Receivable programs. The system provides you with income statements, balance sheets, accounts payable and receivable status lists, accounts payable and receivable aging reports, journal reports, account listings, and closing summaries. During each accounting period (as defined by the user), the system handles 800 accounts payable/receivable up to \$1 million each. All accounts are automatically numbered. This accounting package costs \$129.95 and is designed for integration with future software modules such as a payroll system, inventory, and so on.

COMPUTER SYSTEMS RESEARCH INC.

66 Rockland St.
North Easton, MA 02356
617-331-0450

ACCOUNTING MASTER PROGRAM (Models II, III, and 16)

This program works with either the Inventory and Order Entry program or by itself as an accounting package. Combined with the Order Entry program, you can produce invoices with items, credits with items, and payables to accounts. Used alone, it stores up to 800 customer accounts and provides you with Delinquent Reports, Active Accounts, Full Lists, Billing Statements, Transaction Reports, and Mailing Labels. This program keeps track of accounts receivable quickly and efficiently. It sells for \$200.

INVENTORY MASTER PROGRAM (Models II, III, and 16)

This program stores up to 1,300 inventory items. You can add, modify,

delete, and inquire about any desired item. Manual inventory transactions include Sell, Adjust, Receive, and Order. The program also provides you with inventory lists and purchasing reports. Your customer can use this software program as a stand-alone package for inventory control, or use it together with the Order Entry and Accounting programs. This program costs \$200.

ORDER ENTRY MASTER PROGRAM (Models II, III, and 16)

This program operates only with the other two in order to function. It draws from and posts to the Accounting Master File for customer information, and does the same with the Inventory Master File for product sales information. It handles sales, credits, and payments, but its real worth is in detailed invoicing with items. Here, it keeps track of line totals, invoice totals, and state and federal taxes. On a four-drive Model III, you can store up to 1,800 transactions per month. This program costs \$200.

Other offered programs include Multi-Location Inventory Control, Mailing List, Part Number Cross Reference Program, Invoice Control, and more.

COMPUTERWARE
P.O. Box 668
Encinitas, CA 92024
619-436-3512

CHECK LEDGER (Color Computer)

A single-entry bookkeeping system that lets the user define a chart of income and expense accounts. Reporting capabilities include detail account, summary account, written checks, outstanding checks, adjustments, and deposits. Year-to-date dollar totals are maintained for each account, as well as a complete checking account history. Manual account corrections is provided. It sells for \$195.

INVENTORY CONTROL (Color Computer)

Designed to help the retailer, distributor, or businessperson keep control of inventory. The program stores cost and quantity information, updates it immediately, and offers key management report summaries at any time. Formatted reports include General Inventory Report, Cost Extension List, Retail Extension List, Profit Margin Report, Price List, Count List, and Year-to-Date Monthly Sales. You are

Now NRI takes you inside the new TRS-80 Model 4 microcomputer with disk drive to train you at home as the new breed of computer specialist!

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Now training includes either the TRS-80 Model 4 Microcomputer with Disk Drive or TRS-80 Color Computer with Computer Access Card; professional LCD multimeter; the NRI Discovery Lab; and hundreds of demonstrations and experiments. (TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)



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Washington, D.C. 20016

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provided with four costs, four locations, selling history, and vendor information for each item. The program costs \$195.

PAYROLL (Color Computer)

Besides collecting key employee information, this program allows entry of pay rates for standard hours, overtime, and salary. Hourly, salary, and commissioned employees may be paid weekly, bi-weekly, semi-monthly, or monthly. You can sort all the reports by employee number, social security number, employee name, or state code. The program automatically reports federal and state taxes, and permits changing tax rates and maximums according to government changes. The program comes with password protection and sells for \$295.

ACCOUNTS PAYABLE (Color Computer)

This program collects vendor invoice information and reports the business' cash commitments and payment history. For each invoice entered, the program stores the invoice number, ven-

dor, invoice date, invoice amount, and payment document number. Reports include Account Cross Reference, Account Master, Account Summary, Accounts Past Due, Payment Forecast, and Activity. These may be sorted by vendor number, vendor name or invoice date with range selection available for selective reporting. The system is available for \$195.

ACCOUNTS RECEIVABLE (Color Computer)

Provides reliable and timely information regarding the status of all customer accounts. The program tells you which accounts are past due, forecasts how much money to expect for cash flow planning, and keeps you on top of your customer's credit positions. Customer name, address, credit limit, invoice, and payment information is recorded. Available reports include Account Summary, Account Overdue, Account Aged, Payment Forecast, Audit Trails, Account Master, and Account Cross Reference. This system sells for \$149.

COMPUTRONICS INC. 50 N. Pascack Road Spring Valley, NY 10977 800-431-2818

BUSINESS PAC 100 (Models I, II, and III)

Comprises 100 ready-to-run business programs ranging in interest from inventory control to payroll, and from bookkeeping systems and stock calculations to checkbook maintenance and accounts receivable/payable. Contact Computronics for their 64-page software catalog for more detailed information on the above programs, and also inquire about their VersaBusiness series of business software. Model I and III versions are available on disk or cassette for \$99.95, and Model II versions are available on disk for \$149.95.

CUSTOM DATA 1100 New York Ave. P.O. Box 1066 Alamogordo, NM 88310 505-434-1096

CHURCH/CUSTOM LEDGER (Models II, III, 12, and 16)

Two comprehensive general-ledger programs. The Church Ledger is designed to interface with Custom

Data's already successful Church Donations program, while the Custom Ledger is a stand-alone program. Both programs allow the user to track five separate checking accounts with five account types and nine categories under each account type. The Church Ledger permits 100 general-ledger accounts and 570 transactions per month, and the Custom Ledger allows 200 general-ledger accounts and 2,175 transactions per month. Both generate a chart of accounts, a trial balance, a statement of income and expenses, a balance sheet, a transaction journal, a check register, checkbook reconciliation, a budget report, and a sessions transaction journal. For those with two-disk-drive systems, the Model III version costs \$180, and the Model II, 12, and 16 versions cost \$225. Four-disk-drive systems cost \$199 for the Model III, and \$249 for Models II, 12, and 16.

CUSTOM SOFTWARE SERVICES P.O. Box 150 Porterville, CA 93258 209-784-7966

ENHANCEMENTS TO R/S PAYROLL (Models II, 12, and 16)

Improvements to Radio Shack's payroll program increase capacity to 999 employees on hard disk (475 employees with a two-disk-drive system), replaces the Basic sort with a machine-language sorting program capable of sorting 999 employees and creating an index file in under a minute, allows escaping from a displayed employee's check during payroll processing without creating the check, sends the screen's contents to the printer during editing and payroll processing sessions, and adds the amount of the check in word form to all payroll checks.

The enhancements are available for \$100, and a copy of your R/S Payroll must accompany your order to verify that you have purchased the program. The disk is reformatted under TRSDOS 2.0 and the improved versions of each program are copied to your disk.

ACCOUNTS RECEIVABLE SYSTEM (Models II, 12, and 16)

Designed for trucking companies, this system handles up to 300 customers, 500 transactions per customer each month, with a maximum of 7,600 transactions each month when used on a three-disk-drive system. Also included are five load-management programs for

TRS-80 MODEL III ASSEMBLY LANGUAGE

A complete course in assembly language, written for the beginner. Basic concepts, the Z-80 instruction set, complete Model III ROM and RAM information, programming examples, the disk controller, the TRSDOS 1.3 operating system, RS-232-C interface.

With the book you can also purchase Monitor #5, a comprehensive machine language monitor (specify Model 1 or 3).

Book only \$16.95
Book and Monitor #5 on disk \$29.95

HOME BUDGET

Analyzes your income and expenses, computes monthly and year-to-date summaries showing income tax deductions.

Model 1/3/4 disk version \$49.95
Model 1/3/4 cassette version \$29.95
Model 2/12 or IBM/PC version \$59.95

SMALL BUSINESS ACCOUNTING

Based on Dome Bookkeeping Record #612, this program keeps track of income, expenses, and payroll (not included in cassette version) for a small business.

Model 1/3/4 disk version \$59.95
Model 1/3/4 cassette version \$29.95
Model 2/12 or IBM/PC version \$69.95

FREE Software Catalogue

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Howe Software

14 Lexington Road
New City, New York 10956 -175

(914) 634-1821

Visa and MasterCard accepted.
*TRS-80 is a trademark of Tandy Corp.

billing on a per-barrel, per-gallon, per-ton, per-hundred weight, and percent-age of hundred weight basis.

The system generates a complete set of reports, including sales analysis reports and year-to-date summaries for each customer, as well as standard statements and invoices. This accounting system is priced at \$500.

DATA MANAGEMENT SYSTEMS
211 N. El Camino Real
Suite 101C
Encinitas, CA 92024
619-942-0744

CCDS (Model 16)

CCDS is a relational data-base system. The user views data as simple collections of flat files or tables, and each row of a table is viewed as a data record. Records may be selected based on data values, and specified fields of each record are displayed or printed. In addition, you can combine data from different files and display or print the combination. Standard and formatted reports and displays can contain derived fields, and users can enter simple English

queries for retrieval. CCDS is offered at an introductory price of \$595 and comes with a 30-day trial period.

DEMI-SOFTWARE
6 Lee Road
Medfield, MA 02052
617-359-4502

DEMI-PLAN: PROJECT MANAGEMENT SYSTEM
(Models I and III) (48K)

A project management program for defining and maintaining a file of project tasks and resources. The information is used to print various forms of Gantt Charts, Resource Histograms, and Task/Resource reports. The system determines the critical path of a project, and lets the project manager introduce "what-if" data to test the effect of date and resource changes on the project's completion date. It sells for \$49.95 post-paid, and documentation only costs \$5.

Demi-Software manufactures numerous business-related programs other than their Project Manager System. A sampling includes Personal Finance Package, Mailing List, Label Printer,

Continued from p. 154

PURCHASE ORDER

Color Computer Software
Computer Systems Research Inc.
Computronics Inc.
Eltech Associates
Micro Architect Inc.
Southwest Systems
Taranto & Associates Inc.
TSASA Inc.

REPORT/MAILING LIST GENERATOR

Blechman Enterprises
Color Computer Software
Computer Systems Research Inc.
Demi-Software
Howe Software
Micro Architect Inc.
Small Business Systems Group
XYZT Computer Dimensions Inc.

STOCK MARKET

Computronics Inc.
Management Services
Micro Architect Inc.
Star Value Software
Think Software Inc.
TSASA Inc.

Continued on p. 159



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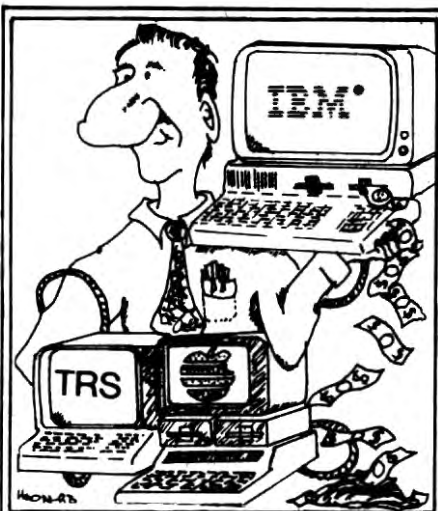
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A labor reporting/performance system that monitors and measures the efforts of your work force. It provides you with the daily, weekly, and monthly information you need to control your costs. You can trace each employee's work efforts, each department's performance, and all production-job labor costs. In addition, you can monitor indirect labor charges on your expense accounts with weekly and monthly reports. The system handles 400 employees, 500 production jobs, and 200 departments or work centers. The Model III version sells for \$345, and the Model II/16 version for \$445.

Eltech makes nine other business programs, including Shop Order Control, Purchase Order Control, Manufacturing Job Cost Control, Inventory Control, Bill of Materials Processor, Production Planning Control, Material Planning Control, and others. Contact Eltech for further information concerning product descriptions, pricing, and Radio Shack compatibility.

EXECUTIVE SOFTWARE INC.

255 Delaware Ave.
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A program package that helps businessmen analyze complex business problems where many alternatives and/or criteria exist. It takes the user through eight menu-selected sections that include problem definition, statement of decision purpose, establishing and valuing must and want criteria, calculation of criteria values, defining alternatives, weighing and scoring alternatives against criteria, assessing possible adverse consequences, and final conclusions. This program is offered at \$139, and it is recommended that the user have access to an 80-column printer.

G&G CUNNINGHAM, CPAs

610 Park Blvd.
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G&G GL (Model II)

A general ledger program written by a certified public accountant for accounting practices with numerous client records. The program supports as many as nine departments. Printouts are available for each department, all departmental information, or summary information only for all departments. The chart of accounts for a particular installation and the number of transactions between closings are both unlimited, subject to the user's disk space. The program prints standard transmittal letters to accompany prepared financial statements. This package costs \$495 and comes with a 30-day refund if you are not satisfied.

G&G 1040 (Model II) (64K)

A tax preparation package that accepts IRS-supplied forms as input sheets. It supports 27 IRS forms and the results of all calculations are carried to other forms as appropriate. Where computations are necessary to choose the least-tax alternative, the program selects and computes the result with the lowest tax rate. A variety of print options are available, and you can easily recompute and reprint your entire return in fewer than 15 seconds. The Professional Series costs \$750, and the Starter Series (11 schedules, and no depreciation or batch options) sells for \$195.

GOOD SOFTWARE CORP.

12900 Preston Road
 Dallas, TX 75230
 214-239-6085

INVESTOR III

(Models II, III, 12, and 16) (64K)

Allows you to quickly evaluate real estate investments. Calculate up to 20 years of projections based on depreciation tax shelter, future property values, mortgage balances, capital gains and recapture taxes, net proceeds from resale, return on equity, and internal rate of return. A sensitivity analysis feature permits rapid change of assumptions and revised projections with output to printer or screen.

The program costs \$249 plus \$5 shipping and handling, and comes with a 30-day warranty. Good Software also

replaces defective disks at a substantial discount. Demo packages cost \$50 plus \$5 shipping.

GOOTH SOFTWARE
931 South Bemiston
St. Louis, MO 63105

INCOME TAX PROGRAMS

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Continued from p. 157

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Gooth Software
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- Blechman Enterprises
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- Demi-Software
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Handles up to 5,000 customers and 15,000 transactions. The program has a balance-forward system, and is capable of entering and posting 120 invoices per hour. You can add a customer in 30 seconds without having to sort the customer file. Reports include aging, copy of statements, labels, late charges, posting audit trail, and so on. A test set limited to 15 accounts sells for \$50. The complete system is priced at \$149.95. The General Ledger program is only \$50 if you order it with Accounts Receivable.

HOWARD W. SAMS & CO. INC.
4300 West 62nd St.
Indianapolis, IN 46268
317-298-5419

MIND TOOLS (Model II) (VisiCalc)

This program temporarily interlocks with the VisiCalc spreadsheet so you can immediately perform 17 common financial planning calculations. Mind Tools allows you to calculate present, net present, and future values; yields; internal and financial management rates of return; and basic statistics. It also allows break-even analyses, depreciation schedules, and amortization tables. This system costs \$69.95, and comes with complete documentation, including 128-page user's manual and a 40-page quick-reference guide.

MAGNUM (Model III) (48K)

A powerful data management system that lets you create, store, search out, sort, edit, display, and print records in data files up to 1,200 records long. You can search 10 ways for up to eight items in one or all fields, and display or print the results in record-order or sort on up to three fields. Magnum prints any of four predefined columnar reports on any of three mailing-label formats and prints on up to six different forms, such as checks and invoices. This software package sells for \$79.95. An 80-column printer is recommended.

HOWE SOFTWARE
14 Lexington Road
New City, NY 10956
914-634-1821

SMALL BUSINESS ACCOUNTING (Models I, II, and III)

Keeps track of income, expenditures, and payroll for a small business. Enter income and expenditures on a daily, weekly, or monthly basis. The program computes monthly, through last month, and year-to-date summaries. The payroll section, not included in the cassette version, records individual employees and their paychecks with up to six categories of payroll deductions. The disk version sells for \$59.95, the cassette version for \$29.95, and the Model II version for \$69.95.

MAILING LIST (Models I, II, and III) (48K)

Maintains mailing lists of up to 1,328 names. Commands allow adding, changing, deleting, and finding names. The program sorts by machine language, according to the data in any field (name, address, and zip code). Labels are printed in up to four columns in master list or on video display. Tabs adjust to fit any size labels. The program is available only on disk. The Model I/III version costs \$69.95; the Model II version is \$79.95.

IN-MEMORY DATA-BASE MANAGEMENT (Models I, II, and III)

Defines files of various descriptions and maintains them on either cassette or disk. An in-memory system, the program allows files of up to 50 fields, with the number of records available determined by RAM space. Commands include add, change, or delete records; find a specific item; sort according to the data in any field; print file on display or printer; save file on cassette or disk; and total items in a single field with or without comparison. Reports are formatted in several ways. The cassette version costs \$29.95, the disk version \$34.95, and the Model II version \$49.95.

SMALL BUSINESS MANAGEMENT SYSTEM (Models I, II, and III)

Contains everything you need to manage a small business. The software includes Order Desk, to enter orders and print invoices and mailing labels;

Bookkeeping, a complete general ledger; Inventory, summarizes all products sold by product type and price charged; and Customization, a complete installation package for each business to tailor the program to its own requirements. Before you buy this system, check its capabilities and limitations. The Model I/III version sells for \$350, the Model II version for \$400.

JOSEPH NICHOLS PUBLISHER
P.O. Box 2394
Tulsa, OK 74101
918-583-3390

WRITER'S PROFESSIONAL SUBMISSION REGISTER (Model III) (48K)

A menu-driven program that lets the writer record each submission by manuscript title, publisher or magazine, address of publisher or magazine, date of submission, and identification of the literary form. An update feature provides the date of acceptance or rejection, and a comment line for recording money received or editorial remarks.

The program displays or prints the current submission of a manuscript, all the places the script was submitted, all manuscripts sent to a particular publisher or magazine, a list of all the submissions in a particular literary form, and a listing of the complete register. The disks hold approximately 150 manuscript title records, 2,500 submission records, and 300 addresses. The Register sells for \$59.95 on two disks written in Cobol.

**K.J.K. MANAGEMENT
GROUP INC.**
Systems Division
546 Columbian St.
Weymouth, MA 02190
800-323-5511

GAS-PRO (Model III)

A comprehensive bookkeeping system developed specifically for service stations. It permits shift-by-shift check-out of the day's gas and repair sales, accumulating to a one-page sales summary with a detailed statistical analysis of gas sales. Gas-Pro maintains accounts receivable, prints customer statements, tracks accounts payable, details invoices for payment, provides a daily breakdown of parts and labor into 20 user-defined categories, and it tracks mechanic's sales and commissions

weekly or monthly.

It is available from K.J.K. for \$6,800, including hardware, software, disks, in-house instruction on system use, and free system updates for one year.

LIZCON TRADING
2949 South 3rd West St.
Salt Lake City, UT 84116
801-484-8179

A/R-STATEMENT OF ACCOUNT (Models I, II, and III)

Print the following: statement of account, statement of commission, accounts receivable ledger, accounts receivable aging, price list by product class, alphabetical listing of customers, mailing labels, and alphabetical listing of vendors. The random-access method creates all data files and speeds data update and retrieval. The Model I/III version costs \$199, and the Model II version \$289.

INVOICING-INVENTORY PROGRAM (Models I, II, and III)

Lets you update quantity-on-hand in the inventory file while printing the invoice. With the data base, you can print the following: product inventory ledger, price list by product class, alphabetical listing of products, items below reorder level, alphabetical listing of customers, mailing labels, and alphabetical listing of vendors. Model I/III version sells for \$199, and the Model II version for \$289.

MAILING LIST PROGRAM (Models I, II, and III)

Lets you print mailing labels not only by city, state, and zip code, but also by priority coding. This permits you to selectively print mailing labels according to preference. The Model I and III versions each sell for \$99, and the Model II version sells for \$189.

INVOICING-A/R-INVENTORY PROGRAM (Models I, II, and III)

Updates quantity-on-hand in the inventory file while printing the invoice in addition to posting invoice data to the accounts receivable file. You are able to print the following: statement of account, statement of commission, accounts receivable ledger, accounts receivable aging, product inventory ledger, price list by product class, alphabetical listing of products, items

below reorder level, alphabetical listing of customers, mailing labels, and alphabetical listing of vendors. Model I/III version costs \$399, and the Model II version costs \$499.

VIDEO TAPE RENTAL SOFTWARE (Model III)

Allows you to print sales receipts and interact with customer and inventory files. You can quickly track down a rented item by entering its inventory number; the screen shows the name of the renting customer and the date rented or returned. The program is priced at \$399.

MANAGEMENT SERVICES
2901 Clendenen Lane
Longview, TX 75601
214-757-4558

MARKET MASTER (Models I, II, and III) (48K)

Market Master, a stock and commodity market analysis tool that creates and maintains large price data files, tests a trading system in various markets, graphs prices and results of a trading system, provides daily buy/sell recommendations, and provides printouts in any report mode. Nine versions of this system are available, each containing one of the following unique trading systems: Dual Moving Average, Percentage Band, Channel, Oscillator, Delay Oscillator, Delayed Channel, Linear Regression System, Composite Index, and Exponential Internal Index. Each version of Market Master sells for \$124.95. If you want to purchase the complete set, the company recommends that you buy the Magnum series for \$595 on the Model I/III and \$695 on the Model II. The Magnum series is a more powerful version of the Market Master system.

Market Master is just one of several stock programs put out by Management Systems. A sampling of programs includes Datamax, Comdata Package, MJK Package, Analyst II, Data Files, and the Magnum System.

MANHATTAN SOFTWARE
P.O. Box 1063
Woodland Hills, CA 91365
213-453-6943

AMWAY BUSINESS MANAGER (Models I and III)

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Continued on p. 164

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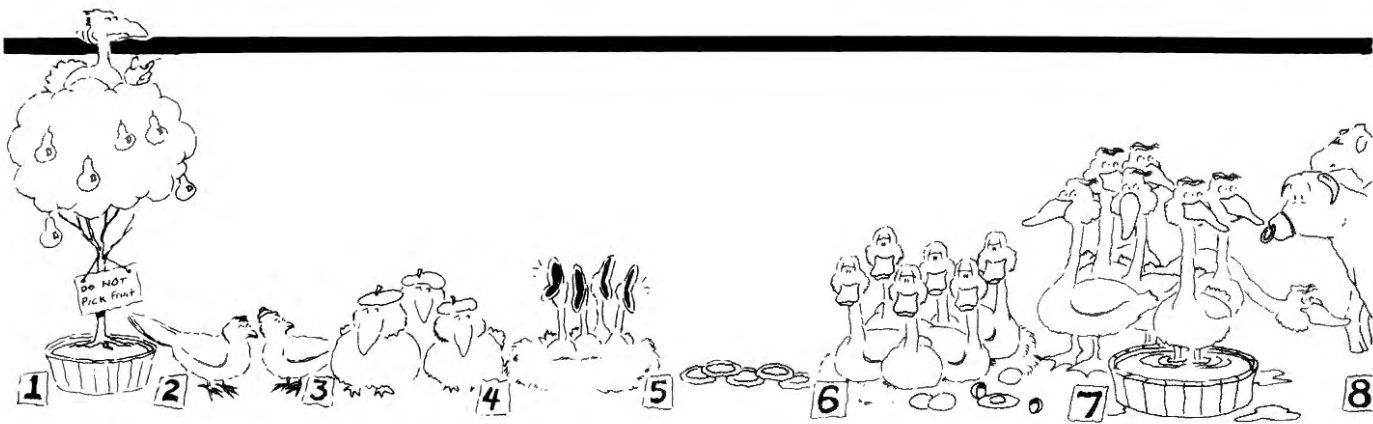
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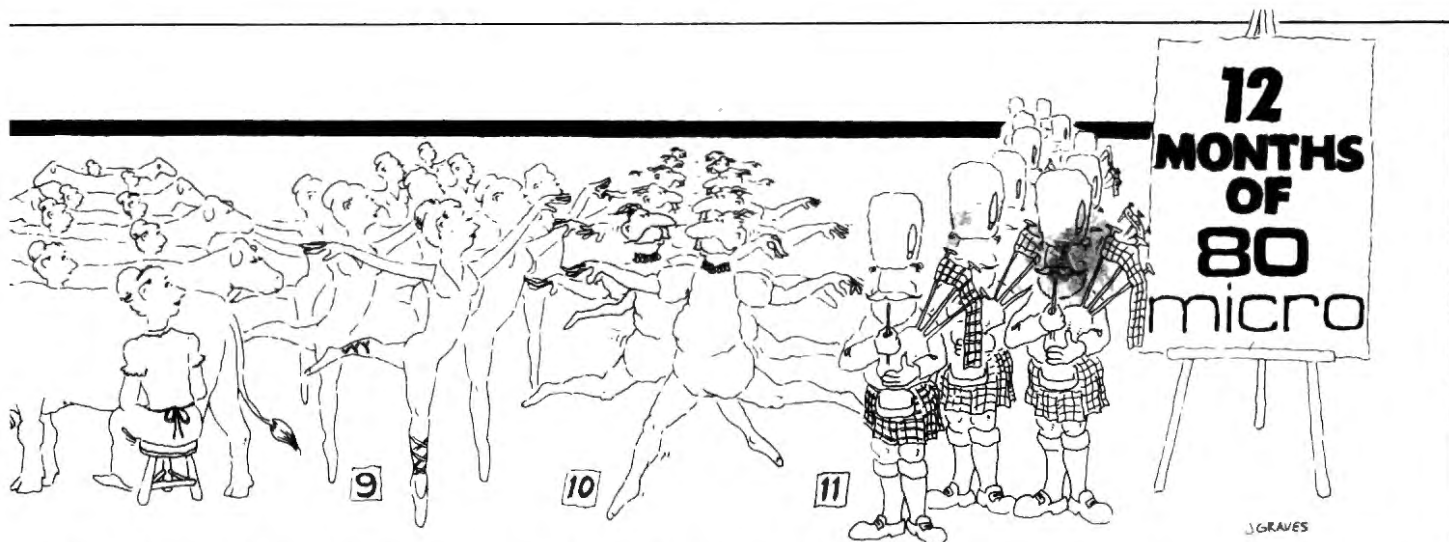
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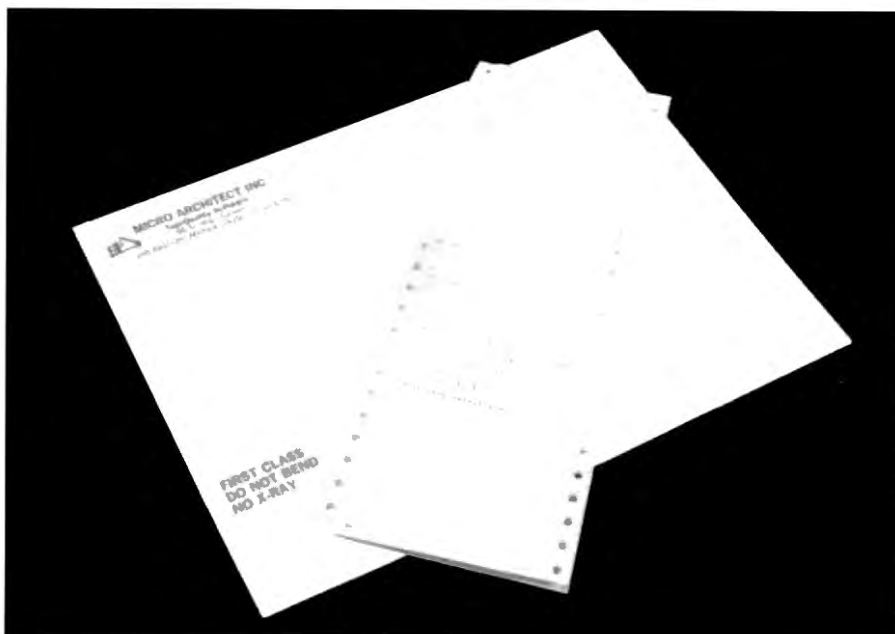
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Micro Architect's Mail-X program prints labels, and accesses over 32,000 records in one file.

Continued from p. 161

this software package controls inventory, verifies incoming SA-1 orders, and compiles PV and BV for personal orders. The program provides inventory initialization, restocking, and non-order withdrawal. Any product can be checked on the display at any time, and the data updated or edited as necessary. A random-access disk file provides full information on 450 products, including stock number, name, PV, BV, and wholesale and resale costs. The program also accommodates detailed information on 200 distributors. Reports provide Inventory Status, Sales, Product Records, Reorder Needs, and Distributor Records. The program is supplied with a 50-page manual and comes with demonstration figures in several of the files. It sells for \$149.95.

THE AMWAY COMPANION (Models I and III)

A supplementary program that interacts with the indexes and files of the Amway Business Manager package to provide the following features: automatic printing of a single-page or multi-page SA-2R RDC order, with all information placed in the appropriate spaces of the order lines; order information inserted from the reorder file of the Business Manager program into the Companion program with a month-to-date total of PV and BV feature; product rearrangement and product updates; on-screen scrolling of all product records; and page-formatted printouts of Product Records, Inventory Status, and Sales with page heading and num-

bering. The program costs \$49.95 and requires a friction-feed printer if you want SA-2Rs single-sheet printed.

AMWAY BONUS MANAGER (Models I and III)

Another supplementary program for the Business Manager software package. This program provides the following capabilities: printed reports on downline groups and families, on-screen and printed reports on upline relationships of any distributor in the Business Manager's files, calculation of bonuses due to each distributor, editing feature to update any distributor's record filed with the Business Manager, and added transfers and other bonus information for a complete record of bonuses receivable and payable at any level. This supplementary package sells for \$99.95.

MICRO ARCHITECT INC. 96 Dothan St. Arlington, MA 02174 617-643-4713

INV-V (Models I and III) (32K)

An advanced inventory management and control system that consists of an initialization, data-base manager, and report manager modules. The inventory item is randomly accessed by a nine-digit alphanumeric key. Reports give you order information, performance, and formatted dump of your data base. This system key-random accesses over

1,000 items (2,400 on a Model III), and has the following features: screen input, order entry, shell sort, and a powerful report writer. This program sells for \$89; for an additional \$10 you receive an optional data disk.

Micro Architect manufactures over 30 other business programs for the Models I/III and Model II computers. A small sampling includes a cassette data base, stock security information system, sorting utility, sale analysis, mailing list system, accounts receivable, general ledger, payroll, accounts payable, and so on.

MICRO 80 INC. 2665 North Busby Road Oak Harbor, WA 98277 800-528-6050 (Orders only) 206-675-6143 (Inquiries)

MANAGEMENT SYSTEM II (Models I and III)

A cassette-based file management program executing all commands by single-letter entry. File presentation is a maximum of two horizontal lines (100-plus characters) with one to nine vertical columns. Column titles are easily created, and files may be added, updated, listed, deleted, or saved to either tape or printer. Special features include a machine-language sort of any column you choose and a total function for adding integers in any column. There is also a Labels command that lets you produce mailing labels, file labels, and so forth. The cassette is priced at \$26.95.

MICRO-ORGANIZER I (Models I and III)

A three-program set that itemizes expenditures by the day, week, month, or year. You can analyze necessities, scrutinize non-essentials, and review wasteful spending habits. It comes with a claims adjuster program so you can conduct an accurate inventory of your possessions and account for your untold assets. The system also features Scheduler, an up-to-date appointment calendar. This program is available on both tape and disk at \$19.95.

MICRO-ORGANIZER II (Models I and III)

A three-program set capable of creating and manipulating name and address files. Comes with Comparison Shopper, a comprehensive cross-reference system that identifies and com-

Which TRS-80* Accounting Software Do I Buy . . .

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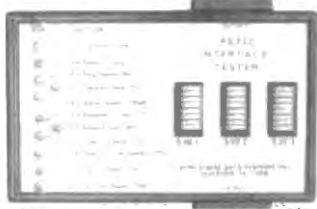
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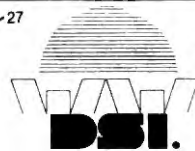
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Reports generated by this program include Open Voucher Report, Cash Requirements Report, and Aged Payables Report. The system prints checks for each vendor, and lists all vouchers paid by this check. In addition, there is an End-of-Period Processing Program that accumulates the debit and credit transactions passed to the user's general ledger, and prints out a transaction register with this data. The pricing

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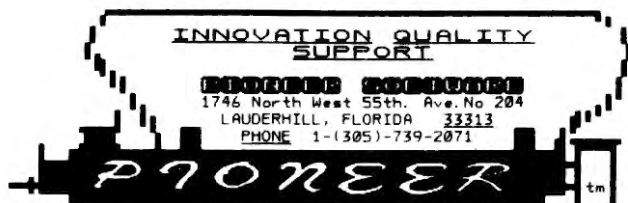
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(217) 359-8482
Telex: 206995

HOME TEMPLATES (Models I, II, III, 12, and 16)

These models manage your yearly budget, your weekly shopping list, an amortization schedule for your loan payments, determine how long your IRA money lasts after you retire, and calculate your IRS Schedule A deductions. It costs \$39.95 and comes on disk.

SOUTHWEST SYSTEMS Microcomputer Sales & Services 44 3rd Ave., Suite F Chula Vista, CA 92010 619-425-5500

FULL SERVICE PAYROLL (Models I and III)

Provides for up to 100 employees grouped into a maximum of six different departments. This flexible method provides for payment of employees on salary, hourly rates, commission, or draw accounts. There are 20 different deduction categories used to automatically compute non-standard deductions for employees. The system uses either pre-printed checks or a regular company checkbook. A versatile error-check feature provides for checkpoints during payroll processing.

At the end of each quarter, the 941 continuation sheet is prepared, as well as a summary for preparation of state and federal tax forms, and a summary of non-standard deductions by category. This program sells for \$150, and the accompanying documentation costs \$15. This program contains California state tax computations, so you must inquire about the availability of other states' before ordering.

Southwest Systems manufactures several other business-oriented programs that include Minibiz Bookkeeping System, Aircraft Maintenance System, Project Cost Control System, Manufacturer's Cost Estimating System, Order Entry & Invoicing System, and much more.

STAR VALUE SOFTWARE 12218 Scribe Drive Austin, TX 78759 512-837-5498

OPTIONVUE-A (Models I and III) (48K)

A stock market spreadsheet program for brokers and individual investors that compares investment alternatives

using basic option strategies. The program quickly answers "what-if" questions and is capable of handling the following types of investments: ordinary stock purchase or short sale, ordinary call or put option purchase, covered writing, naked writing, and ratio writing. It is available on disk or cassette for \$189 which includes documentation and shipping.

OPTIONVUE-B (Models I and III) (48K)

Also a spreadsheet program, but designed to work with situations involving the simultaneous use of two options on the same underlying stock (spreads, straddles, and combinations). The program takes into account an estimate for trade commissions based on the user's choice of full service or discount broker, and opening cost is based strictly on the Securities and Exchange Commission rules for margin requirements. Available on both disk and cassette, it sells for \$189.

OPVALU/ADVANCED OPVALU (Models I and III) (32K)

OPVALU is a program for determin-

ing the fair market value for listed put and call options. It is ideal for spotting an overpriced or underpriced option in the market. It sells for \$39.95.

Advanced OPVALU determines the fair market price for arrays of listed put and call options on a single issue. It is available for \$129. Both come on either disk or cassette and with complete documentation.

TARANTO & ASSOCIATES INC. P.O. Box 6216 121 B Paul Drive San Rafael, CA 94903

PAYROLL (Models I and III)

Consists of 28 programs that maintain files, perform pay entry and verification, compute pay and deduction amounts, and print reports and forms. Employees may be hourly or salaried, and miscellaneous deductions are selected on a one-time or recurring basis. You can write paychecks outside the system and incorporate data into files for inclusion in historical records, payroll journals, and tax forms. This package computes all taxes, and is capable of printing 941A and W-2

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Orlando, FL 32853 (305) 896-4264

* Bible Search currently requires a TRS-80 (TM of Tandy Corp.) Model I or III with 48K memory and two disk drives. Inquire about its availability on other computers.

Taranto & Associates
 COMPUTER SYSTEMS SERVICES
 P. O. Box 6073 San Rafael, California 94903
 Ph. (415) 472-2670

STATEMENT

DATE	10/08/80
ACCOUNT NUMBER	0035

No 1301
 PAGE 1

ORVEL P. ORMAN
 Widget Manufacturing
 2345 Woodland Ave.
 San Francisco, CA 94128

AMOUNT ENCLOSED \$ _____

RETURN THIS PORTION WITH PAYMENT

DATE	CHARGES AND CREDITS	AMOUNT
	BALANCE FORWARD	4,055.00
10/08/80	LLLLLLLL CHARGE	27.00
10/08/80	21345 CHARGE	98.00
10/08/80	998 PAYMENT	750.00-
10/08/80	999 PAYMENT	200.00-
	SERVICE CHARGE	43.05
	NEW BALANCE DUE	3,255.05

CURRENT	30 DAYS	60 DAYS	90 DAYS	PAY LAST AMOUNT IN THIS COLUMN
150.05	0.00	55.00	3,050.00	

Taranto & Associates *Thank You*

A statement sample from Taranto's Accounts Receivable Balance Forward program.

forms. It sells for \$75, and the user's manual costs \$20.

This is just one of several business software programs that Taranto & Associates makes for the Model I/III. Other programs include Accounts Payable, General Ledger, Cash Journal, Accounts Receivable, Invoicing, and Inventory Control.

MEMBERSHIP ACCOUNTS RECEIVABLE (Models II, 12, and 16)

This package is for organizations that supply products or services to organization members, rather than customers. The program monitors up to 8,000 members and 20,000 transactions. Special features include a balance-forward system that discards transactions at the end of a month, cash accounting that reports income as collected, and monitors up to 38 income accounts for direct posting, a periodic billing facility for dues that has 20 different dues rate categories to select from, recurring transaction facility for individual members, aged statements with descriptive reference, and selective mailing facility in member code or zip code sequence. This software package is available for \$500, and runs under

TRSDOS or CP/M.

Taranto & Associates Inc. makes several other business programs for Radio Shack Models II, 12, and 16. Other programs of interest include Accounts Payable, Purchase Order, Payroll, Job Costing, Inventory Control, Accounts Receivable, Invoicing, Sales Analysis, and so on.

THE SOFTWARE ESTABLISHMENT
 31230 Cedarvalley Drive
 Westlake Village, CA 91362
 213-991-7711

SERVICE BILLING SYSTEM (CP/M)

This CP/M program is a complete billing package featuring a letter writer that automatically adds the customer's name and address, a calendar system, and a label and envelope generator. Customers are charged three ways: unit billing, automatic billing, and flat rate charges. Five different management reports collect and incorporate statement information. In addition, this program handles taxes, commissions, and credit cards. The disk program sells for \$618.

THE SOFTWARE TERMINAL
 P.O. Box 53376
 223 Fairway Drive
 Fayetteville, NC 28305
 919-483-2003

INSURE: LIFE INSURANCE AGENT MANAGEMENT SYSTEM (Model II)

Designed for a single life insurance agent or agency. The system stores 480 bytes of client information in the Client Master file alone. In addition, separate files maintain information on policies, source of payments and descriptions, paid business, and pending business. Major features of Insure include records accessed in under two seconds, over 900 client history records of almost 40 items per disk, full screen editing, summary reports of income by agent or company, mailing list and labels, and a file for keeping MDRT credits for each agent with credits automatically figured. A demo disk with documentation costs \$25 and can be credited toward the system price of \$250.

ACCOUNTS RECEIVABLE (Model II)

This system handles the receivables of a small- or medium-sized business. It helps management keep a hand on billing, and monitoring incoming funds. Special features of this program include full screen editor; up to 1,000 receivables monitored; file access in under two seconds; sales and payments posted using transaction codes for easy-to-follow audit trails; sales information transferred to inventory; and statements aging reports, transaction journals, and alphabetical account listings printed. A demo disk with documentation costs \$25 and is credited toward the system cost of \$200. You can purchase both the Accounts Receivable and Inventory Management System for \$300.

INVENTORY MANAGEMENT SYSTEM (Model II)

This program provides you with current information concerning sales inventory volume, present purchases, and inventory performance. It stores up to 3,000 inventory items and 900 vendors on disk. Any stock item is accessed in under two seconds. Sales information enters from the screen or from the Accounts Receivable without rekeying. In addition, all vendors and/or stock can be automatically transferred from Radio Shack's IMS without rekeying.

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Also Note: SUPERLOG is now fully interrupt activated; it may be accessed from practically any foreground task including LDOS Utilities, LBASIC, LSCRIPT, EDAS, etc. with non-destructive return to the foreground program. No other information management program is this versatile!

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(Model IV version to be offered soon.)

LOG TRSDOS versions, Models I, III still available.

KSoft (601) 992-2239

318 Lakeside Drive Mastercard and Visa accepted.
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(TRSDOS is a trademark of Tandy Corporation)
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YOUR HARDWARE PURCHASE IS COVERED BY AN MCW 90 DAY, LIMITED, PARTS AND LABOR WARRANTY OR THE WARRANTY OF THE ITEM'S MANUFACTURER CONFIRM YOUR COVERAGE WHEN PLACING AN ORDER. COPIES OF THE WARRANTY ARE AVAILABLE ON REQUEST.

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PO BOX 39278 DETROIT, MI. 48239
TELEPHONE ORDER LINE (313) 525-3040**



DAISY WHEEL New Smith Corona TP-1

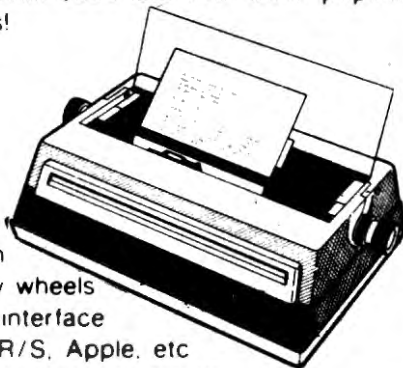
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THINK SOFTWARE INC.

572-810 W. Broadway
Vancouver, BC,
Canada, V5Z 4C9
604-261-7261

WALL STREET TAP SYSTEM (Models I and III)

Consists of three computer programs: Stockline, an advanced stock appraisal package; The Stock Stalker, a beginner's stock analysis program; and the TAP Communications Package, a terminal package for downloading information from CompuServe.

Stockline provides comparison charts, moving average, on-balance volume, point and figure, and price/volume charts. All for \$149.95. The Stock Stalker, the simpler stock appraiser, is available for \$59.95 and offers comparison charts to spot confirmation signals and relative strength, and price/volume charts to analyze price and volume trends.

The Wall Street TAP sells for \$59.95 alone, and if you order both the Stockline and the TAP together you save 10 dollars and get them for \$199.95.

TSASA INC.
2 Chipley Run
West Berlin, NJ 08091
609-346-3063

(Color Computer)

This software manufacturer has over 30 business programs compatible with the Color Computer. A small sampling of the available software for business use includes The Accountant, Accounts Receivable and Payable, Order Tracker, Business Inventory, Cash Flow Model, The Predictor-Linear Regression, Investment Analyst, Utility Bill Saver, and much more.

UNIVAIR INTERNATIONAL

9024 St. Charles Rock Road
St. Louis, MO 63114
314-426-1099

LEGAL TIME AND BILLING SYSTEM (Model II with CP/M)

Designed for attorneys, architects, accountants, administrators, and other professionals who provide services on a time and expense basis. The system contains a full accounts receivable package on clients, and a project management program.

In addition to setting up files for all of the clients and staff members, the system allows definition of a data base containing up to 900 categories of projects, as well as 1,000 service codes for specific types of work performed. These

codes may be defined as either fees or expenses.

Projects or cases are easily entered and can be cross-referenced in several ways. Twenty-six types of reports and statements are generated with this program, including Inter-Office Master Reports, Client Master Activity Reports, Daily Office Production Reports, and Monthly Statements and Forms. The entire package sells for \$950; a demo package costs \$250.

This Legal Time and Billing System is one of 10 business programs manufactured by Univair International. They have Management System programs for Medical, Dental, Insurance, and Real Estate practices. In addition, they make Accounts Receivable/Payable, General Ledger, and Inventory programs.

UNIVERSAL DATA RESEARCH INC.

2457 Wehrle Drive
Buffalo, NY 14221
716-631-3011

DATA-BASE MANAGER (Color Computer and Model III)


Part I of this system creates data-base files that can be updated or modified at any time. It prints reports after you select print parameters and the fields to be printed. In addition, it compresses and sorts files. Part II of the program edits the file header for any Data-Base-compatible program, transfers data from one file to another, creates

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software. If you've gone from a TRS-80 Model I to a Model II/16 or an IBM PC, say, you get a full credit for whatever you paid me for your Model I systems. Just send me your old disks and I'll send you the new ones.

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Taranto ✓70
& ASSOCIATES, INC

Model I, Model III and Model 4 systems: Accounts Payable, Accounts Receivable, General Ledger, Inventory Control, Invoicing, Payroll.

Model II, Model II/12/16, CP/M and IBM PC systems: General Ledger, Accounts Payable/Purchase Order, Accounts Receivable (Open Item or Balance Forward), Payroll/Job Costing, Inventory Control.

Post Office Box 6216, 121 Paul Drive, San Rafael CA 94903. Outside California, toll free (800) 227-2868. In California, (415) 472-2670.

CP/M is a trademark of Digital Research Corporation. TRS-80 and TRSDOS are trademarks of Tandy Corporation. MS/DOS is a trademark of Microsoft Corporation.

keyfiles for sorts, modifies data within a file using conditional operations, and prints any size or number of mailing labels. Parts I and II of this system each cost \$99, as does the Model III version.

The Data-Base Manager program is one of 12 business programs that Universal Data Research Inc. makes for the Color Computer. Additional programs include Accounts Receivable/Order Entry, Accounts Payable/Purchase Order, General Ledger System, Report Writer II, Balanced Billing System, Inventory II, Payroll Package, Manufacturer's Inventory, and so on.

VOLKSMICRO COMPUTER SYSTEMS INC.

202 Packets Court, Suite C
Williamsburg, VA 23185
804-220-0005

COMMWHIZ (Models I and III)

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characters) for Logon and Password or ID; a continuously displayed status line that shows the status of the mode, buffer, printer, autobuf, and communications settings; easy mode changes; default initializations for the most frequently used case; one-key commands; and special characters that include underscore, wave, reverse slash, and brackets.

Also included is TMODEM, a file transfer program for automatic transfers of any file (even if in machine-language programs) between you and others having TMODEM. This package is available on disk for \$79.95. If you don't have a modem, you can purchase their Hayes Smart Modem and Commwhiz for \$299, a savings of \$59.95.

XYZT COMPUTER DIMENSIONS INC.
2 Penn Plaza, Suite 1500
New York, NY 10121
212-244-3100

NEW INTERACTIVE COMPUTING ENVIRONMENT (NICE)

NICE integrates existing packages for microcomputers into one user-friendly system. The whole environ-

ment is multifunctional—it can be used for the development of new application software packages, or for enhancing and customizing existing ones. NICE is comprised of six subsystems, three of which have direct business application. All sell for \$75 each and are compatible with Models I and III. The entire NICE package is available for \$450.

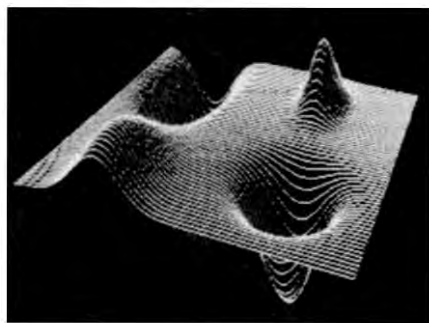
Report Writer supports all kinds of reports, invoices, mailing labels, and customized letters off a data base. Forms can be easily specified and printed out with the necessary computations, totals, subtotals, headers, and trailers.

Database Facility is designed to access records within one second. It has an unlimited number of both files (each file of up to 255 fields of 64 characters each), and keys (every field can be a key). Three levels of key readiness allow fast data entry mode and fast retrieval. It has easy file definition and maintenance, and can be called directly from Basic.

Library Support Option creates libraries for logical organization of your files and programs, saves space, increases speed of operation, and eases file manipulation. Up to 240 files per library, with practically an unlimited number of libraries. ■

Surface Plot

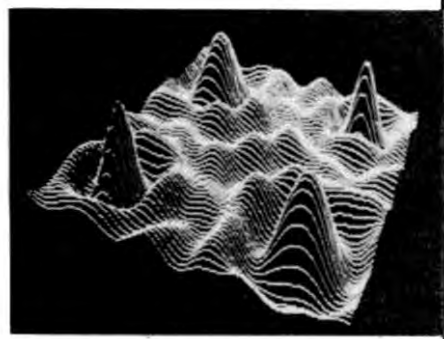
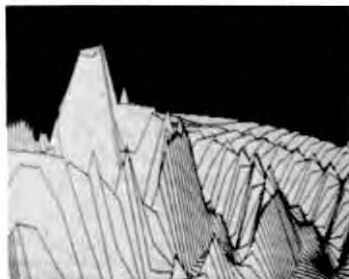
The Grafyx Solution[®] with Depth



Outstanding Grafyx. SURFACE PLOT lets you broaden your imagination by creating amazing three-dimensional views with Grafyx Solution. Micro-Labs' Grafyx Solution is a plug-in, clip-on board which gives you 98,304 points in a 512 x 192 matrix. That's sixteen times as many points as a standard Model III! Another unique feature is the ability to display the hi-res screen along with the normal text and low-res screen.

Flexible Grafyx. SURFACE PLOT allows you to enter an equation of the form $Z=F(X,Y)$ where Z is the height above the surface for a given X, Y coordinate. For example, entering the equation $Z=10-X^2$ draws a hill. The final picture can be viewed from any position in space so you can see an image from underneath, above, or even inside a hill or valley on the plot surface. You can also specify the size of the resulting image.

Complete Grafyx. The program automatically removes hidden lines for



best results. The documentation contains complete instructions and sample equations so that you will have your computer hard at work without delay. The finished plot can be saved on disk or printed on any of 20 popular printers.

The Grafyx Solution package is shipped from stock and includes the board, 44 programs including an 80-Column display driver and Extended Graphics Basic, and a 54 page manual all for \$299.95. The SURFACE PLOT program, twelve hi-res pictures, and manual is \$39.95. Shipping is FREE on pre-paid or COD orders. (Tx. residents add 5% sales tax.)

464 MICRO-LABS, INC. 214-235-0915
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MOD III

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MOD I or MOD III

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Type in up to 100 questions and answers to compose a test. The test may be printed in Multiple Choice, Matching, True/False, or Short Answer. Questions may be printed in order, at random. Answers may be printed as questions and questions as answers. An answer key is automatically printed for each test. Tests may be duplicated using keys, again instantly.

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MOD III

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MOD I or MOD III

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MOD III/II

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Satellite Word Processing

by Henry Aldrich

If your Model I/III is in heavy demand as a word processor, use Color Computers as satellite terminals and let the I/III do the printing.

Word processing with a Model I/III disk system is popular in my university department. However, the heavy demand for the system makes getting access to it difficult.

The most time-consuming aspect of word processing is typing in the copy. If satellite terminals were available for text preparation, you could prepare copy on a terminal and use a computer to do the printing. I'll describe such a system using a Color Computer as the satellite terminal and a Model I/III as the host computer.

I initially hoped that I could transfer text between the Color Computer and a Model I/III since both write to and read from tape at 1,500 baud. Unfortunately, the Model I/III does not read Color Computer tapes. The two

computers format lead-in and termination information differently, so that reading tapes from one computer by the other doesn't work without changing these parameters.

Machine-language programs could probably be developed to accomplish this; however, my configuration works without special software and requires no hardware modifications. You do, however, have to make simple cable connections.

The System

The satellite word-processing system described here is relatively low-cost. Tandy's 16K Color Computer sells for \$199.95 and a Color Scribes ROM pack costs \$40. Almost any black and white television set serves as a Color

Computer monitor for word processing. See Table 1 for a list of software and hardware requirements.

This system provides the most important features of text formatting except superscripts, subscripts, and underlining. However, these capabilities are available with word-processing software from independent suppliers.

The Color Computer's 16K memory provides storage for about six single-spaced or 12 double-spaced pages. As you near this storage limit, you should store text files in blocks on tape. The amount of memory available is easy to judge since Color Scribes displays it at the bottom of the screen.

It is possible to prepare text on the 16K Color Computer with Color Scribes, then transfer the text across the built-in RS-232C interface to a Model I or III with its own RS-232C interface, disk drives, and a smart terminal program.

Once the Model I/III receives the text, it is stored on disk. Then, with the Model I/III running Scribes or one of its enhancements, the main system loads, chains, and prints the disk files. Underlining and other sophisticated commands are quickly and easily inserted with the global change functions of Model I/III Scribes.

Required Software

Color Scribes, on plug-in ROM pack.
Lindbergh Software's Omniterm or similar smart terminal program for Model I or III.
Scribes for the Model I or III.
Super Color Terminal program from Nelson Software (optional).

Required Hardware

TRS-80 Color Computer and monitor.
TRS-80 Model I or III with RS-232 interface.
Cable to connect RS-232 printer output of Color Computer to RS-232 interface of Model I/III.

Table 1. Required software and hardware.

The Key Box

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Color Computer (16K RAM)
Disk Drive
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Drive Kit Only (no drives)	\$199
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AEROCOMP "DDS"	49
(Double dens. data separator for Percom Doublr, LNDoublr or Superbrain	
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(Single dens. data separator)	

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DOSPLUS 3.5	129
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Cable Construction

Building the cable is straightforward. You'll need a four-wire cable about 6 feet long (phone wire works well), a four-pin DIN plug (for the Color Computer output), and a 40-contact card-edge plug (for the Model I RS-232) or a 25-pin male DB 25 plug (for the Model III RS-232). Radio Shack stores stock all of these components.

The proper cable connections appear in Table 2. Most are obvious, except for the cable connection between the Color Computer's "receive data" line and the Model I/III "data terminal ready" line. This connection satisfies a system requirement of the Color Computer. Its input line must receive a constant signal from the Model I/III indicating that it is ready to receive data. This connection assures an uninterrupted data flow.

Set-up Procedure

Load Omniterm into your Model I/III. Set Omniterm parameters to match the printer default protocols of Color Scriptor. One of Omniterm's nice features is the ease with which you can change these parameters. Simply hit the @ key twice to enter the command mode and change the UART (universal asynchronous receiver-transmitter) settings to:

Baud	600
Data bits	8
Stop bits	2
Parity	None

Then open the input buffer by pressing the I key.

All of the other parameters can remain at default—printer off, screen reformat 54, carriage return suppression off, line feed suppression on, duplex full, echo off, CR/LF grouping off, and output from buffer off. Use the

break key to return to the display mode.

Interconnect the two computers with the appropriate cable as indicated in Table 1. If you're using a Model I, the Color Computer must be far enough away from it so the Model I's radio frequency interference doesn't disrupt the Color Computer's display.

Boot up the Color Computer with a Scriptor ROM pack in place. Load your text from tape, or type NEW TEXT. Reformat the line width on the Color Computer to your preference. I use a

*"You can use the
Color Computer as a
portable word processing
terminal. . ."*

32-character line width, so lines print as they appear on the screen.

Since Color Scriptor behaves as if it is controlling a printer, the computer transmits a carriage return at the end of each line of text. Failure to reformat the text before sending it to the Model I/III results in 32-character lines with a carriage return at the end of each line. You can remove them in Model I/III Scriptor, but it is tedious. Reformatting prior to transfer avoids the problem. Select the Print option from Color Scriptor's main menu. Then answer the "Printer or tape?" query with "Printer." Begin text transmission to the Model I/III. The color display scrolls as each line is printed.

Alternatively, you could use Nelson Software's Super Color Terminal program. It transfers text in the Color Computer's buffer directly to the Model I/III without carriage return commands at the end of each line, circumventing the problem found with Scriptor.

Save Color Scriptor's text files on tape

in the conventional manner. Then load Super Color Terminal from tape or ROM pack. Use its tape-to-buffer feature to load the Scriptor text file from tape into the buffer. Then, from the main menu, select "LPRINT BUFFER."

When transmission is complete, put your Model I/III into command mode and toggle the input buffer off by typing I. Save the data in the buffer on disk using the standard Omniterm choices from command mode. Return to the Model I/III disk operating system by using Omniterm's X command or by pressing the reset button.

Enter Scriptor in the usual way. Load the text file from disk. Operate normally in Scriptor to edit, print, and so on. If you use the Nelson program, remove the series of carriage returns corresponding to the pagination points on the Color Computer.

Color Scriptor in ROM pack does not display lowercase letters, but uses reverse video capital letters instead. This is surprisingly easy to get used to, however. Some of the cassette word processors, such as Telewriter, do display lowercase, but they require a 32K machine to provide sufficient text storage.

You might want to drive a printer directly with the Color Computer, particularly since many users already have a parallel printer. There are three economical options: first, serial printers, such as the Radio Shack DMP-100, for around \$300 by mail; second, Epson plug-in serial interface card for its parallel printers for less than \$100; finally, independent suppliers' universal serial-to-parallel converter for about \$70.

You can use the Color Computer as a portable word processing terminal, providing you take along a cassette recorder and the universal TV interface cord. Radio Shack sells a sturdy, inexpensive Color Computer vinyl case for transporting the unit. If you connect the Color Computer to a modem and use a smart terminal program such as Nelson Software's Super Color Terminal, it is even possible to transmit manuscripts or data to your home office from field locations or motel rooms. First check with the manager to be sure the alarm won't go off if you disconnect the room's TV cable from the set!

Sophisticated word processing capabilities are within nearly everyone's personal budget using this system, if a Model I or III is available for the final printing operations. ■

Write to Henry Aldrich at 122 Northwest 28th Terrace, Gainesville, FL 32607.

For Model I	
4-pin DIN (Color Computer)	to 40-contact card edge (Model I RS-232)
Pin 1 (CD: carrier detect)	to Pin 30 (CD)
Pin 2 (RD: receive data)	to Pin 34 (DTR: data term. rdy)
Pin 3 (SGND: signal ground)	to Pin 20 (SGND)
Pin 4 (TD: transmit data)	to Pin 22 (RD: receive data)

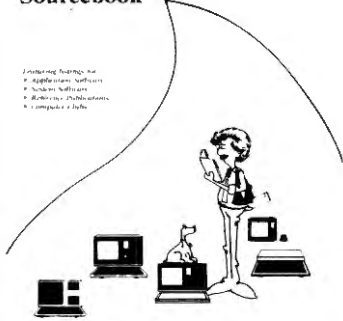
For Model III	
4-pin DIN (Color Computer)	to 25-pin DB 25 (Model III RS-232)
Pin 1 (CD)	to Pin 8 (CD)
Pin 2 (RD)	to Pin 20 (DTR)
Pin 3 (SGND)	to Pin 7 (SGND)
Pin 4 (TD)	to Pin 3 (RD)

Table 2. Cable specifications for Color Computer to Model I/III file transfer.

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Spacemap

by Hubert Borrmann

Contrary to what you're probably thinking, Spacemap isn't the latest Model I arcade clone—it's a track-by-track disk directory.

Have you ever needed to know where on a disk you have some free space? Or needed to locate a particular file to correct disk errors? I had the same problems and wrote a Model I program that identifies the location of a disk's files in terms of tracks and granules (see Program Listing).

I wrote the program in Assembly language for a 32K or 48K system with at least one disk drive. It occupies three granules on a disk, resides in memory from 7000-8F80 hexadecimal (hex), and works under TRSDOS, NEW-DOS80, and DOSPLUS.

Spacemap in Action

When you boot up the program, a vanity screen first appears on the display while the program does some housekeeping chores.

Then the main menu appears (see Fig. 1). When you select an option, the program displays a space map like the one in Fig. 2. The display includes the name and creation date of the disk, the number of free granules, the number of allocated granules, and the number of granules not available.

It may seem odd that there are some granules unavailable. Spacemap is developed for 40-track disks; if the disk being mapped is formatted for only 35 tracks, the nonexistent tracks (35-39) are denoted under Not Available (see Fig. 3).

Visible User Files Only Options

The Spacemap directory identifies four tracks per line with a total of 10 lines on the display. Each track is subdivided into its two granules, labelled G-1 and G-2.

Figure 2 shows the space map of one of my disks, called Workdisk, after I selected the Visible User Files Only op-

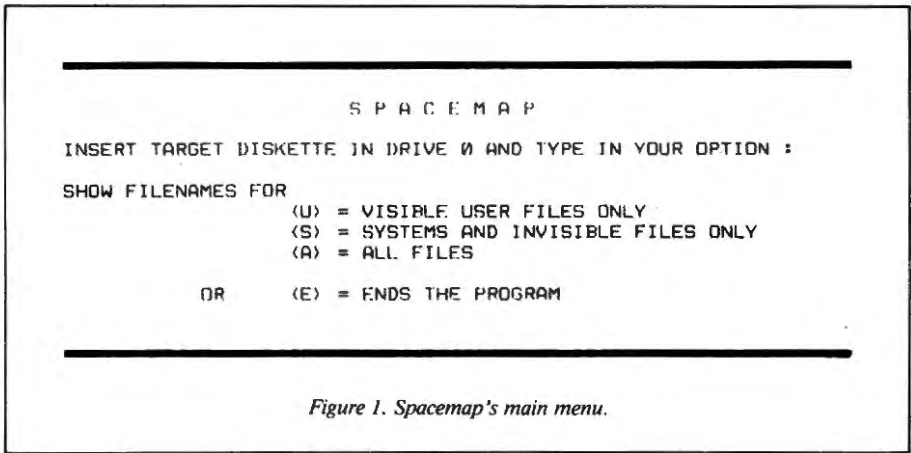


Figure 1. Spacemap's main menu.

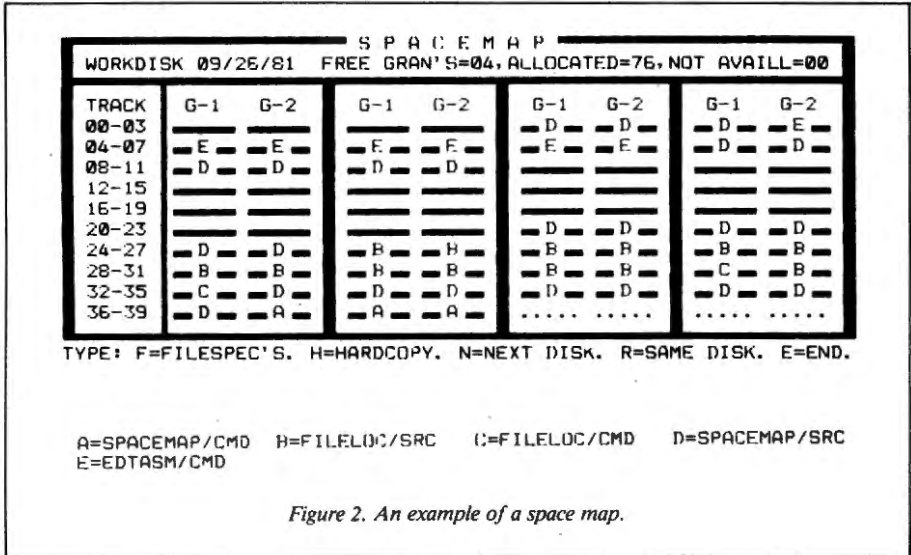


Figure 2. An example of a space map.

tion. The free granules are indicated by dots. Tracks 38 and 39 are free. Solid lines denote the allocated granules. Only user files are shown with an identifying letter.

System and Invisible Files Only Option

Conversely, system files appear as a solid white line without a letter. For example, the program EDTASM/CMD, coded with the letter E, resides in track 3, granule 2 and all of tracks 4, 5, and 6.

Now look at Fig. 4 where system files on the same disk are identified. Note track 17, where you find both granules identified with the letter D. Below that you see that D stands for Dir/SYS, the disk directory. Granule 1 of track zero is coded with an A, occupied by Boot/SYS. The unidentified solid lines contain the user files identified in Fig. 2.

All Files Option

This option requests identification of all files. No unidentified granules are shown (see Fig. 5).

Additional Details

With the map on the screen, there isn't enough room to display all the file names simultaneously. Underneath the map, on video line 16, is another menu (see Figs. 2-5). Option F, Filespec, displays the file names—they stay on the screen as long as you keep the F key depressed. When you release the key, the space map returns. Another option, H, Hardcopy, produces a printout of both the map and its file names. If you want to map another disk, type N, return to the main menu and read the new directory. If you don't want to read a new directory, type R, bypass the directory-read, and reuse the directory currently in memory. To end the program, type E. See the Program Listing for Spacemap's program flow.

Disk Directory

The disk directory occupies all 10 sectors of track 17. Sector zero contains two tables. The first one is the granule allocation table (GAT), the second one the lockout table. There is a byte in these tables for each possible track, and this byte describes the status of that track. Consider the lockout table first. If, for example, the tenth byte, describing track 9, doesn't equal FC hex, this track is locked out and unusable.

In the granule allocation table, a byte may indicate that both of its granules are free if it is FC hex, or that both granules are allocated if it is FF hex. If the first granule is allocated and

SPACE MAP								
TRSDOS	09/26/81 FREE GRAN'S=16, ALLOCATED=54, NOT AVAILL=10							
TRACK	G-1	G-2	G-1	G-2	G-1	G-2	G-1	G-2
00-03	—	—	—	—	—	—	—	—
04-07	—	—	D	A	A	A	B	B
08-11	C	C	.....	.....	.....	.....	.....	.....
12-15	.....	.....	.....	.....	.....	.....	.....	.....
16-19	—	—	—	—	—	—	—	—
20-23	—	—	.....	.....	D	D	D	D
24-27	H	F	.....	.....	.....	.....	E	E
28-31	G	G	D	.....	.....	.....	.....	.....
32-35	D	D	D	D	D	D	N/A	N/A
36-39	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TYPE: F=FILESPEC'S. H=HARDCOPY. N=NEXT DISK. R=SAME DISK. E=END.

A=SPACEMAP/CMD R=FILELOC/CMD C=TEST1A/CMD D=TEST2/BAS
E=GETDISK/BAS F=DISK DUMP/BAS G=GETTAPE/BAS H=TAPEDISK/CMD

Figure 3. The space map of a 35-track disk. Note the entry for (granules) Not Available.

SPACE MAP								
WORKDISK	09/26/81 FREE GRAN'S=04, ALLOCATED=76, NOT AVAILL=00							
TRACK	G-1	G-2	G-1	G-2	G-1	G-2	G-1	G-2
00-03	A	F	F	F	.....	.....	.....	.....
04-07	.....	.....	.....	.....	.....	.....	.....	.....
08-11	.....	.....	.....	.....	C	C	C	C
12-15	C	E	I	M	O	G	K	N
16-19	H	J	D	D	L	G	B	B
20-23	B	B	B	P	.....	.....	.....	.....
24-27	.....	.....	.....	.....	.....	.....	.....	.....
28-31	.....	.....	.....	.....	.....	.....	.....	.....
32-35	.....	.....	.....	.....	.....	.....	.....	.....
36-39	.....	.....	.....	.....	.....	.....	.....	.....

TYPE: F=FILESPEC'S. H=HARDCOPY. N=NEXT DISK. R=SAME DISK. E=END.

A=BOOT/SYS R=SYS6/SYS C=BASIC/CMD D=DIR/SYS
E=SYS7/SYS F=SYS8/SYS G=SYS8/SYS H=SYS1/SYS
I=SYS9/SYS J=SYS2/SYS K=SYS10/SYS L=SYS3/SYS
M=SYS11/SYS N=SYS4/SYS O=SYS12/SYS P=SYS5/SYS
Q=SYS13/SYS

Figure 4. An example space map of system files.

SPACE MAP								
WORKDISK	09/26/81 FREE GRAN'S=04, ALLOCATED=76, NOT AVAILL=00							
TRACK	G-1	G-2	G-1	G-2	G-1	G-2	G-1	G-2
00-03	A	H	H	H	M	M	M	V
04-07	V	V	V	V	V	V	M	M
08-11	M	M	M	M	C	C	C	C
12-15	C	E	L	Q	S	U	O	R
16-19	K	N	D	D	P	I	B	B
20-23	B	B	B	T	M	M	M	M
24-27	M	M	G	G	G	G	G	G
28-31	G	G	G	G	G	G	J	G
32-35	J	M	M	M	M	M	M	M
36-39	M	F	F	F	.....	.....	.....	.....

TYPE: F=FILESPEC'S. H=HARDCOPY. N=NEXT DISK. R=SAME DISK. E=END.

A=BOOT/SYS B=SYS6/SYS C=BASIC/CMD D=DIR/SYS
E=SYS7/SYS F=SPACEMAP/CMD G=FILELOC/SRC H=SYS0/SYS
I=SYS8/SYS J=FILELOC/CMD K=SYS1/SYS L=SYS9/SYS
M=SPACEMAP/SRC N=SYS2/SYS O=SYS10/SYS P=SYS3/SYS
Q=SYS11/SYS R=SYS4/SYS S=SYS12/SYS T=SYS5/SYS
U=SYS13/SYS V=EDTASM/CMD

Figure 5. A space map identifying all granules.

Program Listing. The Spacemap program with line comments.

```

00010 ; * * * * * S P A C E M A P * * * * *
00020 ; . . . . .
00030 ; EQUATES
3C00 00040 VIDEO EQU 3C00H ;START OF SCREEN
033A 00050 CHSCR EQU 033AH ;PRINT CHAR ON SCREEN
003B 00060 CHPRNT EQU 003BH ;PRINT CHAR ON PRINTER
01C9 00070 CLS EQU 01C9H ;CLEAR VIDEO SCREEN
057C 00080 PRTCLS EQU 057CH ;CLEAR SCREEN PARTIALLY
402D 00090 DOS EQU 402DH ;DOS ENTRY POINT
0060 00100 DELAY EQU 0060H ;ROM DELAY ROUTINE
4020 00110 CURSOR EQU 4020H ;CURSOR ADDRESS
37E1 00120 SELREG EQU 37E1H ;DISK CONTROLLER SEL REG
37EE 00130 DATREG EQU 37EEH ;DATA REGISTER
37EC 00140 CMDREG EQU 37ECH ;COMMAND REG
37EF 00150 BYTREG EQU 37EFH ;BYTE REGISTER
00160 ; . . . . .
7000 00170 * * * * *
7000 3100A0 00180 START LD SP,0A000H ;START OF PROGRAM
7003 CDC901 00190 CALL CLS ;ADDR FOR STACK POINTER
7006 3E17 00200 LD A,17H ;CLEAR SCREEN
7008 CD3A03 00210 CALL CHSCR ;SET SCREEN UP FOR
700B 211378 00220 LD HL,MSG6 ;WIDE LETTERS (32 CH)
700E 11463C 00230 LD DE,VIDEO+70 ;TITLE
7011 012C00 00240 LD BC,44 ;OF
7014 EDB0 00250 LDIR ;PROGRAM
7016 21DD77 00260 LD HL,MSG3 ;AND
7019 11983D 00270 LD DE,VIDEO+400 ;MY NAME
701C 010600 00280 LD BC,6 ;AND
701F EDB0 00290 LDIR ;CALL
7021 21E377 00300 LD HL,MSG4 ;TO
7024 110A3E 00310 LD DE,VIDEO+522 ;VIDEO
7027 012600 00320 LD BC,38 ;SCREEN
702A EDB0 00330 LDIR ;TO
702C 210978 00340 LD HL,MSG5 ;BE
702F 11963E 00350 LD DE,VIDEO+662 ;ADMIRED
7032 010A00 00360 LD BC,10 ;FOR
7035 EDB0 00370 LDIR ;A
7037 3E27 00380 LD A,27H ;WHILE.
7039 32AD77 00390 LD (MSG2+16),A ;SINGLE QUOTE
703C 325279 00400 LD (MSG15+20),A ;TO 2
703F 3E20 00410 LD A,' ' ;MESSAGES
7041 327483 00420 LD (SCRPAT),A ;FILL THE
7044 217483 00430 LD HL,SCRPAT ;SCREEN DISPLAY
7047 117583 00440 LD DE,SCRPAT+1 ;PATTERN
704A 010004 00450 LD BC,1024 ;AREA
704D EDB0 00460 LDIR ;WITH
704F 213679 00470 LD HL,MSG15 ;BLANKS.
7052 11B683 00480 LD DE,SCRPAT+66 ;MESSAGES TO GO
7055 013C00 00490 LD BC,60 ;TO
7058 EDB0 00500 LDIR ;VIDEO
705A 217279 00510 LD HL,MSG16 ;LINE 2
705D 113684 00520 LD DE,SCRPAT+194 ;AND
7060 013B00 00530 LD BC,59 ;TO
7063 EDB0 00540 LDIR ;VIDEO LINE 4
7065 3E0A 00550 LD A,10 ;" LINES
7067 21337A 00560 LD HL,TRKTBL ;FROM HERE
706A 117684 00570 LD DE,SCRPAT+258 ;TO THERE
706D 010500 00580 A00 LD BC,5 ;5 AT A TIME
7070 EDB0 00590 LDIR
7072 EB 00600 EX DE,HL ;ADD
7073 013B00 00610 LD BC,59 ;59
7076 09 00620 ADD HL,BC ;TO
7077 EB 00630 EX DE,HL ;DESTINATION.
7078 3D 00640 DEC A ;ALL 10 LINES DONE ?
7079 20F2 00650 JR NZ,A00 ;IF NOT, CONTINUE
707B 3E83 00660 LD A,131 ;GRAPHIC BLOCKS
707D 217483 00670 LD HL,SCRPAT ;TO
7080 77 00680 LD (HL),A ;VIDEO
7081 117583 00690 LD DE,SCRPAT+1 ;LINE
7084 013F00 00700 LD BC,63 ;# 1
7087 EDB0 00710 LDIR ;AND
7089 21F483 00720 LD HL,SCRPAT+128 ;ALSO
708C 11F583 00730 LD DE,SCRPAT+129 ;TO
708F 013F00 00740 LD BC,63 ;VIDEO
7092 77 00750 LD (HL),A ;LINE
7093 EDB0 00760 LDIR ;# 3
7095 3E8C 00770 LD A,140 ;BLOCKS
7097 21F486 00780 LD HL,SCRPAT+896 ;TO
709A 11F586 00790 LD DE,SCRPAT+897 ;VIDEO
709D 013F00 00800 LD BC,63 ;LINE
70A0 77 00810 LD (HL),A ;#
70A1 EDB0 00820 LDIR ;15
70A3 3EBF 00830 LD A,191 ;FILL
70A5 327483 00840 LD (SCRPAT),A ;IN
70A8 32B383 00850 LD (SCRPAT+63),A ;1ST AND LAST
70AB 32B483 00860 LD (SCRPAT+64),A ;POSITIONS
70AE 32F383 00870 LD (SCRPAT+127),A ;OF
70B1 32F483 00880 LD (SCRPAT+128),A ;LINES
70B4 323384 00890 LD (SCRPAT+191),A ;1, 2, 3
70B7 060B 00900 LD B,11 ;
70B9 DD213484 00910 LD IX,SCRPAT+192 ;BUILD
70BD 114000 00920 LD DE,64 ;VERTICAL
70C0 3EBF 00930 A01 LD A,191 ;LINES
70C2 DD7700 00940 LD (IX),A ;WITHIN
70C5 DD7715 00950 LD (IX+21),A ;THE
70C8 DD7723 00960 LD (IX+35),A ;FRAME
70CB DD7731 00970 LD (IX+49),A ;FOR
70CE DD773F 00980 LD (IX+63),A ;SCREEN
70D1 3E95 00990 LD A,149 ;LINES
70D3 DD7700 01000 LD (IX+8),A ;4
70D6 DD19 01010 ADD IX,DE ;TO 14
70D8 10E6 01020 DJNZ A01 ;CONT IF NOT DONE
70DA 3E97 01030 LD A,151 ;FILL IN
70DC 32FC83 01040 LD (SCRPAT+136),A ;MISSED SPOTS
70DF 3EBF 01050 LD A,191 ;IN

```

Listing continued

the second one is free, the code is FD hex; if the first granule is free and the second allocated, the code is FE hex. Sector zero also contains the disk name and the date the disk was created. My program does not use some information.

Sector 1, which contains hash codes, is not used either. The last eight sectors, sectors 2-9, each contain eight file directory entries. These are 32 bytes long and describe a file.

There are two types of file directory entries, the primary entry and the extension entry. The primary entry (FPDE) contains in its first byte a code that indicates whether or not the file exists, whether it is a visible or an invisible file, whether it is a systems or non-systems file, and the file protect code. It also indicates that this is a primary directory entry. The entry contains the 8-byte file name, the 3-byte extension (if any), and some end-of-file information. There are also five 2-byte pairs specifying extents.

The first byte is the track number where the file starts, and the second byte indicates whether this file starts with granule 1 or 2 of this track. It also indicates the number of contiguous granules covered. If there aren't enough contiguous granules to store the file, the next 2-byte pair indicates where the file continues. If the entire file is allocated, the first byte of the next 2-byte pair contains FF hex.

If, however, four of these 2-byte pairs are used and more file space is required, then the first byte of the fifth 2-byte pair contains the code FE hex. In this case its second byte points to the location of a File Extension Directory Entry (FXDE). This entry looks very much like a primary entry but is identified as FXDE in byte 1. It also has five 2-byte pairs, specifying more extents. The program prepares the space map using this information.

Now some comments on the program. A look at the flowchart shows that, after the title display, a screen pattern builds in memory. This is the framework for the

6171	CP	191
6172	JR	Z,A52A
6173	CP	149
6174	JR	Z,A52A
6175	CP	128
6176	JR	C,A52B
6177	LD	A,'*'
6178	JR	A52B
6179	A52A LD	A,'!'
6180	A52B CALL	CHPRNT

Figure 6. If your printer doesn't print block graphics, make these changes in the Program Listing.

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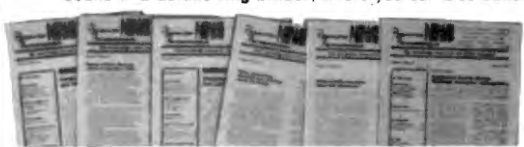
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Listing continued

70E1	320984	01060	LD	(SCRPAT+149),A	;VIDEO
70E4	321784	01070	LD	(SCRPAT+163),A	;LINE
70E7	322584	01080	LD	(SCRPAT+177),A	; 3
70EA	32E8F	01090	LD	A,143	;AND
70EC	320987	01100	LD	(SCRPAT+917),A	;ALSO
70EF	321787	01110	LD	(SCRPAT+931),A	;IN
70F2	322587	01120	LD	(SCRPAT+945),A	;VIDEO
70F5	323387	01130	LD	(SCRPAT+959),A	;LINE
70F8	32F486	01140	LD	(SCRPAT+896),A	; 15
70FB	3E8D	01150	LD	A,141	;
70FD	32FC86	01160	LD	(SCRPAT+904),A	;
7100	218A77	01170	LD	HL,MSG1+31	;TITLE
7103	118B83	01180	LD	DE,SCRPAT+23	;OVER
7106	011100	01190	LD	BC,17	;GRAPHICS
7109	EDB0	01200	LDIR		;IN LINE 1
710B	219D77	01210	LD	HL,MSG2	;MENU
710E	113487	01220	LD	DE,SCRPAT+960	;MSG
7111	014000	01230	LD	BC,64	;TO
7114	EDB0	01240	LDIR		;LINE 16
7116	3E52	01250	LD	A,'R'	;READ/NOREAD INDIC
7118	32C779	01260	LD	(RDIND),A	;TO READ
711B	00E8	01270	LD	B,14	;WAIT
711D	CD1376	01280	CALL	WAIT	;A WHILE
7120	3E1C	01290	LD	A,1CH	;RESTORE
7122	CD3A03	01300	CALL	CHSCR	;REG SIZE SCREEN
7125	CD9001	01310	CALL	CLS	;CLEAR SCREEN
7128	3E83	01320	LD	A,131	;BUILD
712A	21003C	01330	LD	HL,VIDEO	;GRAPHIC
712D	21103C	01340	LD	DE,VIDEO+1	;FRAME
7130	013F00	01350	LD	BC,63	;FOR
7133	77	01360	LD	(HL),A	;THE
7134	EDB0	01370	LDIR		;MENU
7136	21003F	01380	LD	HL,VIDEO+896	;LINES 1
7139	11813F	01390	LD	DE,VIDEO+897	;AND
713C	013F00	01400	LD	BC,63	;16
713F	77	01410	LD	(HL),A	
7140	EDB0	01420	LDIR		
7142	216B77	01430	LD	HL,MSG1	;TITLE
7145	11773C	01440	LD	DE,VIDEO+119	;TO
7148	013100	01450	LD	BC,49	;MENU LINE 3
714B	EDB0	01460	LDIR		
714D	3AC779	01470	LD	A,(RDIND)	;WHICH
7150	FE52	01480	CP	'R'	;MSG
7152	2808	01490	JR	Z,A02	;INSERT DISK
7154	21E778	01500	LD	HL,MSG13	;USING
7157	012400	01510	LD	BC,36	;DIRECTORY
715A	1806	01520	JR	A03	;IN MEM MSG
715C	214378	01530	LD	HL,MSG7	;INSERT NEXT
715F	013C00	01540	LD	BC,60	;DISK MSG
7162	11003D	01550	LD	DE,VIDEO+256	;MOVE IT TO
7165	EDB0	01560	LDIR		;LINE 5
7167	217F78	01570	LD	HL,MSG8	;SHOW FILENAMES MSG
716A	11803D	01580	LD	DE,VIDEO+384	;TO
716D	011300	01590	LD	BC,19	;LINE
7170	EDB0	01600	LDIR		; 7
7172	219278	01610	LD	HL,MSG9	;VIS USER FILES
7175	11D23D	01620	LD	DE,VIDEO+466	;MSG
7178	011E00	01630	LD	BC,30	;TO
717B	EDB0	01640	LDIR		;LINE 8
717D	21B078	01650	LD	HL,MSG10	;SYSTEMS FILES
7180	11123E	01660	LD	DE,VIDEO+530	;MSG
7183	012700	01670	LD	BC,39	;TO
7186	EDB0	01680	LDIR		;LINE 9
7188	21D778	01690	LD	HL,MSG11	;ALL FILES
718B	11523E	01700	LD	DE,VIDEO+594	;MSG
718E	011000	01710	LD	BC,16	;TO
7191	EDB0	01720	LDIR		;LINE 10
7193	210079	01730	LD	HL,MSG12	;OR-END
7196	11CB3E	01740	LD	DE,VIDEO+715	;MSG
7199	011E00	01750	LD	BC,30	;TO
719C	EDB0	01760	LDIR		;LINE 12
719E	3E55	01770	LD	A,'U'	;MOVE
71A0	32D33D	01780	LD	(VIDEO+467),A	;LETTERS OF
71A3	3E53	01790	LD	A,'S'	;THE MENU
71A5	32133E	01800	LD	(VIDEO+531),A	;OPTIONS
71A8	3E41	01810	LD	A,'A'	;IN
71AA	32533E	01820	LD	(VIDEO+595),A	;THE
71AD	3E45	01830	LD	A,'E'	;MENU
71AF	32D33E	01840	LD	(VIDEO+723),A	;MESSAGES
71B2	210011	01850	LD	HL,1100H	;INIT LOOP CTR
71B5	CD8F76	01860	CALL	SCANKB	;CHECK KEYBOARD INPUT
71B8	FE00	01870	CP	0	;ANYTHING TYPED ?
71BA	2018	01880	JR	NZ,A05	;YES, CHECK WHAT
71BC	3E8F	01890	LD	A,8FH	;NOTHING TYPED
71BE	32D33D	01900	LD	(VIDEO+467),A	;PUT GRAPHIC BLOCKS
71C1	32133E	01910	LD	(VIDEO+531),A	;OVER THE
71C4	32533E	01920	LD	(VIDEO+595),A	;MENU
71C7	32D33E	01930	LD	(VIDEO+723),A	;OPTIONS
71CA	210009	01940	LD	HL,900H	;INIT LOOP CTR
71CD	CD8F76	01950	CALL	SCANKB	;CHECK FOR KB INPT
71D0	FE00	01960	CP	0	;ANYTHING ?
71D2	28CA	01970	JR	Z,A04	;NO, REPEAT CHECK
71D4	32C879	01980	LD	(KBIND),A	;SAVE KEYBOARD ENTRY
71D7	FE53	01990	CP	'S'	;SYSTEMS FILES ?
71D9	2815	02000	JR	Z,A06A	;YES
71DB	FE55	02010	CP	'U'	;USER FILES ?
71DD	2811	02020	JR	Z,A06A	;YES
71DF	FE41	02030	CP	'A'	;ALL FILES ?
71E1	280D	02040	JR	Z,A06A	;YES
71E3	FE45	02050	CP	'E'	;END PROGRAM ?
71E5	20B7	02060	JR	NZ,A04	;NO, INVALID ENTRY
71E7	21003F	02070	LD	HL,VIDEO+896	;CURSOR ADDRESS
71EA	222040	02080	LD	(CURSOR),HL	;TO LINE 15
71ED	CD2D40	02090	CALL	DOS	;EXIT TO DOS (END PGM)
71F0	3AC779	02100	LD	A,(RDIND)	;HAVE TO

Listing continued

map and, once built, is used for all maps. After the directory is read or ignored, depending on the read switch setting, a granule table is built in memory. This table is 80 bytes long, each byte representing one granule for a 40-track disk. The table is filled with 50 hex, 51 hex, or 52 hex, depending on the information found in the GAT and lockout table.

After this table is complete, the program checks sectors 2-9 for files, keyed to the map by name. The files checked depend on the option taken earlier when you answered the query for file names. A file code counter is started and incremented for each file you use. This code is then inserted into the granule table in the granules where the file resides. Later, this code converts to the more convenient A-Z, 1-9, 10 and up configuration for display purposes. The file name area is built showing these codes and their associated file names.

After a check of sectors 2-9 is complete, the now-updated granule table is decoded and a screen display pattern is built. The display pattern then moves to the screen memory. Pressing the F key replaces it with the keyed file names. When you release F, the display pattern moves back to video. This happens very quickly. You get a printout by sending data bytes to the printer ROM routine from the map area, followed by the file name area. In order to center the output, eight blanks precede each line. Find more detailed comments in the program listing.

A careful look at the map shows whether a file is badly fragmented or not. Fragmentation depends upon the number of contiguous granules available to the system when a file is saved. Single-drive owners see how many systems files have to be carried on each disk.

Spacemap is handy, especially when mapping disks with different operating systems, or data disks without the systems programs. The program produces a map as long as the directory criteria are the same.

Modifications

I own the Microline-80 printer, and the CR/LF code for is 0A hex. If your printer requires a different code, change line 8110 in the Program Listing. If your printer doesn't print block graphics, make the changes listed in Fig. 6; they should produce acceptable graphics. ■

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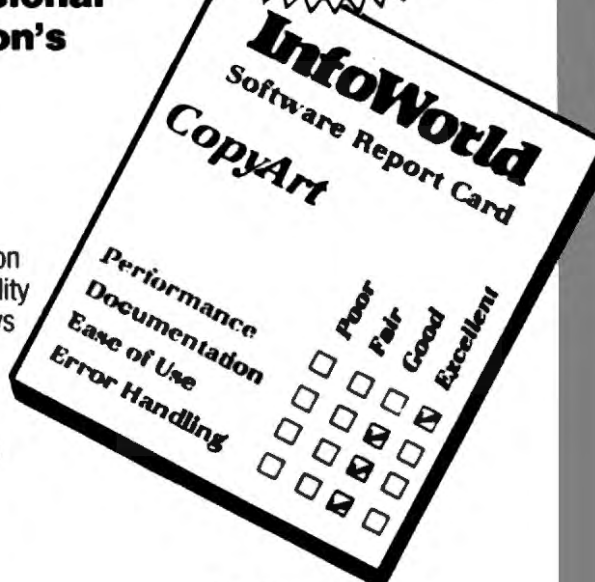
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71F3 FE4E	02110	CP	'N'	;READ DIRECTORY ?	72B0 FD23	02850	INC	IY	;ALLOCATED
71F5 CA2672	02120	JP	Z,A09	;NO	72B2 FD22CC79	02860	LD	(ALCTR),IY	;COUNTER
71F8 AF	02130	XOR	A	;YES	72B6 18CC	02870	JR	All	;MOVE BYTES
71F9 F3	02140	DI		;DISABLE INTERRUPTS	72B8 216877	02880 A14	LD	HL, PTRN10	;G-1 ALLOC, G-2 FREE
71FA 32C979	02150	LD	(SECNUM),A	;SECTOR ZERO	72BB FD2ACC79	02890 A15	LD	IY,(ALCTR)	;ADD
71FD 21747A	02160	LD	HL,SEC0	;MEM ADDR	72BF FD23	02900	INC	IY	;1
7200 22D579	02170	LD	(SECADR),HL	;FOR SECTOR 0	72C1 FD22CC79	02910	LD	(ALCTR),IY	;TO ALLOC CTR
7203 CD1E76	02180	CALL	READ	;START DRIVE, SEEK, READ	72C5 FD2ACA79	02920	LD	IY,(PRCTR)	;ADD
7206 3B02	02190	LD	A,2	;SEC 2	72C9 FD23	02930	INC	IY	;1
7208 32C979	02200	LD	(SECNUM),A	;TO SECTOR NUMBER	72CB FD22CA79	02940	LD	(PRCTR),IY	;TO FREE CTR
720B 2AD579	02210 A07	LD	HL,(SECADR)	;DEVELOP ADDR	72CF 18B3	02950	JR	All	;MOVE BYTES
720E 010001	02220	LD	BC,256	;WHERE SECTOR	72D1 216977	02960 A16	LD	HL, PTRN9	;G-1 FREE, G-2 ALLOC
7211 09	02230	ADD	HL,BC	;TO BE READ	72D4 18E5	02970	JR	All	;ADD TO CTRS, MOVE BYTES
7212 22D579	02240	LD	(SECADR),HL	;INTO	72D6 2ACA79	02980 A17	LD	HL,(PRCTR)	;# FREE GRANS
7215 CD3E76	02250	CALL	SEEK	;SEEK AND READ SECTOR	72D9 CDD776	02990	CALL	HEXASC	;TO ASCII
7218 3AC979	02260	LD	A,(SECNUM)	;DID WE	72DC 2A727A	03000	LD	HL,(ASCII+3)	;2-BYTE RESULT
721B FE89	02270	CP	9	;READ LAST SECTOR (9) ?	72DF 22D507	03010	LD	(MSAREA+97),HL	;TO MAP
721D 2806	02280	JR	Z,A08	;YES	72E2 2ACC79	03020	LD	HL,(ALCTR)	;# ALLOC GRANS
721F 3C	02290	INC	A	;NO, UPDTE SEC NMBR	72E5 CDD776	03030	CALL	HEXASC	;TO ASCII
7220 32C979	02300	LD	(SECNUM),A	;AND SAVE	72E8 2A727A	03040	LD	HL,(ASCII+3)	;AND 2 BYTES
7223 18E6	02310	JR	A07	;READ NEXT SECTOR	72EB 22E287	03050	LD	(MSAREA+110),HL	;TO MAP
7225 FB	02320 A08	EI		;RE-ENABLE INTERRUPTS	72EE 2ACE79	03060	LD	HL,(NACTR)	;# NOT AVAIL
7226 217403	02330 A09	LD	HL,SCRPAT	;MOVE SCREEN PATTERN	72F1 CDD776	03070	CALL	HEXASC	;TO ASCII
7229 117487	02340	LD	DE,MSAREA	;TO MAP-SAVE-AREA	72F4 2A727A	03080	LD	HL,(ASCII+3)	;AND 2 BYTES
722C 010004	02350	LD	BC,1024	;SO WE CAN BUILD	72F7 22F007	03090	LD	(MSAREA+124),HL	;TO MAP
722F EDB0	02360	LDIR		;MAP.	72FA 3E40	03100	LD	A,64	;SCAN COUNTER
7231 21447B	02370	LD	HL,SEC0+200	;DISK	72FC 32D079	03110	LD	(SCCTR),A	;TO 64 (8X8 ENTRIES)
7234 11B687	02380	LD	DE,MSAREA+66	;NAME	72FF 21747B	03120	LD	HL,SECTS	;DIR ENTRY ADDRESS
7237 010000	02390	LD	BC,8	;TO MAP	7302 22DB79	03130	LD	(DEADDR),HL	;TO SECTOR 2
723A EDB0	02400	LDIR			7305 AF	03140	XOR	A	;CODE COUNTER
723C 214C7B	02410	LD	HL,SEC0+216	;DISK	7306 32D179	03150	LD	(CODCTR),A	;TO ZERO
723F 11BF87	02420	LD	DE,MSAREA+75	;DATE	7309 3E20	03160	LD	A,' '	;BLANK
7242 010000	02430	LD	BC,8	;TO MAP	730B 32748B	03170	LD	(FSAREA),A	;OUT
7245 EDB0	02440	LDIR			730E 21748B	03180	LD	HL,FSAREA	;FILE NAME SAVE
7247 210000	02450	LD	HL,0	;RESET COUNTERS	7311 22D979	03190	LD	(PSADDR),HL	;AREA
724A 22CA79	02460	LD	(FRCTR),HL	;FOR FREE GRANS	7314 11750B	03200	LD	DE,FSAREA+1	;AND RESET
724D 22CC79	02470	LD	(ALCTR),HL	;ALLOC GRANS	7317 01FF03	03210	LD	BC,1023	;FILE SAVE ADDRESS
7250 22CE79	02480	LD	(NACTR),HL	;N/A GRANS	731A EDB0	03220	LDIR		
7253 11E379	02490	LD	DE,GRTBL	;RESET GRAN TABLE ADDR	731C 212979	03230	LD	HL,MSG14	;NO FILENAMES
7256 3E28	02500	LD	A,40	;SET SCAN CTR FOR	731F 11748B	03240	LD	DE,FSAREA	;MESSAGE
7258 32D079	02510	LD	(SCCTR),A	;40 TRACKS	7322 010D00	03250	LD	BC,13	;TO
725B DD21747A	02520	LD	IX,SEC0	;SEC 0 MEM ADDR	7325 EDB0	03260	LDIR		;FILE SAVE AREA
725F DD7E60	02530 A10	LD	A,(IX+96)	;BYTE IN LOCKOUT TBL	7327 2ADB79	03270 A18	LD	HL,(DEADDR)	;DIR ENTRY 1ST BYTE
7262 FEFC	02540	CP	0FCH	;TRK LOCKED OUT ?	732A CB66	03280	BIT	4,(HL)	;FILE KILLED ?
7264 2030	02550	JR	NZ,A12	;YES, ADD 2 TO NACTR	732C 2823	03290	JR	Z,A20	;YES, DONT WANT IT
7266 DD7E00	02560	LD	A,(IX)	;BYTE IN GRAN ALLOC TBL	732E CB7E	03300	BIT	7,(HL)	;EXTENSION DIR ENTRY ?
7269 FEFF	02570	CP	0FFH	;BOTH GRANS ALLOC ?	7330 201F	03310	JR	NZ,A20	;YES, DONT WANT IT
726B 283A	02580	JR	Z,A13	;YES, ADD 2 TO ALLOC CTR	7332 3AC879	03320	LD	A,(KBIND)	;OPTION
726D FEFD	02590	CP	0FDH	;G-1 ALLOC, G-2 FREE ?	7335 PE41	03330	CP	'A'	;ALL FILES WANTED ?
726F 2847	02600	JR	Z,A14	;YES, ADD 1 TO FR+ALLOC	7337 282E	03340	JR	Z,A21	;YES
7271 FEFE	02610	CP	0FEH	;G-1 FREE, G-2 ALLOC ?	7339 FE53	03350	CP	'S'	;SYST + INVIS FILES WANTD?
7273 285C	02620	JR	Z,A16	;YES, ADD 1 TO ALLOC+FREE	733B 200A	03360	JR	NZ,A19	;NO, USER+VIS ONLY
7275 FD2ACA79	02630	LD	IY,(FRCTR)	;BOTH GRAN'S FREE	733D CB76	03370	BIT	6,(HL)	;YES, WHAT FILE IS IT ?
7279 FD23	02640	INC	IY	;ADD 2	733F 2026	03380	JR	NZ,A21	;SYST FILE, WANT IT
727B FD23	02650	INC	IY	;TO	7341 CB5E	03390	BIT	3,(HL)	;OR
727D FD22CA79	02660	LD	(FRCTR),IY	;FREE-CTR	7343 2022	03400	JR	NZ,A21	;INVIS FILE, WANT IT TOO
7281 216577	02670	LD	HL, PTRN7	;BOTH GRANS FREE	7345 180A	03410	JR	A20	;NEITHER, DONT WANT IT
7284 010200	02680 A11	LD	BC,2	;2 BYTES	7347 CB76	03420 A19	BIT	6,(HL)	;WHAT FILE IS IT ?
7287 EDB0	02690	LDIR		;MOVE THEM TO GRAN TABLE	7349 2006	03430	JR	NZ,A20	;SYST, DONT WANT IT
7289 DD23	02700	INC	IX	;ADJ FOR NEXT GRAN-BYTE	734B CB5E	03440	BIT	3,(HL)	;OR
728B 3AD079	02710	LD	A,(SCCTR)	;HOW MANY GAT	734D 2002	03450	JR	NZ,A20	;INVIS, DONT WANT IT
728E 3D	02720	DEC	A	;BYTES HANDLED ?	734F 1816	03460	JR	A21	;THIS I WANT
728F 2045	02730	JR	Z,A17	;ALL 40 DONE	7351 3AD079	03470 A20	LD	A,(SCCTR)	;HOW MANY DIR ENTRIES
7291 32D079	02740	LD	(SCCTR),A	;REDUCE # TRKS LEFT	7354 3D	03480	DEC	A	;DID WE CHECK ?
7294 18C9	02750	JR	A10	;HANDLE NEXT GAT BYTE	7355 CA5B74	03490	JP	Z,A32	;ALL ? THEN DONE
7296 216377	02760 A12	LD	HL, PTRN6	;BOTH GRANS LOCKED OUT	7358 32D079	03500	LD	(SCCTR),A	;UPDATE SCAN CTR
7299 FD2ACE79	02770	LD	IY,(NACTR)	;ADD 2	735B 2ADB79	03510	LD	HL,(DEADDR)	;AND
729D FD23	02780	INC	IY	;TO	735E 012000	03520	LD	BC,32	;ADJUST
729F FD23	02790	INC	IY	;NOT-AVAIL-CTR	7361 09	03530	LD	HL,BC	;DIR ENTRY ADDR
72A1 FD22CE79	02800	LD	(NACTR),IY	;COUNTER	7362 22DB79	03540	LD	(DEADDR),HL	;FOR NEXT DIR ENTRY
72A5 18DD	02810	JR	All	;MOVE TO GRAN TBL, ETC.	7365 18C0	03550	JR	A18	;CHECK NEXT ENTRY
72A7 216777	02820 A13	LD	HL, PTRN8	;BOTH GRANS ALLOC	7367 3AD179	03560 A21	LD	A,(CODCTR)	;IS THIS THE
72AA FD2ACC79	02830	LD	IY,(ALCTR)	;ADD 2	736A FE00	03570	CP	0	;1ST ENTRY ?
72AE FD23	02840	INC	IY	;TO					

Listing continues

Listing continued

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736C 200B 03580 JR NZ,A21A ;NO
736E 21748F 03590 LD HL,BLANKS ;BLANK OUT THE
7371 11748B 03600 LD DE,FSAREA ;NO-FILENAME
7374 010C00 03610 LD BC,12 ;MESSAGE
7377 EDB0 03620 LDIR
7379 3C 03630 A21A INC A ;ADD 1
737A 32D179 03640 LD (CODCTR),A ;TO FILE-CODE CTR
737D CD0077 03650 CALL CONVRT ;TO ASCII CODE
7380 DD2AD979 03660 LD IX,(FSADDR) ;2 DIGIT
7384 3A727A 03670 LD A,(ASCII+3) ;ASCII
7387 DD7700 03680 LD (IX),A ;TO FILE
738A 3A737A 03690 LD A,(ASCII+4) ;SAVE
738D DD7701 03700 LD (IX+1),A ;AREA
7390 3E3D 03710 LD A,'=' ;AND AN = SIGN
7392 DD7702 03720 LD (IX+2),A ;TOO.
7395 2ADB79 03730 LD HL,(DEADDR) ;GET
7398 010500 03740 LD BC,5 ;ADDR OF FILENAME
739B 09 03750 ADD HL,BC ;IN DIR ENTRY.
739C 0600 03760 LD B,8 ;MAX LEN FILENAME
739E 7E 03770 A22 LD A,(HL) ;CHAR IN DIR ENTRY
739F FE20 03780 CP ' ' ;A SPACE ?
73A1 2808 03790 JR Z,A23 ;YES, CHECK EXTENSION
73A3 DD7703 03800 LD (IX+3),A ;NO, MOVE TO FSAREA
73A6 23 03810 INC HL ;INCR DIR ENTRY
73A7 DD23 03820 INC IX ;AND FSAREA ADDR
73A9 10P3 03830 DJNZ A22 ;IF NOT DONE, CHECK NEXT
73AB 2ADB79 03840 A23 LD HL,(DEADDR) ;POINT TO
73AE 010D00 03850 LD BC,13 ;1ST POS
73B1 09 03860 ADD HL,BC ;OF EXTENSION
73B2 7E 03870 LD A,(HL) ;IS
73B3 FE20 03880 CP ' ' ;THERE ONE ?
73B5 2812 03890 JR Z,A24 ;IF NOT, WE'RE DONE
73B7 DD7704 03900 LD (IX+4),A ;MOVE
73BA 3E2F 03910 LD A,'/' ;A SLASH
73BC DD7703 03920 LD (IX+3),A ;AND
73BF 23 03930 INC HL ;3
73C0 7E 03940 LD A,(HL) ;EXTENSION
73C1 DD7705 03950 LD (IX+5),A ;CHARACTERS
73C4 23 03960 INC HL ;TO
73C5 7E 03970 LD A,(HL) ;FILE SAVE
73C6 DD7706 03980 LD (IX+6),A ;AREA
73C9 2AD979 03990 A24 LD HL,(FSADDR) ;INCR FSADDR
73CC 011000 04000 LD BC,16 ;FOR
73CF 09 04010 ADD HL,BC ;NEXT
73D0 22D979 04020 LD (FSADDR),HL ;FILENAME
73D3 2ADB79 04030 LD HL,(DEADDR) ;DEVELOP ADDR
73D6 011600 04040 LD BC,16H ;OF 1ST OF 5
73D9 09 04050 ADD HL,BC ;2-BYTE
73DA E5 04060 PUSH HL ;EXTENTS
73DB DDE1 04070 POP IX ;CHECK
73DD DD7E00 04080 A25 LD A,(IX) ;BYTE 1 OF 2-BYTE PAIR
73E0 FEFF 04090 CP 255 ;ALL EXTENTS DONE ?
73E2 CA5173 04100 JP Z,A20 ;YES, GET NEXT DIR ENTRY
73E5 FEFE 04110 CP 254 ;MORE EXTS IN EXT-DIR-ENT?
73E7 CA2474 04120 JP Z,A29 ;YES, FIND EXT-DIR-ENTRY
73EA 21E379 04130 HL,GRTBL ;LOAD ADDR OF GRAN-TBL
73ED 07 04140 ADD A,A ;MPY TRK TIMES 2
73EE 010000 04150 LD BC,0 ;CLEAR BC
73F1 4F 04160 LD C,A ;ADD TRK*2
73F2 09 04170 ADD HL,BC ;TO GRAN TBL ADDR
73F3 DD7E01 04180 LD A,(IX+1) ;BYTE 2 OF EXTENT
73F6 32D279 04190 LD (WCTRL),A ;TO WORK CTR 1
73F9 FE1F 04200 CP 1FH ;IF LESS THAN 20H
73FB 2008 04210 JR Z,A26 ;FILE STARTS IN GRAN 1
73FD 3006 04220 JR C,A26 ;OF TRACK.
73FF D620 04230 SUB 20H ;IF LARGER, STARTS IN G2
7401 32D279 04240 LD (WCTRL),A ;ADJUSTED GRAN COUNT
7404 23 04250 INC HL ;ADJ GTADDR FOR GRAN 2
7405 3AD279 04260 A26 LD A,(WCTRL) ;GRAN COUNT
7408 3C 04270 INC A ;ADJUST TO TRUE COUNT
7409 32D279 04280 LD (WCTRL),A ;
740C 3AD179 04290 A27 LD A,(CODCTR) ;FILE CODE
740F 77 04300 LD (HL),A ;TO GRAN TABLE
7410 3AD279 04310 LD A,(WCTRL) ;# GRANS

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7413 3D 04320 DEC A ;SUB 1
7414 32D279 04330 LD (WCTRL),A ;AND SAVE
7417 FE00 04340 CP 0 ;ALL GRANS MARKED ?
7419 2803 04350 JR Z,A28 ;IF YES, ALL DONE
741B 23 04360 HL ;INCR GTADDR FOR
741C 18EE 04370 JR A27 ;NEXT GRAN
741E DD23 04380 A28 INC IX ;INCR ADDR.
7420 DD23 04390 INC IX ;TO POINT TO NEXT
7422 1889 04400 JR A25 ;2-BYTE PAIR
7424 DD23 04410 A29 INC IX ;BYTE 2 OF EXT-DIR-PNTR
7426 DD7E00 04420 LD A,(IX) ;INTO A
7429 F5 04430 PUSH AF ;AND SAVE IT
742A 21747B 04440 LD HL,SECTS ;BYTE 1 OF DIR SEC 2 ADDR
742D E607 04450 AND 07H ;MASK UNWANTD BITS
742F 3C 04460 INC A ;GIVES SECTOR +1
7430 47 04470 LD B,A ;INTO B
7431 110001 04480 LD DE,256 ;SECTOR SIZE
7434 19 04490 A30 ADD HL,DE ;MULTIPLE ADDS GIVE
7435 10FD 04500 DJNZ A30 ;SECTOR ADDR
7437 ED52 04510 SBC HL,DE ;AND TRUE ADDRESS
7439 F1 04520 POP AF ;RETRIEVE A
743A E5 04530 PUSH HL ;SAVE SECT ADDR
743B 0F 04540 RRCA ;ROTATE
743C 0F 04550 RRCA ;3 HIGH ORDER
743D 0F 04560 RRCA ;BITS
743E 0F 04570 RRCA ;INTO
743F 0F 04580 RRCA ;3 LOWEST PLACES
7440 E607 04590 AND 07H ;MASK UNWANTED BITS
7442 3C 04600 INC A ;ADD 1
7443 47 04610 LD B,A ;SAVE IN B
7444 112000 04620 LD DE,32 ;SIZE OF DIR ENTRY
7447 210000 04630 LD HL,0 ;CLEAR HL
744A 19 04640 A31 ADD HL,DE ;MULTIPLE ADD'S GIVE
744B 10FD 04650 DJNZ A31 ;ENTRY DISPLACEMENT (+1)
744D ED52 04660 SBC HL,DE ;AND TRUE DISPLACEMENT
744F 011600 04670 LD BC,22 ;DISPL TO 1ST 2-BYTE
7452 09 04680 ADD HL,BC ;EXTENT WITHIN ENTRY
7453 C1 04690 POP BC ;RETRIEVE SECTOR ADDR
7454 09 04700 ADD HL,BC ;GIVES ADDR OF 1ST EXTENT
7455 E5 04710 PUSH HL ;PUT INTO
7456 DDE1 04720 POP IX ;INDEX REG IX
7458 C3DD73 04730 JP A25 ;PROCESS DIR ENTRY
745B 217D08 04740 A32 LD HL,MSAREA+265 ;SET UP BASE
745E 22E179 04750 LD (MSBASE),HL ;FOR 1ST PRINT LINE
7461 21E379 04760 HL,GRTBL ;SET UP ADDRESS
7464 22D779 04770 LD (GTADDR),HL ;OF GRAN TABLE
7467 3E01 04780 LD A,1 ;INIT
7469 32D379 04790 LD (LINECT),A ;LINE COUNTER.
746C AF 04800 XOR A ;A TO 0
746D 32D479 04810 LD (ROWCTR),A ;RESET ROW-COUNTER
7470 2AE179 04820 A33 LD HL,(MSBASE) ;AND
7473 22DF79 04830 LD (MSADDR),HL ;MAP SAVE AREA ADDR
7476 2AD779 04840 A34 LD HL,(GTADDR) ;GET 1 BYTE
7479 7E 04850 LD A,(HL) ;FROM GRAN TABLE
747A FE50 04860 CP 50H ;IS IT FREE ?
747C 282B 04870 JP Z,A36 ;YES
747E FE51 04880 CP 51H ;ALLOCATEWD W/O NAME ?
7480 282C 04890 JR Z,A37 ;YES
7482 FE52 04900 CP 52H ;NOT AVAILABLE(LOCKOUT)?
7484 282D 04910 JR Z,A38 ;YES
7486 CD0077 04920 CALL CONVRT ;DECODE FILECODE (ASCII)
7489 3A727A 04930 LD A,(ASCII+3) ;IS RESULT
748C FE20 04940 CP ' ' ;ONLY 1 BYTE ?
748E 200B 04950 JR NZ,A35 ;NO, 2 BYTES
7490 3A737A 04960 LD A,(ASCII+4) ;MOVE 1 BYTE
7493 325B77 04970 LD (PTRN4+2),A ;IDENT
7496 215977 04980 HL,PTRN4 ;TO PATTERN 4
7499 181B 04990 JR A39 ;AND MOVE IT.
749B 326077 05000 A35 LD (PTRN5+2),A ;MOVE
749E 3A737A 05010 LD A,(ASCII+4) ;2-BYTE IDENT
74A1 326177 05020 LD (PTRN5+3),A ;INTO
74A4 215E77 05030 LD HL,PTRN5 ;PATTERN 5
74A7 180D 05040 JR A39 ;AND MOVE IT
74A9 214A77 05050 A36 LD HL,PTRN1 ;FREE-PATTERN

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Listing continued

Listing continued

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74AC 1808      05060      JR      A39      ;MOVE IT
74AE 214F77   05070 A37     LD      HL, PTRN2 ;ALLOC-PATTERN
74B1 1803      05080      JR      A39      ;MOVE IT
74B3 215477   05090 A38     LD      HL, PTRN3 ; N/A - PATTERN
74B6 ED58DF79 05100 A39     LD      DE, (MSADDR) ;MOVE DESIRED PATTERN
74BA 010500    05110      LD      BC, 5     ;TO
74BD EDB0      05120      LDIR     ;MAP SAVE AREA
74BF 2AD779   05130      LD      HL, (GTADDR) ;INCR GRAN TBL
74C2 23        05140      INC      HL      ;ADDRESS
74C3 22D779   05150      LD      (GTADDR), HL ;FOR NEXT GRAN
74C6 3AD479   05160      LD      A, (ROWCTR) ;ADD
74C9 3C        05170      INC      A      ;1 TO
74CA 32D479   05180      LD      (ROWCTR), A ;ROW COUNTER
74CD FE01      05190      CP      1      ;IS IT 1 ?
74CF 2811     05200      JR      Z, A40    ;YES
74D1 FE03      05210      CP      3      ;OR 3 ?
74D3 280D     05220      JR      Z, A40    ;YES
74D5 FE05     05230      CP      5      ;OR 5 ?
74D7 2809     05240      JR      Z, A40    ;YES
74D9 FE07     05250      CP      7      ;OR 7 ?
74DB 2805     05260      JR      Z, A40    ;YES
74DD 010000    05270      LD      BC, 8     ;LOAD 8
74E0 1803      05280      JR      A41      ;OR
74E2 010600    05290 A40     LD      BC, 6     ;6 TO POINT TO NEXT
74E5 2ADP79   05300 A41     LD      HL, (MSADDR) ;AREA IN
74E8 09        05310      ADD     HL, BC    ;MAP-SAVE
74E9 22DP79   05320      LD      (MSADDR), HL ;AREA.
74EC 3AD479   05330      LD      A, (ROWCTR) ;IS ROW COUNTER
74EF FE08      05340      CP      8      ; ON 8 ?
74F1 2083      05350      JR      NZ, A34   ;NO
74F3 AF        05360      XOR     A      ;YES,
74F4 32D479   05370      LD      (ROWCTR), A ;RESET ROW COUNTER
74F7 014000    05380      LD      BC, 64    ;AND SET
74FA 2AE179   05390      LD      HL, (MSBASE) ;MSBASE TO
74FD 09        05400      ADD     HL, BC    ;POINT TO
74FE 22E179   05410      LD      (MSBASE), HL ;NEXT LINE.
7501 3AD379   05420      LD      A, (LINECT) ;HAVE ALL
7504 3C        05430      INC      A      ;10 LINES
7505 32D379   05440      LD      (LINECT), A ;BEEN
7508 FE0B      05450      CP      11     ;PROCESSED ?
750A C27074   05460      JP      NZ, A33   ;NO, PROCESS NEXT ONE
750D 217487   05470 A42     LD      HL, MSAREA ;MOVE MAP SAVE AREA
7510 11003C    05480      LD      DE, VIDEO ;TO
7513 010004    05490      LD      BC, 1024 ;VIDEO SCREEN
7516 EDB0      05500      LDIR     ;MOVE
7518 3E46      05510 A43     LD      A, 'P'    ;MOVE
751A 32C63F   05520      LD      (VIDEO+966), A ;OPTIONS
751D 3E48      05530      LD      A, 'H'    ;TO BE
751F 32D43F   05540      LD      (VIDEO+980), A ;TYPED
7522 3E4E      05550      LD      A, 'N'    ;OVER
7524 32E03F   05560      LD      (VIDEO+992), A ;MENU
7527 3E52      05570      LD      A, 'R'    ;LINE
7529 32ED3F   05580      LD      (VIDEO+1005), A ;16
752C 3E45      05590      LD      A, 'E'    ;ON
752E 32PA3F   05600      LD      (VIDEO+1018), A ;VIDEO
7531 210011    05610      LD      HL, 1100H ;INIT LOOP COUNTER
7534 CD8F76   05620      CALL   SCANKB    ;GET INPUT
7537 FE00      05630      CP      0      ;ANYTHING TYPED ?
7539 201B     05640      JR      NZ, A44   ;YES, CHECK WHAT
753B 3E8F     05650      LD      A, 8FH    ;GRAPHIC BLOCK
753D 32C63F   05660      LD      (VIDEO+966), A ;OVER
7540 32D43F   05670      LD      (VIDEO+980), A ;MENU
7543 32E03F   05680      LD      (VIDEO+992), A ;OPTIONS
7546 32ED3F   05690      LD      (VIDEO+1005), A ;ON MENU
7549 32PA3F   05700      LD      (VIDEO+1018), A ;LINE 16.
754C 210009    05710      LD      HL, 900H  ;INIT LOOP CTR
754F CD8F76   05720      CALL   SCANKB    ;GET INPUT
7552 FE00      05730      CP      0      ;ANYTHING TYPED ?
7554 28C2      05740      JR      Z, A43    ;NO, REPEAT CHECK
7556 32C879   05750 A44     LD      (KBIND), A ;SAVE INPUT
7559 FE46      05760      CP      'P'      ;FILESPECS WANTED ?
755B 2813     05770      JR      Z, A45    ;YES
755D FE48     05780      CP      'H'      ;OR HARDCOPY ?
755F 2830     05790      JR      Z, A50    ;YES

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7561 FE4E      05800      CP      'N'      ;NEXT (NEW) DISK ?
7563 2820     05810      JR      Z, A47   ;YES
7565 FE52     05820      CP      'R'      ;REPEAT SAME DISK ?
7567 2824     05830      JR      Z, A49   ;YES
7569 FE45     05840      CP      'E'      ; E N D ?
756B CAE771    05850      JP      Z, A06   ;YES
756E 18A8     05860      JR      A43     ;INVAL ENTRY, TRY AGAIN
7570 21748B    05870 A45     LD      HL, FSAREA ;FILENAMES AND
7573 11003C    05880      LD      DE, VIDEO ;THEIR IDENTFS (CODCTR)
7576 010004    05890      LD      BC, 1024 ;TO VIDEO SCREEN
7579 EDB0      05900      LDIR     ;SHOW FILENAMES
757B 3A0138    05910 A46     LD      A, (3001H) ;UNTIL F-KEY
757E FE40     05920      CP      64      ;RELEASED. THEN
7580 28F9     05930      JR      Z, A46   ;RESTORE MAP
7582 C30D75    05940      JP      A42     ;SET READ/NOREAD INDIC
7585 3E52     05950 A47     LD      A, 'R'   ;TO "READ"
7587 32C779   05960 A48     LD      (RDIND), A ;MENU:WHICH FILENAMES...
758A C32571    05970      JP      A01A    ; "NOREAD" TO
758D 3E4E     05980 A49     LD      A, 'N'   ;INDICATOR
758F 18F6     05990      JR      A48     ;HARDCOPY
7591 21C03F   06000 A50     LD      HL, VIDEO+960 ;MESSAGE
7594 CD7C05    06010      CALL   PRTCLS   ;TO
7597 21AD79    06020      LD      HL, MSG17 ;SCREEN
759A 11D43F   06030      LD      DE, VIDEO+980 ;LINE
759D 011900    06040      LD      BC, 25   ; 16
75A0 EDB0     06050      LDIR     ;PRINT
75A2 CD2077    06060      CALL   SPACES   ;3 BLANK
75A5 CD2077    06070      CALL   SPACES   ;LINES
75A8 CD2077    06080      CALL   SPACES   ;AND 1 DASH-LINE
75AB CD3777    06090      CALL   DASHES   ;AND 2 MORE
75AE CD2077    06100      CALL   SPACES   ;BLANK LINES
75B1 CD2077    06110      CALL   SPACES   ;RESET LINE CTR
75B4 AF        06120      XOR     A      ;TO 0
75B5 32D379   06130      LD      (LINECT), A ;TO POS 1 OF MSAREA
75B8 DD217487 06140      LD      IX, MSAREA ;PRINT 8 LEADING BLANKS
75BB CD2D77    06150 A51     CALL   LEADBL   ;B TO CHAR/LINE
75BF 0640      06160      LD      B, 64
75C1 DD7E00    06170 A52     LD      A, (IX)  ;PRINT A
75C4 CD3B00    06180      CALL   CHRPRNT ;CHARACTER
75C7 DD23      06190      INC     IX      ;FOR NEXT CHAR
75C9 10F6     06200      DJNZ   A52     ;UNTIL 64 CHAR PRINTED
75CB CD4477    06210      CALL   CR      ;SEND CR/LF (0A)
75CE 3AD379   06220      LD      A, (LINECT) ;ADD 1
75D1 3C        06230      INC     A      ;TO
75D2 32D379   06240      LD      (LINECT), A ;LINE COUNTER
75D5 FE0F     06250      CP      15     ;ALL 15 LINES PRINTED ?
75D7 D0E3     06260      JR      NZ, A51  ;IF NOT, PRINT NXT LINE
75D9 CD2077    06270      CALL   SPACES   ;PRINT
75DC CD2077    06280      CALL   SPACES   ;2 BLANK LINES
75DF DD21748B 06290      LD      IX, FSAREA ;IX TO POS 1 OF FSAREA
75E3 DD7E00    06300 A53     LD      A, (IX+2) ;IS POS 3
75E6 FE20     06310      CP      ' '     ;A SPACE ?
75E8 2814     06320      JR      Z, A55   ;IF YES, NO MORE FILENAM
75EA CD2D77    06330      CALL   LEADBL   ;PRNT 8 LEADING BLANKS
75ED 0640     06340      LD      B, 64   ;SET TO CHAR/LINE
75EF DD7E00    06350 A54     LD      A, (IX)  ;PRINT ONE
75F2 CD3B00    06360      CALL   CHRPRNT ;CHARACTER
75F5 DD23      06370      INC     IX      ;INCR FOR NEXT ONE
75F7 10F6     06380      DJNZ   A54     ;PRNT UNTIL 64 PRINTED
75F9 CD4477    06390      CALL   CR      ; CR/LF
75FC 18E5     06400      JR      A53     ;PRINT NEXT LINE
75FE CD2077    06410 A55     CALL   SPACES   ;PRINT 2
7601 CD2077    06420      CALL   SPACES   ;BLANK LINES
7604 CD3777    06430      CALL   DASHES   ;AND LINE OF ---
7607 CD2077    06440      CALL   SPACES   ;AND
760A CD2077    06450      CALL   SPACES   ;3 MORE
760D CD2077    06460      CALL   SPACES   ;BLANK LINES
7610 C30D75    06470      JP      A42     ;RESTORE MAP
7613 210030    06480 ; . . . . .
7616 2B        06490 ; . . . . . SUBROUTINES . . . . .
7619 2B        06500 ; . . . . .
761C 2B        06510 ; WAITING LOOP. REG B HAS COUNT OF OUTER LOOP
761F 2B        06520 WAIT LD HL, 3000H ;INIT INNER LOOP
7622 2B        06530 WAIT1 DEC HL ;SUB 1

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Listing continued

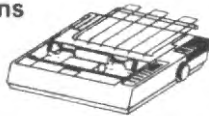
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Listing continued

```

7617 7C      06540    LD      A,H      ;TEST
7618 B5      06550    OR       L        ;HL FOR ZERO
7619 20FB    06560    JR      NZ,WAIT1 ;NOT YET
761B 10FB    06570    DJNZ   WAIT      ;SUB 1 FROM OUTER LOOP
761D C9      06580    RET       ;GO BACK
761E C9      06590    ;
761E C9      06600    ; START DRIVE, SEEK AND READ SECTORS
761E 3E01    06610    READ   LD      A,1      ;DRIVE # 0
7620 32E137  06620    (SELREG),A ;TO SELECT REG
7623 010000  06630    LD      BC,0     ;DELAY TO GET UP
7626 CD6000  06640    CALL   DLAY      ;SPEED.
7629 3E01    06641    LD      A,1H     ;RESELECT
762B 32E137  06642    (SELREG),A ;DRIVE
762E 3E03    06643    LD      A,3H     ;RESTORE TO
7630 32EC37  06644    (CMDREG),A ;TRACK 0
7633 0606    06645    LD      B,6H     ;SHORT
7635 10FE    06646    DJNZ   $        ;DELAY
7637 3AEC37  06647    READ1 LD      A,(CMDREG);STATUS
763A CB47    06648    BIT    0,A       ;READY ?
763C 20F9    06649    JR      NZ,READ1;NOT YET
763E 3E11    06650    SEEK  LD      A,17     ;TRACK 17
7640 57      06660    LD      D,A      ;TO REG D
7641 3E01    06670    LD      A,1      ;RE-SELECT
7643 32E137  06680    (SELREG),A ;DRIVE # 0
7646 3AC979  06690    LD      A,(SECNUM);SECTOR #
7649 5F      06700    LD      E,A      ;TO REG E
764A ED53EE37 06710    (DATREG),DE ;BOTH TO DATA REG
764E 3E1F    06720    LD      A,1FH    ;SEEK CODE
7650 32EC37  06730    (CMDREG),A ;TO COMMAND REG
7653 0606    06740    LD      B,6      ;SHORT
7655 10FE    06750    DJNZ   $        ;DELAY
7657 3AEC37  06760    SKWAIT LD      A,(CMDREG);STATUS ?
765A CB47    06770    BIT    0,A       ;READY ?
765C 20F9    06780    JR      NZ,SKWAIT;NOT YET
765E CB67    06790    BIT    4,A       ;READY, BUT ERROR ?
7660 2813    06800    JR      Z,RDBYTE;NO
7662 3E03    06810    LD      A,3      ;RESTORE-CODE
7664 32EC37  06820    (CMDREG),A ;TO COMMAND REG
7667 0606    06830    LD      B,6      ;SHORT
7669 10FE    06840    DJNZ   $        ;DELAY
766B 3AEC37  06850    RSWAIT LD      A,(CMDREG);STATUS
766E CB47    06860    BIT    0,A       ;READY ?
7670 20F9    06870    JR      NZ,RSWAIT;NOT YET
7672 C33E76  06880    JP      SEEK     ;TRY AGAIN
7675 3E8C    06890    RDBYTE LD      A,8CH    ;READ-CODE
7677 32EC37  06900    (CMDREG),A ;TO COMMAND REG
767A 0606    06910    LD      B,6      ;SHORT
767C 10FE    06920    DJNZ   $        ;DELAY
767E 0606    06930    LD      B,0      ;FOR 256 BYTES
7680 3AEC37  06940    RDWAIT LD      A,(CMDREG);STATUS
7683 CB4F    06950    BIT    1,A       ;READY ?
7685 28F9    06960    JR      Z,RDWAIT;NOT YET
7687 3AEP37  06970    LD      A,(BYTREG);DATA BYTE
768A 77      06980    LD      (HL),A   ;TO STORAGE
768B 23      06990    INC    HL        ;FOR NEXT BYTE
768C 10F2    07000    DJNZ   RDWAIT   ;CONTINUE UNTIL DONE
768E C9      07010    RET       ; GO BACK
768E C9      07020    ;
768E C9      07030    ; SCAN THE KEYBOARD, LOOP COUNT IS IN HL
768F 3A0138  07040    SCANKB LD      A,(3001H);ROW 1
7692 FE02    07050    CP      2        ;VS "A"
7694 2829    07060    JR      Z,KBINP1;ALL FILES
7696 FE20    07070    CP      32       ;VS "E"
7698 2828    07080    JR      Z,KBINP2;END PGM
769A FE40    07090    CP      64       ;VS "F"
769C 2827    07100    JR      Z,KBINP3;FILESPECS
769E 3A0238  07110    LD      A,(3002H);ROW 2
76A1 FE01    07120    CP      1        ;VS "H"
76A3 2823    07130    JR      Z,KBINP4;HARDCOPY
76A5 FE40    07140    CP      64       ;VS "N"
76A7 2822    07150    JR      Z,KBINP5;NEXT DISK
76A9 3A0438  07160    LD      A,(3004H);ROW 3
76AC FE04    07170    CP      4        ;VS "R"
76AE 281E    07180    JR      Z,KBINP6;REPEAT SAME DISK

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76B0 FE08    07190    CP      8        ;VS "S"
76B2 201D    07200    JR      Z,KBINP7;SYSTEMS FILES
76B4 FE20    07210    CP      32       ;VS "U"
76B6 281C    07220    JR      Z,KBINP8;USER FILES
76B8 2B      07230    DEC    HL        ;OUTER LOOP
76B9 7C      07240    LD      A,H      ;COUNTER
76BA B5      07250    OR      L        ;ZERO ?
76BB 20D2    07260    JR      NZ,SCANKB;NO, CONT UNTIL ZERO
76BD AF      07270    XOR    A        ;NOTHING TYPED YET
76BE C9      07280    RET       ;GO BACK
76BF 3E41    07290    KBINP1 LD      A,'A'    ;ALL FILES
76C1 C9      07300    RET       ;GO BACK
76C2 3E45    07310    KBINP2 LD      A,'E'    ;END
76C4 C9      07320    RET       ;GO BACK
76C5 3E46    07330    KBINP3 LD      A,'F'    ;FILESPECS
76C7 C9      07340    RET       ;GO BACK
76C8 3E48    07350    KBINP4 LD      A,'H'    ;HARDCOPY
76CA C9      07360    RET       ;GO BACK
76CB 3E4E    07370    KBINP5 LD      A,'N'    ;NEXT DISK
76CD C9      07380    RET       ;GO BACK
76CE 3E52    07390    KBINP6 LD      A,'R'    ;REPEAT DSK
76D0 C9      07400    RET       ;GO BACK
76D1 3E53    07410    KBINP7 LD      A,'S'    ;SYSTEMS FILES
76D3 C9      07420    RET       ;GO BACK
76D4 3E55    07430    KBINP8 LD      A,'U'    ;USER FILES
76D6 C9      07440    RET       ;GO BACK
76D6 C9      07450    ;
76D7 DD21657A 07460    ; HEX TO ASCII CONVERSION, HEX IN HL, RESULT IN "ASCII"
76DB DD216F7A 07470    HEXASC LD      IX,CONVTE;CONVERSION TABLE ADDR
76DF AF      07480    LD      IX,ASCII ;RESULT AREA ADDRESS
76E0 DD4601  07490    XOR    A        ;CLEAR A
76E3 DD4E00  07500    LD      B,(IX+1);LOAD TABLE
76E6 B7      07510    OR      C,(IX)  ;WORD IN BC
76E7 ED42    07520    LD      A,0     ;CLEAR FLAGS
76E9 3003    07530    HEX2  SBC    HL,BC ;SUB DECIM VALUE FROM HL
76EB 3C      07540    JR      C,HEX3  ;TOO MANY SUBTRACTS ?
76EC 10F9    07550    INC    A        ;NO, ADD 1 TO RTESULT
76EE 09      07560    JR      HEX2    ;GO, SUB MORE
76EF C630    07570    HEX3  ADD    HL,BC   ;ADD BACK TO GO POSITIVE
76F1 FD7700  07580    ADD    A,30H   ;ADJUST FOR ASCII
76F4 FD23    07590    LD      LD      (Y),A ;AND STORE IN RESULT
76F6 79      07600    INC    IY      ;FOR NEXT RESULT BYTE
76F7 FE01    07610    LD      LD      A,C ;DID WE PROCESS
76F9 C8      07620    CP      1       ;LAST TABLE WORD ?
76FA DD23    07630    RET     Z      ;IF YES, ALL DONE,GO BACK
76FC DD23    07640    INC    IX      ;NO, ADJ TABLE ADDR
76FE 18DF    07650    INC    IX      ;TO NEXT WORD
07660    07660    JR      HEX1    ;AND PROCESS IT
07670    07670    ;
07680    07680    ; CONVERT HEX 01-1A TO A-2, 1B-23 TO 1-9, 24-4F TO 10-53
07690    07690    ; BYTE TO BE CONVERTED IS IN REG A, RESULT IN "ASCII"
7700 FELB    07700    CONVRT CP      27     ;IF 1-26
7702 380D    07710    JR      C,CV1   ;MAKE A-2.
7704 FE24    07720    CP      36     ;IF 27-35
7706 3814    07730    JR      C,CV3   ;MAKE 1-9.
7708 D61A    07740    SUB    26      ;IF 36-? MAKE 10-?
770A 6F      07750    LD      L,A     ;CONVERT
770B 2600    07760    LD      H,0     ;TO
770D CDD776  07770    CALL   HEXASC  ;ASCII
7710 C9      07780    RET       ;GO BACK
7711 C640    07790    CV1   ADD    A,64    ;BECOMES 65-90(A-2)
7713 32737A  07800    CV2   LD      (ASCII+4),A ;TO LOWEST "ASCII"
7716 3E20    07810    LD      A,' '   ;BLANK
7718 32727A  07820    LD      (ASCII+3),A ;TO PRECEDING ASCII
771B C9      07830    RET       ;GO BACK
771C C616    07840    CV3   ADD    A,22    ;BECOMES 49-57 (1-9)
771E 18F3    07850    JR      CV2    ;PUT IN RESULT
771E 18F3    07860    ;
7720 0604    07870    ; PRINT A BLANK SHORT LINE ON THE PRINTER
7722 3E20    07880    SPACES LD      B,4   ;SEND 4
7724 CD3B00  07890    LD      A,' '   ;BLANKS
7727 10FB    07900    SPACE1 CALL  CHRPRNT ;TO PRINTER
7729 CD4477  07910    DJNZ   SPACE1  ;FOLLOWED
7729 CD4477  07920    CALL   CR      ;BY CR/LF

```

Listing continues

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```

772C C9      07930      RET                ;GO BACK
              07940      ; .....
              07950      ; PRINT 8 LEADING BLANKS ON PRINTER
772D 0608    07960      LEADBL LD      B,8      ;SEND
772F 3E20    07970      LD      A,' '    ;8 SPACES
7731 CD3B00  07980      LEADBL CALL   CHRPRN ;TO PRINTER
7734 10FB    07990      DJNZ   LEADBL ;AND THEN
7736 C9      08000      RET                ;GO BACK
              08010      ; .....
              08020      ; PRINT A LINE OF 80 DASHES (-) ON PRINTER
7737 0650    08030      DASHES LD      B,80     ;SEND
7739 3E2D    08040      LD      A,'-'    ; 80
773B CD3B00  08050      DASHL CALL   CHRPRN ;DASHES
773E 10FB    08060      DJNZ   DASHL    ;TO PRINTER
7740 CD4477  08070      CALL   CR        ;FOLLOWED BY CR/LF
7743 C9      08080      RET                ;GO BACK
              08090      ; .....
              08100      ; SEND CR/LF TO PRINTER (USING 0AH)
7744 3E0A    08110      CR      LD      A,0AH   ;CARR RET / LINE FEED
7746 CD3B00  08120      CALL   CHRPRN   ;TO PRINTER
7749 C9      08130      RET                ;GO BACK
              08140      ; .....
              08150      ; CONSTANTS, WORK AREAS, COUNTERS, ADDRESSES, ETC.
774A 2E      08160      PTRN1 DEFM   '.....' ;INDICATES FREE GRANS
              2E 2E 2E 2E
774F 8C      08170      PTRN2 DEFB   8CH      ;ALLOC
7750 8C8C    08180      DEFW   8C8CH    ;WITHOUT
7752 8C8C    08190      DEFW   8C8CH    ;IDENT.
7754 20      08200      PTRN3 DEFM   ' N/A '    ;NOT-AVAILABLE
              4E 2F 41 20
7759 8C84    08210      PTRN4 DEFW   848CH    ;ALLOCATED
              08001      08220      DEFS   1          ;TO
775C 888C    08230      DEFW   8C88H    ;1-DIG CODE.
775E 8C84    08240      PTRN5 DEFW   848CH    ;ALLOCATED
              08002      08250      DEFS   2          ;TO
7762 88      08260      DEFB   88H      ;2-DIG CODE.
7763 52      08270      PTRN6 DEFB   52H      ;BOTH GRANS
7764 52      08280      DEFB   52H      ;LOCKED OUT (N/A)
7765 50      08290      PTRN7 DEFB   50H      ;BOTH GRANS
7766 50      08300      DEFB   50H      ;FREE.
7767 51      08310      PTRN8 DEFB   51H      ;G-1 ALLOC
7768 51      08320      PTRN10 DEFB   51H      ;G-2 ALLOC OR G-1 ALLOC
7769 50      08330      PTRN9 DEFB   50H      ;G-1 FREE G-2 FREE
776A 51      08340      DEFB   51H      ;G-2 ALLOC
776B 20      08350      MSG1  DEFM   '          S P A C E M
              A P
              20 20 20 20 20 20 20 20
              20 20 20 20 20 20 20 20
              20 20 20 20 20 20 20 20
              20 20 20 20 20 20 53
              20 50 20 41 20 43 20 45
              20 4D 20 41 20 50 20 20
              20
779D 54      08360      MSG2  DEFM   'TYPE: F=FILESPEC S. H=HARDCOPY. N=NEXT DISK
              . R=SAME DISK. E=END.'
              59 50 45 3A 20 46 3D 46
              49 4C 45 53 50 45 43 20
              53 2E 20 48 3D 40 41 52
              44 43 4F 50 59 2E 20 4E
              3D 4E 45 58 54 20 44 49
              53 4B 2E 20 52 3D 53 41
              4D 45 20 44 49 53 4B 2E
              20 45 3D 45 4E 44 2E
77DD 42      08370      MSG3  DEFM   'B Y : '
              20 59 20 3A 20
77E3 48      08380      MSG4  DEFM   'H U B E R T   C .   B O R R M A N N   '
              20 55 20 42 20 45 20 52
              20 54 20 20 20 43 20 2E
              20 20 20 42 20 4F 20 52
              20 52 20 4D 20 41 20 4E
              20 4E 20 20 20
7809 4B      08390      MSG5  DEFM   'K 0 M V B '
              20 30 20 4D 20 56 20 42
              20

```

```

7813 53      08400      MSG6  DEFM   'S   P   A   C   E   M   A   P
              '
              20 20 20 20 20 50 20 20
              20 20 20 41 20 20 20
              20 43 20 20 20 20 20 45
              20 20 20 20 20 4D 20 20
              20 20 20 41 20 20 20 20
              20 50 20 20 20 20 20
7843 49      08410      MSG7  DEFM   'INSERT TARGET DISKETTE IN DRIVE 0 AND TYPE
              IN YOUR OPTION : '
              4E 53 45 52 54 20 54 41
              52 47 45 54 20 44 49 53
              4B 45 54 54 45 20 49 4E
              20 44 52 49 56 45 20 30
              20 41 4E 44 20 54 59 50
              45 20 49 4E 20 59 4F 55
              52 20 4F 50 54 49 4F 4E
              20 3A 20
787F 53      08420      MSG8  DEFM   'SHOW FILENAMES FOR '
              48 4F 57 20 46 49 4C 45
              4F 41 4D 45 53 20 46 4F
              52 20
7892 3C      08430      MSG9  DEFM   '<U> = VISIBLE USER FILES ONLY '
              55 3E 20 3D 20 56 49 53
              49 42 4C 45 20 55 53 45
              52 20 46 49 4C 45 53 20
              4F 4E 4C 59 20
78B0 3C      08440      MSG10 DEFM   '<S> = SYSTEMS AND INVISIBLE FILES ONLY '
              53 3E 20 3D 20 53 59 53
              54 45 4D 53 20 41 4E 44
              20 49 4E 56 49 53 49 42
              4C 45 20 46 49 4C 45 53
              20 4F 4E 4C 59 20
78D7 3C      08450      MSG11 DEFM   '<A> = ALL FILES '
              41 3E 20 3D 20 41 4C 4C
              20 46 49 4C 45 53 20
78E7 55      08460      MSG13 DEFM   'USING THE DIRECTORY STILL IN MEMORY '
              53 49 4E 47 20 54 4E 45
              20 44 49 52 45 43 54 4F
              52 59 20 53 54 49 4C 4C
              20 49 4E 20 4D 45 4D 4F
              52 59 20
790B 4F      08470      MSG12 DEFM   'OR <E> = ENDS THE PROGRAM '
              52 20 20 20 20 20 3C 45
              3E 20 3D 20 45 4E 44 53
              20 54 48 45 20 50 52 4F
              47 52 41 4D 20
7929 4E      08480      MSG14 DEFM   'NO FILENAMES '
              4F 20 46 49 4C 45 4E 41
              4D 45 53 20
7936 44      08490      MSG15 DEFM   'DISKNAME MM/DD/YY FREE GRAN S=XX,ALLOCATED
              =XX,NOT AVAILL=XX'
              49 53 4B 4E 41 4D 45 20
              4D 4D 2F 44 44 2F 59 59
              20 20 46 52 45 45 20 47
              52 41 4E 20 53 3D 58 58
              2C 41 4C 4C 4F 43 41 54
              45 44 3D 58 58 2C 4E 4F
              54 20 41 56 41 49 4C 4C
              3D 58 58
7972 54      08500      MSG16 DEFM   'TRACK G-1 G-2 G-1 G-2 G-1 G
              -2 G-1 G-2'
              52 41 43 4B 20 20 20 47
              2D 31 20 20 20 47 2D 32
              20 20 20 20 20 47 2D 31
              20 20 20 47 2D 32 20 20
              20 20 20 47 2D 31 20 20
              20 47 2D 32 20 20 20 20
              20 47 2D 31 20 20 20 47
              2D 32
79AD 48      08510      MSG17 DEFM   'HARDCOPY IS BEING PRINTED '
              41 52 44 43 4F 50 59 20
              49 53 20 42 45 49 4E 47
              20 50 52 49 4E 54 45 44
              20

```

Listing continues

Listing continued

```

79C7 52      08520 RDIND  DEFB  'R'      ;R=READ DIR, N=NOREAD
79C8 3P      08530 KBIND  DEFB  '? '     ;KEYBOARD DIGIT
79C9 00      08540 SECNUM  DEFB  0         ;SECTOR TO BE READ
79CA 0000    08550 PRCTR  DEFW  0         ;# FREE GRANS
79CC 0000    08560 ALCTR  DEFW  0         ;# ALLOCATED GRANS
79CE 0000    08570 NACTR  DEFW  0         ;# NOT-AVAIL GRANS
79D0 00      08580 SCCTR  DEFB  0         ;SCAN COUNTER
79D1 00      08590 CODCTR  DEFB  0         ;CODE CTR (FILE ID)
79D2 00      08600 WCTRL  DEFB  0         ;WORK COUNTER
79D3 00      08610 LINCTR  DEFB  0         ;LINE COUNTER
79D4 00      08620 ROWCTR  DEFB  0         ;ROW COUNTER (DISPL ROW)
79D5 0000    08630 SECADR  DEFW  0         ;WHERE SECT TO BE READ TO
79D7 0000    08640 GTADDR  DEFW  0         ;GRAN TABLE ADDRESS
79D9 0000    08650 FSADDR  DEFW  0         ;FILE SAVE AREA ADDRESS
79DB 0000    08660 DEADDR  DEFW  0         ;DIRECTORY ENTRY ADDR
79DD 0000    08670 EXADDR  DEFW  0         ;ADDR OF 2-BYTE EXTENT
79DF 0000    08680 MSADDR  DEFW  0         ;MAP SAVE AREA ADDR
79E1 0000    08690 MSBASE  DEFW  0         ;MAP SAVE BASE ADDR
0050      08700 GRTBL  DEFS  00        ;GRANULE TABLE (40 TK)
7A33 30      08710 TRKTBL  DEFM  '00-0304-0708-1112-1516-1920-2324-2728-3132-
3536-39'
30 2D 30 33 30 34 2D 30
37 30 38 2D 31 31 31 32
2D 31 35 31 36 2D 31 39
32 30 2D 32 33 32 34 2D
32 37 32 38 2D 33 31 33
32 2D 33 35 33 36 2D 33
39
7A65 1027    08720 CONVBT  DEFW  10000     ;TABLE USED TO
7A67 E803    08730          DEFW  1000     ;CONVERT BINARY IN HL
7A69 6400    08740          DEFW  100      ;TO DECIMAL
7A6B 0A00    08750          DEFW  10       ;VALUE
7A6D 0100    08760          DEFW  1        ;AND THE RESULT
7A6F 58      08770 ASCII  DEFM  'XXXXX'   ;GOES HERE.
58 58 58 58
0100      08780 SEC0   DEFS  256       ;TRACK 17, SECTOR 0
0000      08790 SECTS  DEFS  2048     ; SECTS 2-9
0400      08800 SCRPAT  DEFS  1024     ;SCREEN DISPLAY PATTERN
0400      08810 MSAREA  DEFS  1024     ;MAP SAVE AREA
0400      08820 FSAREA  DEFS  1024     ;FILENAME SAVE AREA
0F74 20      08830 BLANKS  DEFM  '          ' ;JUST BLANKS.
20 20 20 20 20 20 20 20
20 20 20
0F80 00      08835 ZEND   DEFB  0         ;END OF PROGRAM
0000      08840          DEFB  0
0000      08850          DEFB  0
00000 TOTAL ERRORS
7000          END          START

```

TRS-80™

WOBOS™ I

WORLDWIDE OPERATING

Basic Operating System

WOBOS I is a menu driven, prestructured program in BASIC that provides access to over 30 utility functions during development or actual use of a program. Its unique layout allows you to develop your programs within a well organized environment that provides a very strong foundation to build upon. You always had to start from scratch before but now after loading WOBOS I, you'll start with over 11K of subroutines and system utilities. Imagine what this can do for your productivity! WOBOS I is not an accessory to your program. It actually becomes its foundation!

WOBOS I for Model III BASIC 03 01 82 12 34 50

PROGRAM MENU	UTILITIES
1 Your Program A	11 Data List
2 B	22 Sort
3 C	33 Renumber
4 D	44 Append
5 E	55 Memory Dump
6 Graphics Synthesis	66 Map
7 Special characters 0-31	77 Size
8	88 New Data Entry
9	99 Device I/O

Illustrated above is the Primary Menu of WOBOS I for Model III in addition to the features shown, the DEVICE I/O generates a separate 9-choice menu that will allow you to compile, update, sort and output your data files. It also includes a utility that will save both the DATA and WOBOS I on tape and/or disk.

With controllable SOUND

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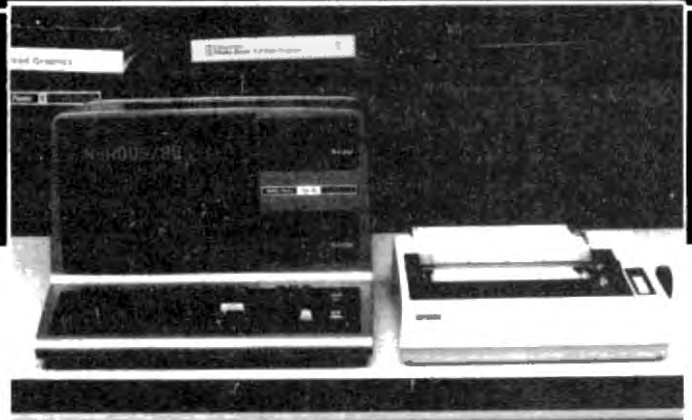
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The LDOS Toolbox

by Jim Heid

The utilities to perfect LDOS are available in Powersoft's Toolbox. You'll also get patches and filters to make your system manageable.

★ ★ ★ ★

The Toolbox for LDOS
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One disk drive, LDOS
\$69.95

Finally, a set of tools I can use without busting my knuckles! The Toolbox for LDOS is a set of utility programs, patches, and filters that makes the best TRS-80 disk operating system even better.

What's a Utility?

A utility is a program that makes using the computer easier. Some utilities add features your computer lacks, such as a different keyboard arrangement. Some work with your word processing program to improve your text.

Others make life easier for disk drive owners by simplifying certain disk operating system (DOS) commands and functions. And some come to the rescue to repair a disk when that vital file won't load.

The Toolbox does all the above and more (see Table 1). Kim Watt, the author of Super Utility Plus, wrote it. The programs in The Toolbox do many things that Super Utility Plus (SU+) does, but they work with LDOS-for-

matted disks only.

They also work with double-sided disk drives and with hard disks, something even SU+ can't do. In fact, this package lets you work with all LDOS-supported disk drives, including single- or double-density, single- or double-sided, 5¼- or 8-inch floppy disk drives, and fixed or removable hard disk drives.

The Package

The Toolbox package contains 19 machine-language programs, two LDOS filter programs, one LDOS patch, and two sample files, all stored on two 5¼-inch disks and accompanied by a 6- by 9-inch, 51-page manual.

You cannot duplicate the disks, but they contain an easy-to-use copy program that transfers The Toolbox programs onto your own single-density disks. Once you transfer them, you can copy them as often as you want.

The Toolbox utilities are written for use with LDOS 5.1.3. Model I users can use them without modification on any LDOS 5.1.x release. Model III users must patch 15 of the programs; the patches are easy to apply and are listed in the front of the manual. You cannot use the programs with the LDOS 5.0.x series.

The Programs

PMOD lets you examine and modify the contents of memory or of a disk. You can browse through the contents of

a disk using the arrow keys, or supply a file name to modify or examine the contents of a particular file without searching the entire disk.

You can type your modifications in hexadecimal (hex), ASCII, decimal, binary, or octal. A sample PMOD screen appears in Fig. 1.

PCHECK is a directory-checking utility. The directory is a disk's table of contents. It contains the information that tells LDOS where your files are located on the disk, how much free space is available, when you last updated a file, and so on.

PCHECK reads a disk's directory and performs a complex, three-stage test to ensure that the directory's information is accurate. It's capable of finding 16 possible error conditions (see Fig. 2).

The error messages are definitely not phrased for the novice, but this makes sense, since the directory is a complex place that novices don't usually access anyway. How could you phrase "Directory links to record not linking back to it" for the novice?

PFIX is the companion program to PCHECK. It fixes most directory errors that PCHECK finds, and also repairs a disk that no longer boots.

The instructions for PFIX state, "In conjunction with PCHECK, most directory problems can be easily located and corrected without extensive knowledge of how directories are formatted."

To test this claim, I set up a test disk and, using PMOD, introduced five errors in the disk's directory. I then checked the disk using PCHECK. It found all the errors, and reported them as shown in Fig. 3.

Next, I ran PFIX to repair the GAT table. (You don't need to know what these letters stand for to use the pro-

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grams; you simply tell PFIX what PCHECK told you when it tested the disk, and it does the rest.) The disk drive came on for a few seconds, and a message told me that the fix was completed. I ran PCHECK to make sure. PFIX had located and repaired all the errors.

If you have a disk formatted a few years ago that is victim to frequent "SECTOR NOT FOUND" or CRC errors, the magnetic charges in the disk's surface might be weakened. PREFORM, a utility that formats a disk without erasing the data on it, can help.

PREFORM reads a track, reformats the track, then rewrites the data that it read. I used it to refresh several older disks, and it works well. PREFORM does not work with hard disk drives.

PVU is a disk-verification utility. It reads a disk and informs you of any faulty sectors. You can specify the drive to be tested, the track number to start testing, and a pause at each bad sector.

PCLEAR erases all unassigned granules, any part of the disk that a file isn't using. It also erases the contents of a particular file and cleans up a disk's directory by clearing unused directory records.

Using PCLEAR, you can wipe out every trace of that confidential memo. Better yet, you can replace the confidential data with the string of your choice.

Assume you have a file called Secret/SCR. At the LDOS READY prompt, type PCLEAR, SECRET/SCR, "HA! FOOLED YOU!". The phrase HA! FOOLED YOU!, repeating over and over again, replaces the data in the file. It's a fine way to foil file foes.

PSS is a sector status utility. It lets you identify which file is assigned to any sector on a disk. You simply supply PSS with the drive, track, and sector numbers, and it determines whether that sector is assigned to any file. If the sector is in use, PSS tells you the file name that it is assigned to, and the relative sector number within that file.

PMAP lets you locate the sectors that make up a particular file and determine the status of all granules on a disk. You can print the report that the program displays.

The PASSGO utility is handy when you forget a password. It lets you remove a password from a single file or an entire disk. You can also specify that passwords be removed on invisible and system files.

PUN is a disk un-repair program. It reverses the effect of the LDOS Repair

Type of System—utility package for LDOS users
Machine-language command files, one LDOS patch
Utility programs are parameter driven
Help screens provide on-line description of parameters
Package supplied on two single-density disks,
each containing a copy program for transferring the files

Summary of Programs

PMOD—disk editing utility that allows examination and modification of disks.
PCHECK—directory check utility that reads directory and reports any errors.
PFIX—directory repair utility that repairs errors found by PCHECK.
PREFORM—disk reformat utility that formats a disk without erasing its data.
PVU—disk verification utility that finds and reports faulty disk sectors.
PCLEAR—disk clean-up utility that clears directory entries for killed files and clears unassigned granules.
PSS—sector status utility that identifies which file is assigned to any sector.
PMAP—disk/file mapping utility that locates sectors comprising a file and determines the status of all granules on a disk.
PASSGO—password removal utility that removes passwords from a single file or all files on a disk.
PUN—disk unrepair program that reverses effect of LDOS repair (alien) command.
PKILL—file killing utility that permits killing of multiple files with a minimum of typing.
PCOMPARE—disk/file comparison utility that compares two disks or files and identifies differences between them.
PFIND—search and replace utility that finds a given string or byte value and optionally replaces it.
PMOVE—file copying utility that transfers multiple files.
PERASE—disk bulk-erase utility that removes all traces of data from a disk.
PDIRT—directory read utility that permits reading of a Model III TRSDOS disk directory without leaving LDOS.
PEX—disk drive exercising utility that steps head in and out.
PHELP—LDOS help utility that contains descriptions for all LDOS library commands and some utilities.
PMX/FLT—filter for printing TRS-80 graphics on Epson MX-80 printer.
DVORAK/FLT—filter that converts the keyboard layout to Dvorak arrangement.
PFILT/FLT—user definable filter that filters input or output devices.
PBOOT/FLT—patch for customizing LDOS boot display.

Table 1. The Toolbox at a glance.

```

. T00.2C20 6279 2073 7570 706C 7969 6E67 2061., by supplying a
HEX 010.2066 696C 6520 6E61 6D65 2C20 796F 7520. file name, you
DRV 020.6361 6E20 6D6F 6469 6679 206F 7220 6578.can modify or ex
1 L30.616D 696E 6520 7468 6520 636F 6E74 656E.amine the conten
B40.7473 206F 6620 6120 7061 7274 6963 756C.ts of a particul
O50.6172 2066 696C 6520 7769 7468 6F75 7420.ar file without
X60.6861 7669 6E67 2074 6F20 7365 6172 6368.having to search
/70.2074 6865 2065 6E74 6972 6520 6469 736B. the entire disk
S80.2E20 596F 7572 206D 6F64 6966 6963 6174.. Your modificat
C90.696F 6E73 2063 616E 2062 6520 7479 7065.ions can be type
RA0.6420 696E 2068 6578 2C20 4153 4349 492C.d in hex, ASCII,
B0.2064 6563 696D 616C 2C20 6269 6E61 7279. decimal, binary
RSEC 00.2C20 6F72 206F 6374 616C 2E20 4120 7361., or octal. A sa
0011 D0.6D70 6C65 2050 4D4F 4420 7363 7265 656E.mple PMOD screen
EOFS E0.2069 7320 7368 6F77 6E20 696E 2046 6967. is shown in Fig
0075 F0.2E20 312E 8E20 2020 2020 5043 4845 434B.. l.. PCHECK

```

Figure 1. Sample PMOD display.

(alien) command, which makes Model I TRSDOS disks readable by Model III LDOS.

PUN changes the data address marks on a repaired disk, so Model I TRSDOS can read the repaired disk. One trip through Punland, and LDOS and TRSDOS can read your disk. PUN works on the Model I only.

PKILL is a utility that lets you kill a number of files quickly with a minimum of typing. PKILL lets you classify the files to be killed according to various categories. For example, the command PKILL :1,/CMD kills all files on the disk in drive 1 with the /CMD extension. The command PKILL :1,A kills all files on the drive 1 disk.

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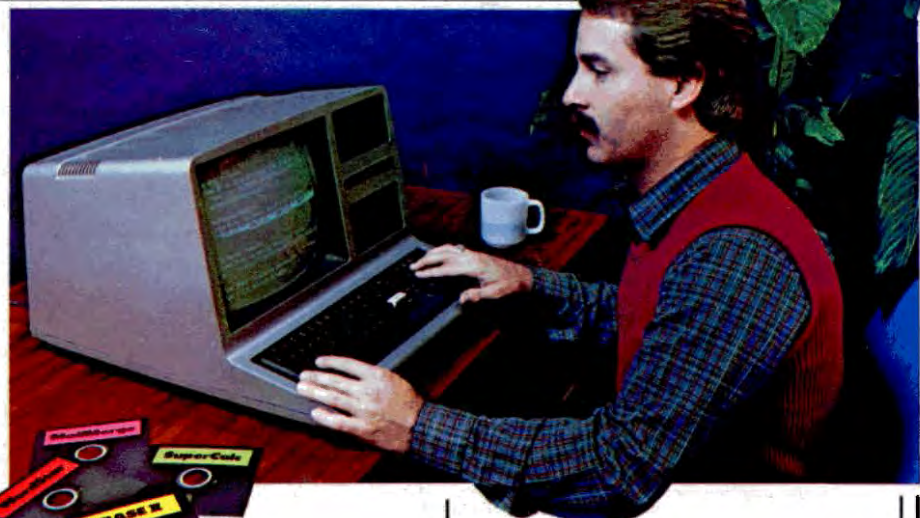
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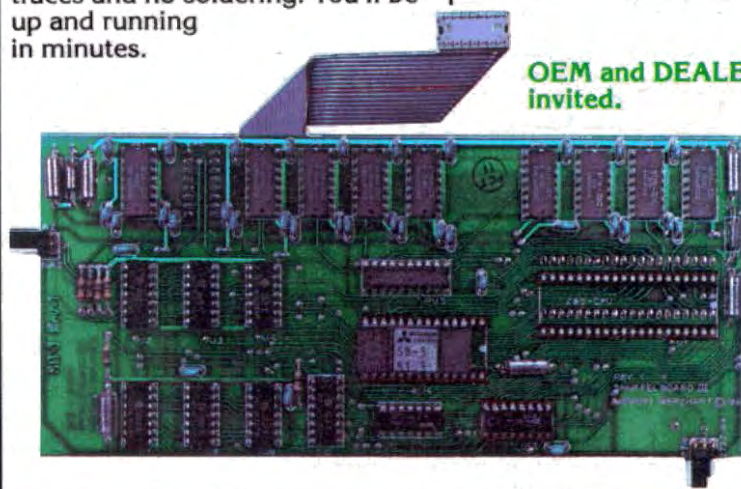
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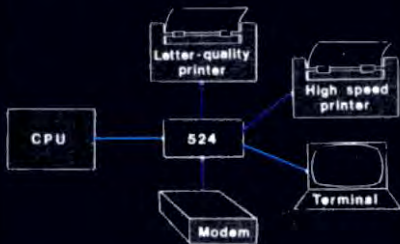
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Adding an exclamation mark to a PKILL command causes the utility to zero the directory entry for each file killed, making it impossible to recover those files. PKILL also lets you use partspecs (part of a file name) when specifying file names. For example, the command PKILL :1,\$TEST kills all files from the drive 1 disk with names that begin with TEST.

PKILL's best feature is its speed. The program operates by reading a disk's directory into memory, killing whatever files you specify, then writing the newly modified directory back to the disk. This technique lets PKILL perform a complex file-killing procedure in little more than the time it takes to read and write a directory.

PKILL's flexible parameters and its speed make it a must-have for hard disk users. One or two passes through PKILL can take the place of a 10-minute disk clean-up session.

PCOMPARE is the disk or file comparison utility. Supply two file names or two drive numbers containing disks to be compared, and PCOMPARE "holds them up to the light, side-by-side" and tells you if the data on them is the same or different. If it's different, PCOMPARE tells you the position of the mismatch within the file or disk.

The program displays a summary at the end of the comparison that gives the number of sectors compared, the number of sectors not matching, and the number of bytes not matching.

The PFIND utility is a string search-and-replace program. It lets you locate and, if desired, replace strings in memory, within a single file, or on a disk-wide basis. You can supply the search string in one of four formats: case dependent (each specified letter must match exactly), case independent (specified letters can be in upper- or lowercase, or a mixture of both), in byte-list format, or in word-list format.

The last two formats let you search for a string of bytes or of 2-byte words. The program accepts byte or word values in binary, decimal, hex, or octal.

PMOVE is the ultimate file copier. It lets you transfer a number of files from one disk to another in one easy operation. PMOVE also lets you supply default file extensions.

Transferring files with PMOVE is much faster than with the LDOS Copy command. In my tests, performed on an unmodified Model III, transferring 10 small files (of fewer than three granules each) took three minutes using the LDOS Copy command, but only one minute and 30 seconds using PMOVE.

1. Cylinder xxx has an invalid GAT table byte
2. Hit byte at xxH invalid or extraneous
3. Filename contains non-ASCII characters
4. End of File Sector beyond allocated sectors
5. No terminator for extent field
6. Directory links to record not linking back to it
7. Track assigned that is beyond diskette boundary
8. Extension assigned before end of extents
9. Forward link to inactive entry
10. Forward link to non-extension entry
11. Extension record not assigned to any files
12. Multiple files assigned to single granule
13. Directory record has invalid HIT byte
14. Directory record has a zero HIT byte
15. Extended directory record has invalid HIT byte
16. Extended directory record has a zero HIT byte

Figure 2. PCHECK error messages.

```
:1 5" Floppy #2, Cyls= 40, SDen, Sides=1, Step=06ms, Dly=.5s
00006 Free Grans, Name = LDOSDISK, Date = 05/03/83.
```

Cylinder 33 Has An Invalid GAT Table Byte.

Cylinder 34 Has An Invalid GAT Table Byte.

Cylinder 35 Has An Invalid GAT Table Byte.

Cylinder 36 Has An Invalid GAT Table Byte.

Cylinder 37 Has An Invalid GAT Table Byte.

00005 Total Errors.

Figure 3. A PCHECK error report.

This is another utility no hard disk owner should be without.

The PERASE utility turns your computer into a \$15 bulk eraser. It erases all data on a disk. A bulk eraser does the same thing as PERASE but faster, but bulk erasers sometimes extend their magnetic fields to include important disks located several feet away. PERASE only erases the disk you specify.

PDIRT lets you read Model III TRSDOS-formatted disks without leaving LDOS. You can specify that the directory listing include invisible files, system files, and system overlays. This utility does not work on a Model I that you haven't modified for double-density operation.

The PEX utility is a disk drive exerciser. It doesn't take your drives out for a walk on cold winter days, but it does give their stepper motors a workout. In its manual mode, PEX lets you position the head to a specified track. You can use this feature when aligning a drive.

In its automatic mode, PEX steps the head back and forth from track zero to the drive's highest-numbered track.

You can use PEX along with a head-cleaning disk, although The Toolbox documentation advises against using the automatic mode for more than 15-30 seconds.

PHELP, the largest program in The Toolbox, provides a summary of each LDOS library command and of the LBasic, Format, Backup, Conv, Patch, and Repair programs.

To use PHELP, type PHELP followed by a space, then the name of the library command. A short description of the command's purpose, use, and parameters appears and the program returns to the LDOS Ready prompt.

The descriptions in PHELP are clearly written, and most summarize the command as well as possible in one screen.

Some LDOS commands, such as System, DIR, and ATTRIB have many parameters and are too complex to describe completely on one screen. The summaries for these commands are more useful as memory joggers than as replacements for the LDOS manual.

Filters and a Fix

One of the features that sets LDOS

apart from other disk operating systems is its ability to filter a device. A device is anything attached to the computer that sends or receives data to or from the computer. Printers, disk drives, video monitors, and keyboards are typical devices.

The keyboard is an input device, since it supplies information to the computer. The video monitor and the printer are output devices, since they display and print information sent from the computer. The disk drive is an input or an output device, since it either supplies stored information to the computer or saves information sent by it.

LDOS lets you intercept and change the data going to or coming from a device. You might, for example, filter the printer to change the number of characters printed on each line.

You could also filter the keyboard so that entire sentences appear when you press a certain key. Filtering is a powerful feature you can use to overcome software or hardware limitations, or to make your computer easier to operate.

Three filters are included in The Toolbox package. The first, PMX/FLT, is for Epson MX-80 printer users. This filter adjusts the MX-80 graphics characters so that they print as normal

TRS-80 graphic characters. This lets you retain the special capabilities of the MX-80 that are otherwise lost when you put it in the TRS-80 mode.

Dvorak/FLT is a keyboard filter that lets you try the famous Dvorak simplified keyboard arrangement. This keyboard layout places frequently used keys in more logical positions than the standard QWERTY layout. Once

"Filtering is a powerful feature you can use to overcome software or hardware limitations."

installed, you can alternate between Dvorak and QWERTY by holding down the clear key and pressing the zero key.

This filter does work, although I didn't spend much time experimenting with the Dvorak layout. I had a hard enough time learning where the space bar is; I'm not about to learn to type all

over again.

PFILT is a powerful filter you customize for your own applications. Unlike filters designed for a specific device, you can use PFILT with either input or output devices.

To use it, you must first create a translation file using the LDOS Build command, or any word processor that saves files in ASCII format. This file contains the information that tells PFILT what to do with the data it intercepts.

I put together a short filter file that I use to filter the output to my dot-matrix printer. This file lets me change type styles in the middle of text by simply pressing two keys.

Two sample filter files in The Toolbox illustrate the power of the PFILT filter. These files, called Code and Decode, are used to scramble and unscramble whatever you type when they are active. They're not of much practical value, but they help you figure out how to use PFILT for your own applications.

PBOOT is a patch that lets you customize, to a small degree, the appearance of the LDOS boot screen. PBOOT lets you add three 22-character message lines displayed next to that big

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LDOS that appears when you boot the system.

I found this patch a convenient way to mark my system disks. I have several LDOS system disks that I use, depending on what I'm doing—one for programming, one for word processing, one for telecommunications, and so on.

PBOOT lets me put a small message in each disk's boot screen. The message appears every time I reset the system, reminding me which system disk I'm using.

Using the Programs

All the programs in The Toolbox are parameter-driven, meaning that you have to type words and values to tell each program what to do, as opposed to selecting options from a menu. Parameter-driven programs are generally more difficult to learn because you have to either memorize each parameter or refer to the manual often.

Powersoft has, however, worked around this drawback. When a program runs, the screen clears, and the program's name, a copyright message, and a prompt for the parameters appears. If you press enter, you get a list of allowable parameters.

You can see this list any time during a

program's execution by pressing the enter key in response to the prompt. Although I still prefer menu-driven programs like Super Utility Plus, this method of providing on-line help works well.

All the programs in The Toolbox operate the same way—beautifully. The programs are carefully error-trapped. The screen displays are consistent and readable, and the error messages, while sometimes very technical, are complete. As an added touch, you can instruct the programs that display reports—disk maps, directory checks, and so on—to send data to the printer as well as to the screen.

Documentation

The manual that accompanies The Toolbox is adequate if you are very familiar with LDOS and with disk terminology in general. It was not written with the novice in mind. It assumes that you know what HIT and GAT mean, and what sectors and data address marks mean.

It doesn't warn the inexperienced computer user that one or two mistakes with a disk modification utility like PMOD can destroy the disk's contents. Finally, the manual is one of those run-it-off-right-justified-on-the-

daisy-wheel-printer-and-reduce-everything-50-percent jobs, and is, therefore, unattractive and difficult to read.

Who's It For?

This toolbox is definitely the craftsman's tool set. The programs in The Toolbox are error-free and work well with LDOS. They are powerful and easy to use, but you must have some knowledge of LDOS and of disk technical terminology, because the manual is geared for the expert user.

If you don't have any experience with disk and memory modification utilities, read one of the many books on the subject and experiment on some unimportant disks before working with valuable ones.

The file-moving and killing utilities are real time-savers. If you have a hard disk drive or several floppy disk drives, these gems are worth the cost of the package in themselves. In fact, at the new price of \$69.95 (these same programs used to sell for \$149.95), The Toolbox should be part of every LDOS user's system. ■

Jim Heid is a technical editor for Wayne Green Books Inc. Contact him c/o 80 Micro.

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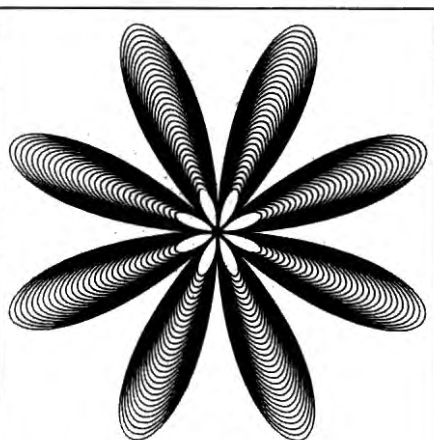


Figure 1. Classic rose curves.

When Radio Shack reduced the price of their plotter/printer (catalog number 26-1190A), I had to buy one. This digital plotter produces 8½- by 11-inch plots with a resolution superior to even the large, \$35,000 plotters of my college days. I've written some programs for the plotter that show off its high-resolution graphics in figures that are attractive and unique.

The plotter uses a ballpoint pen and thus isn't capable of doing work in India ink; that is not an insuperable drawback.

While I purchased the plotter for scientific purposes, I couldn't resist trying to make some intricate drawings. Since the manual provides only a few pro-

grams, I had to write my own. Some of the drawings were fascinating—almost beautiful. With proper modifications, these programs support almost any plotter; none of the features used are unique to my plotter.

The Programs

I consulted analytic geometry texts to learn how to create these figures. These books contain formulas for certain classic curves, such as those in the rose in Fig. 1. Many of these famous curves are defined in terms of polar coordinates. As such, they are difficult to draw on a printer, but are easily drawn on a plotter.

Plotters have a limited set of commands. Indeed, the programs in this article use only four true plotter commands found on virtually all plotters. In Program Listing 1, lines 20-50 establish certain constants for the rose. If you like, vary A to change the size and N to change the number of petals on the rose. The plotter connects to the computer's printer output and is addressed through LPRINT statements.

Line 60 puts the plotter in plotting mode, with LPRINT CHR\$(2). Line 70 is important. It reads:

```
70 LPRINT "G50X950Y0"
'MOVE TO NEW ORIGIN
```

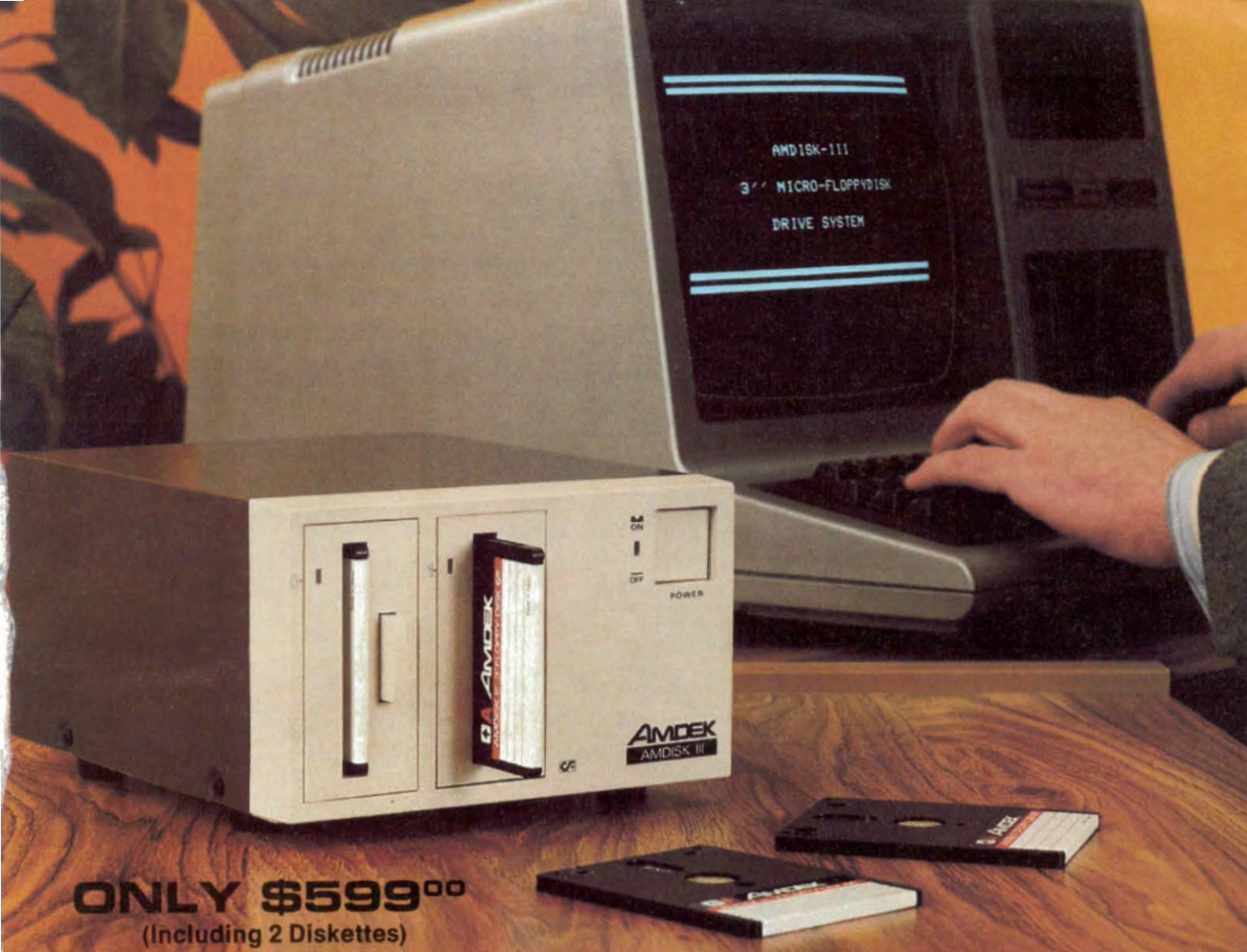
This line moves the plotter pen to the

```
10 REM ROSE PROGRAM
20 A=100
30 N=4
50 C=57.29578
60 LPRINT CHR$(2)
70 LPRINT "G50X950Y0"
80 LPRINT "G03X0Y0"
90 FOR K=1 TO 30
100 A=A+15
110 FOR J=0 TO 360 STEP 1
120 TH=J/C
130 R=A*SIN(N*TH)
140 X=R*COS(TH):Y=R*SIN(TH)
150 LPRINT "G01X";INT(X);"Y";INT(Y)
160 NEXT J
170 NEXT K
180 LPRINT "G50X0Y0"
'CONSTANT
'NUMBER OF LEAVES
'RADIAN CONSTANT
'START PLOTTER
'MOVE TO NEW ORIGIN
'SET NEW ORIGIN
'OUTER LOOP
'INCREASE ROSE
'PLOTTING LOOP
'GET RADIUS EQUIVALENT
'GET RADIUS
'GET COORDINATES
'PLOT SEGMENT
'END INNER LOOP
'END OUTER LOOP
'RETURN TO ORIGIN
```

Program Listing 1

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coordinates $X = 950$, $Y = 0$ with the pen up. Thus, a G50 command moves the pen without drawing a line. Line 80 reads:

```
80 LPRINT "G03X0Y0"
'SET NEW ORIGIN
```

It resets the pen's origin to the current position (here, $X = 950$, $Y = 0$). From this point on, all pen movements are compared (referred) to $X = 950$, $Y = 0$. The phrase G03X0Y0 instructs the plotter to use the current position as a new origin.

The remainder of the program, particularly lines 130-140, contains a complicated formula to draw the rose. Plotting takes place in line 150, which reads:

```
150 LPRINT "G01X";INT(X); "Y";INT(Y)
'PLOT SEGMENT
```

Statements like G01X50Y60 move the pen holder with the pen down, drawing a line from the present pen position to coordinates $X = 50$, $Y = 60$. Line 150 says the same sort of thing, but variables X and Y go into the print statement as they are calculated by the formulas. Thus, the first time you encounter line 150 the plotter draws a short line from the origin (where you last left the pen) to the first point on the curve. The second time you encounter line 150, the plotter extends the line segment of the curve. Notice that Fig. 1, then, is made up entirely of many short, straight lines.

You should have little trouble converting these programs so they work on your machine. In fact, the little \$250 plotter that Radio Shack has just begun to sell seems ideal for the amateur.

Listing 1 also shows the method used to draw the figures. The rose is actually drawn in lines 110-160, but since a sin-

gle rose isn't very interesting to the eye, I added the loop in lines 90 and 170 to

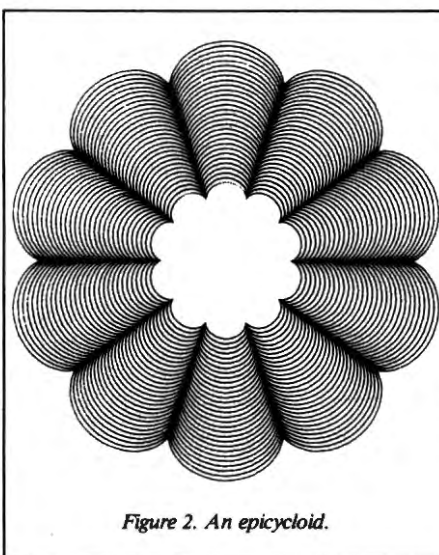


Figure 2. An epicycloid.

make the plotter draw several roses of ever increasing size. You can produce completely different figures by changing the numbers in lines 20, 30, and 100.


If the plot is a bit coarse for you, make the step smaller in line 110. Or, make the steps larger for fascinating, odd, angular figures, completely unlike the original.

I decided to plot an epicycloid, a curve traced by a point on a circle that rolls on the outside of a fixed circle (see Fig. 2). The epicycloid program is similar to the first program (see Program Listing 2).

Since it's used more than once, the function for the epicycloid is moved to a subroutine at line 200. This program introduces a new complication: While the rose began at the origin, the epicycloid begins at a distance from the origin. Consequently, in lines 110 and 120 you

```
10 REM EPICYCLOID PROGRAM 11/24/82
20 BR=150 'RADIUS OF BIG CIRCLE
30 FC=10 'SCALING FACTOR
40 C=57.29578 'RADIAN CONSTANT
50 LPRINT CHR$(2) 'START PLOTTER
60 LPRINT "G50X950Y0" 'MOVE TO NEW ORIGIN
70 LPRINT "G03X0Y0" 'SET NEW ORIGIN
80 FOR K= 1 TO 30 'OUTER LOOP
90 BR=BR+10 'INCREMENT BR
100 LR=BR/FC 'GET SMALL RADIUS
110 GOSUB 200 'GET COORDINATES OF START
120 LPRINT "G50X";INT(X); "Y";INT(Y) 'MOVE THERE, PEN UP
130 FOR J=0 TO 359 STEP 1 'PLOTING LOOP
140 PH=J/C 'GET RADIAN EQUIVALENT
150 GOSUB 200 'GET COORDINATES
160 LPRINT "G01X";INT(X); "Y";INT(Y) 'PLOT SEGMENT
170 NEXT J 'END PLOT LOOP
180 NEXT K 'END OUTER LOOP
190 END
200 REM EPICYCLOID POINT ROUTINE
210 FT=BR+LR:XC=FT/LR 'GET CONSTANTS
220 X=FT*COS(PH)-LR*COS(XC*PH) 'GET X
230 Y=FT*SIN(PH)-LR*SIN(XC*PH) 'GET Y
240 RETURN
```

Program Listing 2




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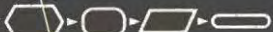
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Totals	1:02:30 hrs.	13:50:08 hrs.

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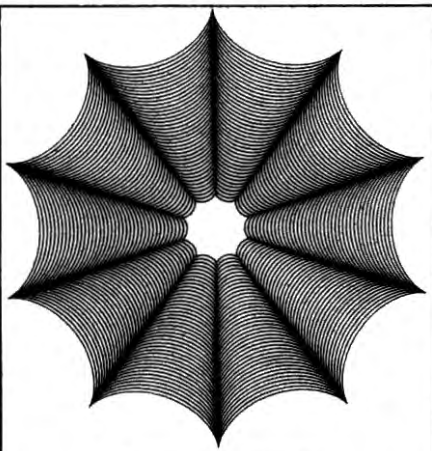


Figure 3. A hypocycloid.

must move the pen to the start of the figure or you'll have an ugly, unwanted line from the origin to the beginning of the curve. The remainder of the program is just like Listing 1; change the shape of the figure by changing the shape of the figure by changing the numbers in lines 20, 30, 90, and 130.

Sometimes small modifications in the formulas lead to significant changes in appearance (see Program Listing 3). By changing the values in line 20 to 100, and in line 90 to 15, and changing the step size in line 130 to 0.5, the plus sign in line 210 to a minus sign, and the minus

"Sometimes small modifications in the formulas lead to significant changes in appearance. . . . These figures remind one of a spider's web."

```

10 REM HYPOCYCLOID PROGRAM 11/24/82
20 BR=100 'RADIUS OF BIG CIRCLE
30 FC=10 'SCALING FACTOR
40 C=57.29578 'RADIAN CONSTANT
50 LPRINT CHR$(2) 'START PLOTTER
60 LPRINT "G50X950Y0" 'MOVE TO NEW ORIGIN
70 LPRINT "G03X0Y0" 'SET NEW ORIGIN
80 FOR K=1 TO 40 'OUTER LOOP
90 BR=BR+15 'INCREMENT BR
100 LR=BR/FC 'GET SMALL RADIUS
110 GOSUB 200 'GET COORDINATES OF START
120 LPRINT "G50X";INT(X);"Y";INT(Y) 'MOVE THERE, PEN UP
130 FOR J=0 TO 359 STEP 0.5 'PLOTING LOOP
140 PH=J/C 'GET RADIAN EQUIVALENT
150 GOSUB 200 'GET COORDINATES
160 LPRINT "G01X";INT(X);"Y";INT(Y) 'PLOT SEGMENT
170 NEXT J 'END PLOT LOOP
180 NEXT K 'END OUTER LOOP
190 END
200 REM HYPOCYCLOID POINT ROUTINE
210 FT=BR-LR:XC=FT/LR 'GET CONSTANTS
220 X=FT*COS(PH)+LR*COS(XC*PH) 'GET X
230 Y=FT*SIN(PH)-LR*SIN(XC*PH) 'GET Y
240 RETURN

```

Program Listing 3

sign in line 220 to a plus, you obtain the hypocycloid shown in Fig. 3.

A hypocycloid is drawn by a point on a circle rolling around the inside of a larger circle. These figures remind one of a spider's web.

Sometimes, even erroneous formulas of geometric figures produce nice results. In Fig. 4, I wanted to plot a set of ellipses, one inside another. But I used the wrong polar formula for the ellipse so the ellipses shifted a bit each time one was plotted (see Program Listing 4).

Basically, it's the same program as the others. Only the formula for the ellipse in the subroutine starting in line 200 is different, along with some other variables to set the size.

```

10 REM ELLIPSE PROGRAM
20 A=500 'SIZE
30 E=0.90 'ECCENTRICITY
40 ST=1 'STEP SIZE
50 C=57.29578 'RADIAN CONVERSION
60 LPRINT CHR$(2) 'START PLOTTER
70 LPRINT "G50X550Y0" 'GO TO ORIGIN (PEN UP)
80 LPRINT "G03X0Y0" 'SET NEW ORIGIN
90 FOR E=0.7 TO 0.98 STEP 0.015 'MULTI-ELLIPSE LOOP
100 TH=0 'SET ANGLE TO ZERO
110 GOSUB 200 'GET COORDINATES 1ST POINT
120 LPRINT "G50X";INT(X);"Y";INT(Y) 'GO THERE
130 FOR J=0 TO 360 STEP ST 'PLOT LOOP
140 TH=J/C 'ANGLE TO RADIAN
150 GOSUB 200 'GET COORDINATES
160 LPRINT "G01X";INT(X);"Y";INT(Y) 'PLOT LINE
170 NEXT J 'END PLOT LOOP
180 NEXT E 'END MULTI-ELLIPSE LOOP
190 END
200 REM ELLIPSE EQUATION
210 R=(A*(1-E*E))/(1-E*COS(TH)) 'ELLIPSE EQUATION
220 X=R*COS(TH):Y=R*SIN(TH) 'TO RECTANGULAR COORD
230 RETURN

```

Program Listing 4

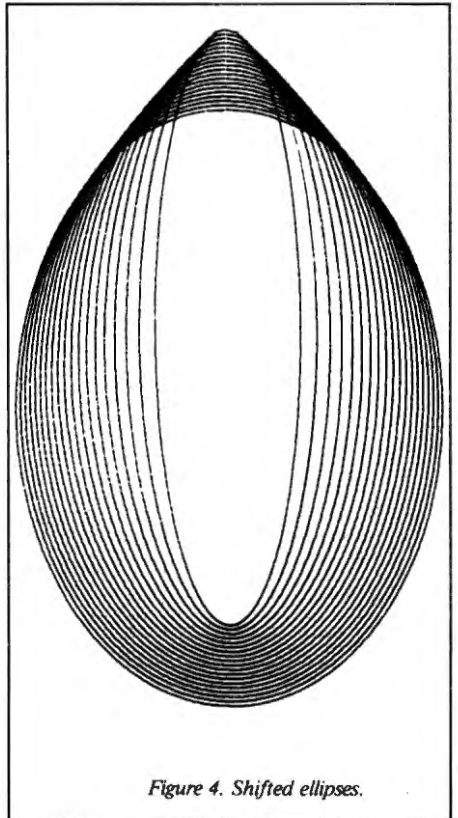


Figure 4. Shifted ellipses.

Some patterns just don't turn out the way you hope (see Program Listing 5). For example, Fig. 5 was supposed to provide some lovely moire' effects. Two circles are drawn, one on top of the other, with rays from the center. I don't like the way it turned out, though, and no amount of fiddling with the constants improves it. Listing 5 shows how this angry-looking plot was developed.

Finally, some patterns you think would be ideal for the plotter just don't work out. In the March 1982 issue of *80 Micro* (p. 112), Bob Boothe had some lovely figures, including a number of superimposed sine waves. A plotter does a great job plotting sine waves, so you would think that I could have surpassed Boothe's figure using Program Listing 6.

The result, Fig. 6, is disappointing—my plotter doesn't do as good a job as Bob Boothe's printer. The ball point pen doesn't seem to provide sufficient blackness. The constant pressure from the ball point pen wrinkles the paper, too. It takes about two hours to draw Boothe's Eye Killer, and the paper gets an awful workout during that time.

In all, however, I find the results of my little experiments pleasing. The programs to make these designs are short. Many more complex programs are available so that you can plot almost anything you want. ■

Jerry O'Dell is a professor of psychology at Eastern Michigan University, Ypsilanti, MI 48197.

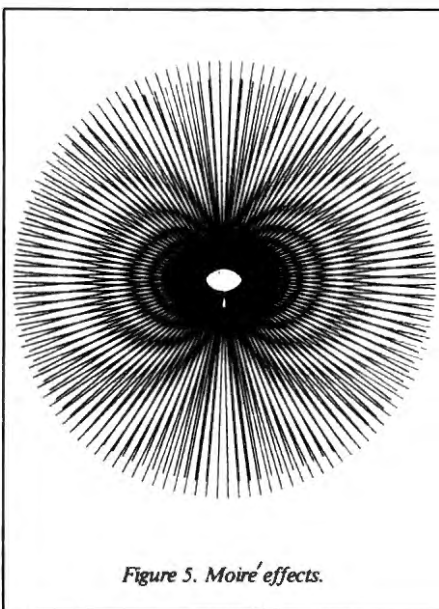


Figure 5. Moire' effects.

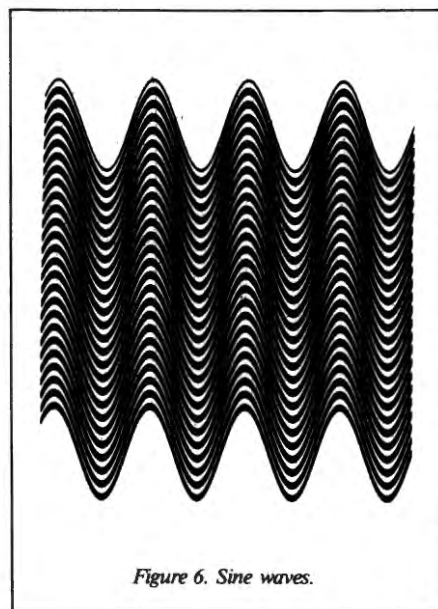


Figure 6. Sine waves.

```

10 REM DOUBLE RAY PLOTTER
20 C=57.29578                                'RADIANT CONSTANT
30 LPRINT CHR$(2)                            'START PLOTTER
40 LPRINT "G50X950Y0"                        'MOVE TO NEW ORIGIN
50 LPRINT "G03X0Y0"                          'SET NEW ORIGIN
60 DS=-20                                     'SET DISPLACEMENT
70 FOR K=1 TO 2                               'OUTER LOOP
80 FOR J=0 TO 359 STEP 3                     'PLOTING LOOP
90 X1=50*COS(J/C)+DS                         'INNER X
100 Y1=50*SIN(J/C)                           'INNER Y
110 X2=500*COS(J/C)+DS                       'OUTER X
120 Y2=500*SIN(J/C)                          'OUTER Y
130 LPRINT "G50X";INT(X1);"Y";INT(Y1) 'GO TO INNER POINT
140 LPRINT "G01X";INT(X2);"Y";INT(Y2) 'PLOT RAY
150 NEXT J                                    'END PLOTING LOOP
160 DS=20                                     'SHIFT IMAGINARY ORIGIN
170 NEXT K                                    'END OUTER LOOP
180 LPRINT "G50X0Y0"                          'RETURN TO ORIGIN

```

Program Listing 5

```

10 REM EYE KILLER PROGRAM (AFTER BOOTHE)
20 HH=175                                     'REM CURVE HEIGHT
30 C=57.29578                                'RADIANT CONVERSION
40 LPRINT CHR$(2)                            'START PLOTTER
50 LPRINT "G50X200Y0"                        'MOVE TO NEW ORIGIN
60 LPRINT "G03X0Y0"                          'SET NEW ORIGIN
70 N=0                                        'ZERO COUNTER
80 FOR J=1 TO 2000                            'OUTER PLOTING LOOP
90 N=N+1                                       'BAND ALTERNATE COUNTER
100 IF N>50 THEN N=1                          'KEEP IN BOUNDS 1-50
110 IF N<25 THEN 170                          'SKIP HALF
120 LPRINT "G50X0Y";INT(-J)                  'RESET PEN TO START
130 FOR X=0 TO 1400 STEP 5                    'PLOT LOOP
140 Y=SIN(X/C)*HH-J                            'GET CURVE HEIGHT
150 LPRINT "G01X";INT(X);"Y";INT(Y) 'PLOT CURVE
160 NEXT X                                     'END INNER LOOP
170 NEXT J                                    'END OUTER LOOP
180 LPRINT "G50X0Y0"                          'RETURN TO ORIGIN (PEN UP)

```

Program Listing 6

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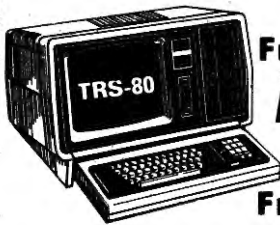
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Aid for AIDS-III

by Amee Eisenberg

In March and April 1983, *80 Micro* published tandem articles on AIDS-III, a data management system (pp. 136 and 168, respectively). The software was sound, but after reading the articles I still didn't understand how to make the darned thing run. Many moons passed before I figured out the system. I'll give you the benefit of my insight.

The Automated Information Directory System (AIDS) comprises three parts: the field, the record, and the file. AIDS handles these parts in specific ways, but allows you an almost unlimited definition of them.

Fields are the smallest possible blocks of data. In the checkbook example cited in the AIDS articles, the fields are check number, dollar amount, payee, etc. Although this sample uses five fields, you can specify up to 12 fields.

Records are blocks of data made up of a set of fields. In AIDS-III, a single record contains the five fields used to describe the information on each check.

Files are blocks of data comprising a set of records. The number of records allowed in a file is determined by the amount of available memory.

AIDS-III got you stymied? Here are some tips on how to use this data management program.

Running AIDS

To run AIDS, you must initialize Basic and reserve file space. Use the syntax "BASIC - F:n", where *n* is the number of files you want to open. I usually use three. You must initialize the files despite the default value of three files for Basic. Without initialization, a BAD FILE NAME error results in all attempts to write or read a file.

AIDS is not necessarily the system you think you see. It is flexible enough to let you modify it to suit your data management needs. You have to change a few lines of Basic code to configure AIDS. This is where imagination comes in. For example, say I need a system that keeps track of friends' birthdays so I can send greeting cards.

The procedure is simple. Lines 4990-5120 in the March AIDS-III program contain the data statements that create an AIDS system. List these lines and study the remarks associated with them. Change the lines according to your needs. In my case, for instance, I need names, addresses, and birth dates. While I was at it, I decided to file phone numbers as well. My address system appears in Fig. 1.

Save the AIDS program with your custom system configuration under its own name. This way, you can refer back to the original system any time you need to create a new AIDS system.

Once you've created your system, the next step is getting your data in and out of it on demand. Run your AIDS system. After the initial AIDS message is displayed, the program displays your system and the menu options on the screen (see Fig. 2).

If you are developing a new system, the only menu option applicable is Add Records. Add your data, then return to the main menu (press the shift and up-arrow keys simultaneously). See Table 1 for the AIDS control keys. One note: AIDS does not accept lowercase input.

To save the information just added, choose the Select & Save Records op-

```

5000 DATA AMEE'S ADDRESS SYSTEM
5010 DATA 5: 'NUMBER OF FIELDS COMPRISING A RECORD
5020 DATA NAME: 'NAME OF FIELD #1
5030 DATA 25: 'NUMBER OF CHARACTERS IN FIELD #1
5040 DATA STREET: 'NAME OF FIELD #2
5050 DATA 25: 'NUMBER OF CHARACTERS IN FIELD #2
5060 DATA TOWN, ETC: 'NAME OF FIELD #3
5070 DATA 25: 'NUMBER OF CHARACTERS IN FIELD #3
5080 DATA PHONE: 'NAME OF FIELD #4
5090 DATA 14: 'NUMBER OF CHARACTERS IN FIELD #4
5100 DATA BIRTHDAY: 'NAME OF FIELD #5
5110 DATA 7: 'NUMBER OF CHARACTERS IN FIELD #5
    
```

Figure 1. Lines inserted in AIDS-III to keep track of names, addresses, birth dates, and phone numbers.

- 1—SELECT & LOAD RECORDS
- 2—ADD RECORDS
- 3—SORT RECORDS
- 4—SELECT & UPDATE RECORDS
- 5—SELECT & DELETE RECORDS
- 6—SELECT & PRINT RECORDS
- 7—SELECT & SAVE RECORDS
- 8—WRITE DESCRIPTOR FILE
- 9—QUIT, ALL DONE

Figure 2. AIDS-III menu options.

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1976	126	71	51	4	580
1977	130	77	43	10	631
1978	128	75	46	7	613
1979	148	84	51	4	624
1980	131	90	37	4	702
1981	148	83	52	3	639
1982	57	34	23	0	596
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SELECT & PRINT RECORDS BY "NAME"
 = EQUAL < LESS THAN - LESS OR EQUAL
 # NOT EQUAL > GTR THAN + GTR OR EQUAL
 CHOOSE RELATION:

Figure 3. AIDS-III logical operators.

Enter	Entry complete, accept data
Up arrow	Skip back to previous entry line
Shift/down arrow/Z	Skip forward to next entry line
Left arrow	Backspace, erase last character
Right arrow	Right-justify entry data
Shift/up arrow	Skip back to previous entry screen
Shift/down arrow	Skip forward to next entry screen
Shift/left arrow	Erase entire contents of entry line
Shift/right arrow/Y	Restore line to original contents
Clear	Cancel action, exit to previous action

Table 1. AIDS control keys and their functions.

A-T Print contents of specified field
 . Print 1 blank space
 ; Print 5 blank spaces
 : Print 10 blank spaces
 ! Print 20 blank spaces
 / Skip down 1 line
 % Skip down 5 lines
 # Skip down 10 lines

Table 2. Maps-III user-defined format specifiers.

tion. This asks you to select which records you want to save. Then it asks for the name of the saved file. You may create a new file, or save the selected records to a file previously created by your AIDS system. Your system writes to the files it creates, not to files created by a different AIDS system. For in-

stance, my address system won't write information to a file created by the AIDS-III checkbook management system.

With all "SELECT &" menu options, you control two parameters. First, you choose the field, and second, you choose a logical operator by which selections are sorted. For example, if I wanted a printout of all the names in my address system, I would choose field A (Name). The logical operators from which I choose appears in Fig. 3.

I'd then ask the computer to print out those names not equal to (#) Z. Then (providing I'm not best buddies with someone who goes by the moniker "Z") I'd get all the names in my address system.

Alternatively, if I needed to know whether any of my friends had a birthday today, I'd use the Select & Print option and field E (birthday) all those birthdays equal to (=) today's date. Then, if anyone's name was displayed, I'd send them a card.

Running Maps, CALCS, and Merge

Option 8 on the main AIDS menu is Create Descriptor File. Descriptor files become important when (and only when) you wish to use the files you've created in your AIDS system with some AIDS subsystem such as Maps, CALCS, and/or Merge. These programs appear in the April 1983 *80 Micro* (p. 168) and are designed to manipulate previously created data files in ways beyond the simple sorts of which AIDS is capable.

Create Descriptor File writes a file that contains the system configuration of your AIDS system. This tells the subsystem programs what to expect when

they read a file from your AIDS system. The Address/DSC descriptor file that I created from my address system indicates that my system is called Amee's Address System, that each record has five fields, and the names and lengths of those fields.

When first run, the AIDS subsystems ask for the descriptor file name. Once the descriptor file has configured the subsystem program, it can then read any other AIDS system file created according to the descriptor file format.

Maps, for example, reads selected files or records and offers three ways to print your data: Print Down Page, Print Across Page, or Print User-Defined Format. The user-defined formats let you sort the fields so you can print data records in any format you choose. In my address system, a user-defined format of A/B/C (field A, skip down one line, field B, skip down one line, field C) creates a mailing label. See Table 2 for the Maps format specifiers.

CALCS is a subsystem that allows you to do some numerical calculations with the data in its files. You may create two formulas and process any field or record through either of those formulas.

Merge manipulates files and records to create lists defined by specified parameters. One nice feature for people working on mailing lists is that Merge searches out and deletes duplicate records. That could save a lot of money by preventing the same person from getting two or three of the same brochure.

In Closing

This article attempts to help you figure out AIDS. It is by no means comprehensive. AIDS is a large and versatile system. But, if you read the March and April articles and play with the system a little, I think you can get a good handle on using AIDS. ■

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All year long, you have to listen to manufacturers tell you which software is best. Here's your chance to tell *them*, with the 1983 Reader's Choice Awards.

This year, we've made it easier for you. We've printed the ballot on the bind-in card opposite p. 226; you don't have to tear out a page from your magazine to vote. To avoid ballot stuffing, we can accept only original cards—no photocopies please.

The entries in this year's poll were compiled from manufacturers' responses to a questionnaire. To this list,

we added last year's first place winners, as well as any product that received 10 percent of the vote in its category.

Look through the entrants, and select your favorite software in each category that applies to you. Write the numbers of your choices on the ballot. If your favorite program isn't on the list, write in its name and manufacturer. All past and present commercial software packages are eligible.

The deadline for returning ballots is Oct. 7, 1983. We'll publish the results in January. ■

Model I/III Software

I/III—Accounting

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- Accounting Software (Compumax Associates)
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- Accounts Payable (Radio Shack)
- Accounts Payable (Taranto & Associates)
- Accounts Payable (Universal Data Research)
- Accounts Receivable (Holman Data Processing)
- Accounts Receivable (MAS80)
- Accounts Receivable (Radio Shack)
- Accounts Receivable (Taranto & Associates)
- Accounts Receivable (Universal Data Research)
- ACCT (Micro Architect)
- Amortization (Rockware Data Corporation)
- Annrose A/R (Sturdivant and Dunn)
- Balanced Billing (Universal Data Research)
- Cashbook (Coolidge & Associates)
- CBook (Contract Services Associates)
- Check Register (MAS80)
- Church Contributions (Universal Data Research)
- Cycle Billing System (Computer Shack)
- Data Train's "The Accountant" (Thoughtware Publishing Company)
- Datagraph (Micro Software Systems)
- Expense Ledger (Manhattan Software)
- Fixed Assets (Dep/Acra) (Nepenthe Programs)
- Flying Club Management System (Communications Systems Laboratories)
- General Ledger (Universal Data Research)
- General Ledger (MAS80)
- General Ledger (Taranto & Associates)
- General Ledger (Holman Data Processing)
- GL80 General Ledger (AT-80)
- Intermediate Bookkeeper (Sturdivant and Dunn)
- Inventory (McClintock Corp.)
- Inventory Control (Taranto & Associates)
- Inventory II (Universal Data Research)
- Invoicing (MAS80)
- Job Cost Control (McClintock Corp.)
- Lynn's Accounts Receivable System (Joe Lynn Computer Services)
- Lynn's Payroll System (Joe Lynn Computer Services)
- Maxi CRAS (Adventure International)
- Non-Disk Check System (Futureview)
- Non-Disk Electric Bookkeeper (Futureview)
- Payroll (McClintock Corp.)
- Payroll (Radio Shack)
- Payroll (Taranto & Associates)
- Payroll (Universal Data Research)
- Payroll (Write-up only) (Nepenthe Programs)
- Quick Check (Chuck Atkinson Programs)
- Repeat Billing (MAS80)
- SBSG Accounts Payable (Small Business Systems Group)
- SBSG Accounts Receivable (Small Business Systems Group)
- SBSG General Ledger (Small Business Systems Group)
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I/III—Business

- Accounts Payable (Nepenthe Programs)
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- Advanced Opvalu (Star Value Software)
- AgriStar (Radio Shack)
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19. Commercial Cooling & Heating Load (McClintock Corp.)
20. Construction Spreadsheet Templates (Software Models)
21. Cycle Analysis (Mar-Tec Stock Market Software)
22. Datagraph (Micro Software Systems)
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26. Enigma—An Unbreakable File (Casier Computing)
27. Executive Calculator—150 Business Progs (MCS Software)
28. Executive Scratch Pad (Software of the Future)
29. Finance Spreadsheet Templates (Software Models)
30. Food Service Cost Estimating (Nepenthe Programs)
31. Heating Fuel Cost (McClintock Corp.)
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33. Inventory Master (Logical Systems)
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19. Black Gold (Krell Software Corp.)
20. Black Hole, The (Funsoft)
21. Block-Breaker (Cedar Software Co.)
22. Bulls and Bears (Krell Software Corp.)
23. Casino Blackjack/Counter (Manhattan Software)
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29. Chess Board (Futureview)
30. Chicken (Soft Sector Marketing)
31. Clash (Computer Shack)
32. Close Assault (Avalon Hill)
33. Combat (Adventure International)
34. Computer Acquire (Avalon Hill)
35. Computer Baseball Strategy (Avalon Hill)
36. Computer Football Strategy (Avalon Hill)
37. Computer Foreign Exchange (Avalon Hill)
38. Computer Statis Pro Baseball (Avalon Hill)
39. Computer Stocks & Bonds (Avalon Hill)
40. Computer Title Bout (Avalon Hill)
41. Conflict 2500 (Avalon Hill)
42. Connections (Krell Software Corp.)
43. Conquest of Chesterwood (Adventure International)
44. Cosmic Patrol (Instant Software)
45. Craps/Slot Machine (B. Erickson Software)
46. Curse of Crowley Manor (Adventure International)
47. DC Ohms Law/F/LC-FRC (B. Erickson Software)
48. Deadline (Infocom)
49. Death Planet: The Dogstar Adventure (Adventure International)
50. Demon Seed (Trend Software Company)
51. Demon Venture #1-Reign of the Red Dragon (Adventure International)
52. Dnieper River Line (Avalon Hill)
53. Dragonlair (Futureview)
54. Draw Poker (Avalon Hill)
55. Duel on a Dead Planet (Futureview)
56. Duel-n-Droids (Acorn Software Products)
57. Earthquake—San Francisco 1906 (Adventure International)
58. Electoral College (Krell Software Corp.)
59. Eliminator (Adventure International)
60. Empire of the Overmind (Avalon Hill)
61. Enemy Evasion (Acorn Software Products)
62. Escape from Traam (Adventure International)
63. Everest Explorer (Acorn Software Products)
64. Exterminate (JMG Software International)
65. Flight Simulator (Sublogic Corporation)
66. Flying Saucers (Radio Shack)
67. Forest Fire Dispatcher (Sublogic Corporation)
68. Fortress II (Soft Sector Marketing)
69. Fredericksburg (Avalon Hill)
70. Galactic Series (Adventure International)
71. Galactic Tactics (Futureview)
72. Galaxy (Avalon Hill)
73. Gammon Gambler Backgammon (Radio Shack)
74. Gas Attack (Comp-U-Gamer Software)
75. GFS Sorceress (Avalon Hill)
76. Giant Space Slug (Futureview)
77. Gin Rummy 3.1 (Manhattan Software)
78. Gobbleman (Melbourne House Software)
79. Gone Fishing/Concentration (B. Erickson Software)
80. Grand Prix (Melbourne House Software)
81. Guns of Fort Defiance (Avalon Hill)
82. Halls of Time (Mops Computer Systems)
83. Haunted House (Radio Shack)
84. Hidden Valley (Adventure International)
85. Horse Race Handicapping System (3G Company)
86. IC-Timer-1/IC-Timer-2 (B. Erickson Software)
87. In-Between/Shell Game (B. Erickson Software)
88. Indoor Soccer (Pel-Tex)
89. Interactive Fiction (Adventure International)
90. Isaac Newton & F.G. Newton (Krell Software Corp.)
91. Jagdstaffel (Discovery Games)
92. Jet Fighter Pilot (Instant Software)
93. Kid-Venture (Adventure International)
94. Killapede (Futureview)
95. King of the Jungle (Acorn Software Products)
96. Kitchen Sink (Instant Software)
97. Laser Ball (Adventure International)
98. Laser Lights (Futureview)
99. Leaper (Cedar Software Co.)
100. Liberator (Computer Shack)
101. Light Cycle (Futureview)
102. Lords of Karma (Avalon Hill)
103. Lost Colony (Acorn Software Products)
104. Lunar Lander (Adventure International)
105. Maces & Magic Series (Adventure International)
106. Mad Mines (Funsoft)
107. Marooned Again (Futureview)
108. Martian Patrol (Melbourne House Software)
109. Master Reversi (Instant Software)
110. Mean Checkers (Adventure International)
111. Medieval Traveler (Futureview)
112. Microchess (Radio Shack)
113. Midway Campaign (Avalon Hill)
114. Migs & Messerschmitts (Discovery Games)
115. Million\$ (Vincent & Associates Software Division)
116. Missile Attack (Adventure International)
117. Monty Plays Monopoly (Radio Shack)
118. Monty Plays Scrabble (Radio Shack)
119. Mortar Battle/Puzzle (B. Erickson Software)
120. Morton's Fork (Adventure International)
121. Nightwalker (Adventure International)
122. North Atlantic Convoy Raider (Avalon Hill)
123. Nuclear Beehive (Futureview)
124. Nukewar (Avalon Hill)
125. Number Guess/Dice Roll (B. Erickson Software)
126. Odyssey in Time (Krell Software Corp.)
127. Oscar Draft/Special Mission Pilot (BAP\$ Software)
128. Outhouse (Soft Sector Marketing)
129. P.T. Boat/Turtle Race (B. Erickson Software)
130. Paddle Pinball (Radio Shack)

131. Panzers East (Avalon Hill)
132. Penetrator (Melbourne House Software)
133. Phantasy Starfighter (KMCS/Phantasy)
134. Phase VII 3.0 (Futureview)
135. Pinball (Acorn Software Products)
136. Planet Buster (Soft Sector Marketing)
137. Planet Miers (Avalon Hill)
138. Planetoids (Adventure International)
139. Plasmoid Invasion (Comp-U-Gamer Software)
140. Primary Fight (Krell Software Corp.)
141. Pro-Cap (Trinity Group)
142. Pyramid (Radio Shack)
143. Pythagoras & Dragon (Krell Software Corp.)
144. Quode (Krell Software Corp.)
145. Raaka-Tu (Radio Shack)
146. RAF: The Battle of Britain (Discovery Games)
147. Rally (Soft Sector Marketing)
148. Rear Guard (Adventure International)
149. Regilian Worm (Prosoft)
150. ROM-Save (B. Erickson Software)
151. Rooms of Cygnus IV, The (Comp-U-Gamer Software)
152. Safari/Starship-2 (B. Erickson Software)
153. Santa Paravia and Fiumaccio (Instant Software)
154. Scarfman (Cornsoft Group)
155. Sea Dragon (Adventure International)
156. Sfinks 3.0 Chess (William Fink)
157. Sfinks 4.0 Chess (William Fink)
158. Shootout at the OK Galaxy (Avalon Hill)
159. Showdown (Adventure International)
160. Sim21 (BV Engineering)
161. Sky Sweep (Soft Sector Marketing)
162. Sneak Thief (Soft Sector Marketing)
163. Solitaire Computer Cards (Futureview)
164. Space Attack (Melbourne House Software)
165. Space Intruders (Adventure International)
166. Space Shuttle (Instant Software)
167. Space Warp (Radio Shack)
168. Sparrow Commander (Instant Software)
169. Spook House (Adventure International)
170. Star Clipper (Krell Software Corp.)
171. Starcross (Infocom)
172. StarFighter (Adventure International)
173. Starship/Sherlock Holmes (B. Erickson Software)
174. Stone of Sisyphus (Adventure International)
175. Stratos (Adventure International)
176. Strike Force (Melbourne House Software)
177. Strip Concentration (Adventure International)
178. Strip Dice (Adventure International)
179. Super Sound (for Super Nova) (Comp-U-Gamer Software)
180. Super Star Baseball (Krell Software Corp.)
181. Super Vaders (Soft Sector Marketing)
182. Supreme Ruler (JMG Software International)
183. Suspended (Infocom)
184. Sword of Zedek (Krell Software Corp.)
185. Tank Arcade (Avalon Hill)
186. Tank Attack/Association (B. Erickson Software)
187. Tanktics (Avalon Hill)
188. Target Practice (Dezoysa Enterprises)
189. Teasers/Mouse (B. Erickson Software)
190. Telengard (Avalon Hill)
191. Think/Luck & Logic (B. Erickson Software)
192. Thor Reversi (William Fink)
193. Time Runner (Funsoft)
194. Time Traveler (Krell Software Corp.)
195. Toxic Dumpsite (Adventure International)
196. Treasure Island/Rescue (B. Erickson Software)
197. Treasure Quest (Adventure International)
198. Ultra-Trek (Logical Systems)
199. VC (Avalon Hill)
200. Vexus (Soft Sector Marketing)
201. Voyage of the Valkyrie (Howard W. Sams & Co.)
202. Voyager (Avalon Hill)
203. Wild West (Melbourne House Software)
204. Winged Samurai (Discovery Games)
205. Wizard's City, The (BAP\$ Software)
206. Wordum (SoftCo)
207. Wormhole (Futureview)
208. Xenos (Radio Shack)
209. Z-Chess (Adventure International)
210. Zork (Radio Shack)
211. Zork I (Infocom)

I/III—Graphics

1. Banner Machine (Virginia Micro Systems)
2. Crayon (Pioneer Software)
3. Crayon Deluxe (Pioneer Software)
4. Draw (Micro Labs)

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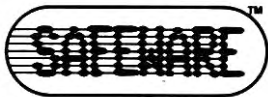
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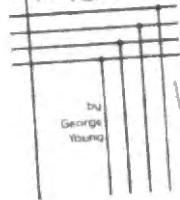
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IXE BOOKS

5. Electric Window, The (Roklan Corporation)
6. Powerdot (Powersoft Products)
7. Powerdraw (Powersoft Products)
8. Scriptr (Pioneer Software)

I/III—Home/Personal Management

1. 97 Year Stock Market Average (Thomas V. Lenz)
2. Amateur Radio Theory Reviews (Micro-80)
3. Astro Star I (AGS Software)
4. Astro-Scope (AGS Software)
5. Billpayer (Stull Micro Products Corp.)
6. Black & Scholes Calculation (Roger S. Dildine)
7. Budget Management (Radio Shack)
8. Calendar Program (Dezoysa Enterprises)
9. Cassette Portfolio (Radio Shack)
10. Collectibles I (Basics and Beyond)
11. Commodity Package (Thomas V. Lenz)
12. Cryptography (Roger S. Dildine)
13. Datagraph (Micro Software Systems)
14. Disk Trendex (Radio Shack)
15. Executive Scratch Pad (Software of the Future)
16. Expense Notebook (Software of the Future)
17. Family Tree (Computer Shack)
18. Generations, The Genealogy Program (Micro-80)
19. Ham Call Sign Search Program (Dezoysa Enterprises)
20. Home Budget (Howe Software)
21. Home Spreadsheet Templates (Software Models)
22. Index (Computer/Business Services)
23. Information Storage and Retrieval System (Dezoysa Enterprises)
24. Loan Calculator (Software of the Future)
25. Management System II (Micro-80)
26. Measurement Tables and Formulae (Dezoysa Enterprises)
27. Microcosm I (Basics and Beyond)
28. Microcosm II (Basics and Beyond)
29. Microcosm III (Basics and Beyond)
30. Money Manager (Acorn Software Products)
31. Nodvill Diet Program "Take a Byte" (Nodvill Software)
32. Paid (BV Engineering)
33. Pers-A-Mail (SoftCo)
34. Personal Check Manager (Adventure International)
35. Photo Assistant (Software of the Future)
36. Powermail (Powersoft Products)
37. Pro-Pix (Adventure International)
38. QSort (BV Engineering)
39. Reap (BV Engineering)
40. Record Library (Software of the Future)
41. Seven Program Package (BAP\$ Software)
42. Sex-O-Scope (AGS Software)
43. Sign (Precision Prototypes)
44. SMAS (Spiral Enterprises)
45. Stockpak (Radio Shack)
46. Super Calendar (Precision Prototypes)
47. Super-Log II (Micro-80)
48. Supertax (Rockware Data Corporation)
49. Tallymaster (Prosoft)
50. Tax Planner (Computer Systems and Services)
51. Transit Star (AGS Software)
52. Trendex Stock Trend Analysis (Radio Shack)
53. Video Library (Software of the Future)
54. Your Family Tree (Acorn Software Products)

I/III—Music

1. Fanfare (Software Affair)
2. Greatest Hits (Software Affair)
3. Music "Magic" (Pioneer Software)
4. Orchestra-85 (Software Affair)
5. Orchestra-90 (Software Affair)
6. Piano-85/90 (Software Affair)

I/III—Spelling Checkers

1. Chertext (Apparat)
2. Electric Webster (Cornucopia Software)
3. Grammatik (Aspen Software)
4. Hexspell (Hexagon Systems)
5. Microproof (Cornucopia Software)
6. Random House Proofreader (Aspen Software)
7. Scripsit Dictionary (Radio Shack)

I/III—Utilities

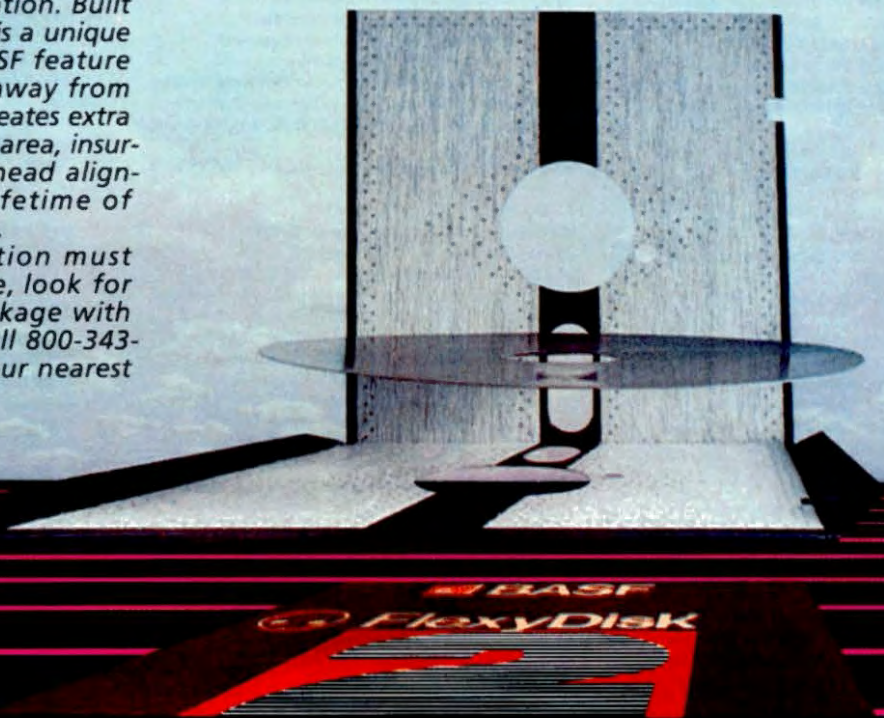
1. Accel 384 (Allen Gelder Software)
2. AOS Utilities #1 (Howard W. Sams & Co.)
3. Arranger (Triple-D Software)
4. Assem/Zsim (Instant Software)
5. ASMB-18 (Allen Ashley)
6. ASMB-20 (Allen Ashley)
7. ASMB-38 (Allen Ashley)
8. ASMB-48 (Allen Ashley)
9. ASMB-51 (Allen Ashley)
10. ASMB-ZB (Allen Ashley)
11. Basic Answer, The (Logical Systems)
12. Basic Compiler (PCD Systems)
13. Boss (Cosmopolitan Electronics Corporation)
14. BOSS/Renum 90 (Cosmopolitan Electronics Corporation)
15. CASM Editor/Assembler (Crown Micro Products)
16. Casop (B.T. Enterprises)
17. CO-DIR Cursor Oriented Directory (Picotrin Technology)
18. Commcnr (Sykam Systems Limited)
19. Complete Memory Dump (Roger S. Dildine)
20. Comref (Apparat)
21. Copy III (B.T. Enterprises)
22. Count, The (Sturdivant and Dunn)
23. DCV-1 Tape to Disk (Small System Software)
24. Debug (Radio Shack)
25. Disk Index (Mumford Micro Systems)
26. DISKLIB (Sykam Systems Limited)
27. DISNDATA Disassembler (Pro/Am Software)
28. DLDIS (Instant Software)
29. DosAside (Philadelphia Consulting Group)
30. DSMBLR II (MISOSYS)
31. EDAS (MISOSYS)
32. Edit (Allen Gelder Software)
33. Edit (Full Screen Editor) (D.C.S. Software)
34. Editor/Assembler (Series I) (Radio Shack)
35. EDTASM (Radio Shack)
36. Enigma—An Unbreakable File (Casler Computing)
37. Epson Driver Program (Apparat)
38. Fast Sort (Precision Prototypes)
39. Faster (Prosoft)
40. FED (Logical Systems)
41. File Transfer Program (Personal Computer Products)
42. Filter Package #1 (Logical Systems)
43. Filter Package #2 (Logical Systems)
44. FLEXTXT Plus (Apparat)
45. Fortran Compiler (PCD Systems)
46. Fourier Analysis (Roger S. Dildine)
47. Full Screen Text Editor for Basic, The (Computer Applications Unlimited)
48. Hex Man (Hexagon Systems)
49. I/O Monitor (Logical Systems)
50. Instant Assembler (Mumford Micro Systems)
51. Interactive Control Language (XYZT Computer Dimensions)
52. Invm (Inventory Management) (D.C.S. Software)
53. LC (MISOSYS)
54. LDOS Help Command (Vinzant & Associates Software Division)
55. LED (Logical Systems)
56. Lisp Interpreter (PCD Systems)
57. Loadhex Disk File Transfer (Crown Micro Products)
58. Macro-Monitor (Howard W. Sams & Co.)
59. Manipulator, The (Vinzant & Associates Software Division)
60. Mastery Directory (Howard W. Sams & Co.)
61. Maxi Stat (Adventure International)
62. Maxprint (Peggytronics)
63. Maxprint Plus (Peggytronics)
64. MCopy (Stewart Software)
65. MDIS (Sykam Systems Limited)
66. Meta (Far West Systems & Software)
67. Monitor #3 (Howe Software)
68. Monitor #4 (Howe Software)
69. Monitor #5 (Howe Software)
70. M-Zal (Computer Applications Unlimited)
71. NEWBASIC 2.0 (Modular Software Associates)
72. Pascal Compiler (PCD Systems)
73. Pascal-80 (New Classics Software)
74. PDS (MISOSYS)
75. PDS (Allen Ashley)
76. Powerdot (Powersoft Products)
77. Powerdraw (Powersoft Products)
78. Ram-Sledges (XYZT Computer Dimensions)
79. RPM (Prosoft)
80. RSM-1P (EPROM) (Small System Software)
81. RSM3 (Small System Software)

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89. Super Directory (Computer Shack)
90. Super DOS (Computer Shack)
91. Super Duper (WittSoft)
92. Super Utility Plus (Powersoft Products)
93. Super-Dir 1.3 (SMS Products)
94. Superkeys (Howard W. Sams & Co.)
95. System Diagnostic (Howe Software)
96. System Savers (Acorn Software Products)
97. Tape Copy 2 (Soft Sector Marketing)
98. tiny-c ONE (tiny-c Associates)
99. TLDIS (Instant Software)
100. Toolbox for LDOS, The (Powersoft Products)
101. Transporter (Bodnar Associates)
102. Trashman (Prosoft)
103. TRSDUM 1&3 (CRB Microtools)

104. TRSTUM 1&3 (CRB Microtools)
105. TSHARE Multi-User (ComSoft)
106. Ultra mon (Instant Software)
107. UOLISP (Far West Systems & Software)
108. UTIL-Cassette Operating System (J.P.C. Products Co.)
109. Utility Disk #1 (Logical Systems)
110. Utility Pack (B.T. Enterprises)
111. VIS/Bridge/GL (Solutions)
112. VIS/Bridge/Report (Solutions)
113. VIS/Bridge/Sort (Solutions)
114. WOBOS I (Western Operations)
115. XBug (Computer Applications Unlimited)
116. Zapit Disk (Soft Sector Marketing)
117. ZBasic 2.2 (Simutek Computer Products)
118. Zaim (Instant Software)

4. Crayon Deluxe (Pioneer Software)
5. Docu-Writer Word Processor (Nepenthe Programs)
6. Electric Pencil (Michael Shrayor)
7. Electric Pencil (McClintock Corp.)
8. Formlet (Contract Services Associates)
9. Formlet for Churches (Custom Data)
10. Lazy Writer (Soft Sector)
11. Letter-Writer (Astro-Star Enterprises)
12. Letter/Report Writer Program (Dezoysa Enterprises)
13. Micro-Script Word Processor (Micro-80)
14. Micro-Typit (Coolidge & Associates)
15. Newsprint (Prosoft)
16. Pel-Tek Word Machine (Pel-Tek)
17. Powerdrivers for Superscript (Powersoft Products)
18. Scriplus (Powersoft Products)
19. Scripsit (Radio Shack)
20. Scriptr (Pioneer Software)
21. SuperScript Printer Drivers (Alps)
22. SuperScript (Acorn Software Products)
23. Typ/Prt (Contract Services Associates)
24. Typital (Howe Software)
25. XTRA Special Delivery (Software Concepts)

I/III—Word Processors

1. Clean Slate (Howard W. Sams & Co.)
2. CopyArt II (Simutek Computer Products)
3. Crayon (Pioneer Software)

Model II/12/16 Software

II/12/16—Accounting

1. Accounting Program (McClintock Corp.)
2. Accounting Software (Compumax Associates)
3. Accounts Payable (Radio Shack)
4. Accounts Payable (Taranto & Associates)
5. Accounts Receivable (Radio Shack)
6. Accounts Receivable (Taranto & Associates)
7. Accounts Receivable Balance Forward (Taranto & Associates)
8. ACCT (Micro Architect)
9. Amortization (Rockware Data Corporation)
10. Asset (PCD Systems)
11. CBook (Contract Services Associates)
12. Corporate 1120 (CPAids)
13. Data Train's "The Accountant" (Thoughtware Publishing Company)
14. General Ledger (Taranto & Associates)
15. General Ledger II (CPAids)
16. Integrated Accounting Package (Micro Architect)
17. Inventory (McClintock Corp.)
18. Inventory Control (Taranto & Associates)
19. Job Cost Control (McClintock Corp.)
20. Master Tax Program (CPAids)
21. Payroll (Radio Shack)
22. Payroll (McClintock Corp.)
23. Payroll (Taranto & Associates)
24. Quick Check (Chuck Atkinson Programs)
25. SBSG Accounts Payable (Small Business Systems Group)
26. SBSG Accounts Receivable (Small Business Systems Group)
27. SBSG General Ledger (Small Business Systems Group)
28. SBSG Inventory (Small Business Systems Group)
29. SBSG Invoicing/Order Entry (Small Business Systems Group)
30. SBSG Payroll (Small Business Systems Group)
31. Small Business Accounting (Howe Software)
32. Supertax (Rockware Data Corporation)
33. Tax Planner (CPAids)
34. Taxplan (Contract Services Associates)
35. Taxpro (Contract Services Associates)
36. Time Accounting (Radio Shack)
37. Visi-Print (The Proper Touch)
38. Viz-A-Con (Abacus Associates)

12. Country Club Management (The Software Terminal)
13. Dental Office System (Windham Software)
14. Directory for Churches (Custom Data)
15. Econometrics (Century Software Systems)
16. Electronic Broker (Radio Shack)
17. Finance Spreadsheet Templates (Software Models)
18. Financial Decisions (Century Software Systems)
19. Financial Planning with VisiCalc (Howard W. Sams & Co.)
20. Financial Statement Analysis (Century Software Systems)
21. General Ledger (Radio Shack)
22. Heating Fuel Cost (McClintock Corp.)
23. HELU Accounting (PCD Systems)
24. HELU Property Management (PCD Systems)
25. Instant Mathematical Programming (PCD Systems)
26. Insure (The Software Terminal)
27. Inventory Control System (Radio Shack)
28. Inventory Management System (Radio Shack)
29. Investor III (Good Software Corp.)
30. Job Costing (ELTECH Associates)
31. Job Costing (Radio Shack)
32. Labor Collection/Performance (ELTECH Associates)
33. Lease Versus Purchase Analysis (Century Software Systems)
34. Life Cycle Cost (McClintock Corp.)
35. Linear Programming (Century Software Systems)
36. Litigation Support (Radio Shack)
37. Loancomp (Contract Services Associates)
38. Mail (Micro Architect)
39. Mail/File Series II (Logical Systems)
40. Mailer (PCD Systems)
41. Mailing List (Howe Software)
42. Mailing List II (Radio Shack)
43. Manufacturing Inventory System (Radio Shack)
44. Medical Office System (Windham Software)
45. Medical Office System (Radio Shack)
46. Medoffice (PCD Systems)
47. Manufacturing Inventory Control (ELTECH Associates)
48. NutriCalc (PCD Systems)
49. Order Entry (American Small Business Computers)
50. Order Entry/ICS (Radio Shack)
51. Order Entry with Inventory Control (Radio Shack)
52. Patient Data Management (The Software Terminal)
53. Pension Maker Defined Benefit System (Emmanuel B. Garcia, Jr. & Associates)
54. Pension Maker Defined Contribution System (Emmanuel B. Garcia, Jr. & Associates)
55. Pers-A-Mail (SoftCo)
56. Personal Datebook (PCD Systems)
57. Personnel Search (Radio Shack)
58. Point of Sale Inventory (SoftCo)
59. Powermail (Powersoft Products)
60. Premium Finance Insurance (Program Innovations)
61. Professional Time Accounting (Computer Systems and Services)
62. Property Management (The Software Terminal)
63. Purchasing Control (ELTECH Associates)
64. Quick Register (Chuck Atkinson Programs)
65. Real Estate Analysis (Century Software Systems)

66. Real Estate Spreadsheet Templates (Software Models)
67. Sales Analysis (Radio Shack)
68. Series Print (Computer/Business Services)
69. Shop Order Control (ELTECH Associates)
70. Small Business Management (Howe Software)
71. Statistical Analysis (Radio Shack)
72. Statistician, The (Quant Systems)
73. Statistics (Century Software Systems)
74. Supermail (American Small Business Computers)
75. Tickertec (Max Ule & Company)
76. TRS-80 Means Business Set (John Wiley & Sons)
77. Vending (The Software Terminal)
78. VisiCalc (VisiCorp)

II/12/16—Data-Base Management

1. AIDS-III (Meta Tech.)
2. CCDS—Relational Database Management System (Data Management Systems)
3. Database Management (Institute for Scientific Analysis)
4. IDM (Micro Architect)
5. In-Memory Database Management (Howe Software)
6. LogiCalc (PCD Systems)
7. Logiquest (PCD Systems)
8. MDSB III (International Software Enterprises)
9. PD Base (PCD Systems)
10. Profile of Church Members (Custom Data)
11. Profile II (Radio Shack)
12. Q-Pro 4 (Quic-N-Easi Products)

II/12/16—Data Communications

1. Binary Synchronous Communications (Radio Shack)
2. Lync (International Software Alliance)
3. Omniterm (Lindbergh Systems)
4. Smart Terminal (Howe Software)
5. ST80-III (Small Business Systems Group)
6. Teleterm (Telexpress)
7. Videotex (Radio Shack)
8. VisiBridge/DJ (Solutions)

II/12/16—Disk Operating Systems

1. ATON CP/M 2.2 Floppy (ATON International)
2. ATON CP/M 2.2 R.S. 8/12 Meg HD (ATON International)
3. CP/M (Digital Research)
4. DOSPLUS II (Powersoft Products)
5. TRSDOS (Radio Shack)
6. UCSD p-System (PCD Systems)

II/12/16—Education

1. Instant Mathematical Programming (PCD Systems)

II/12/16—Business

1. Accounts Paid System (Windham Software)
2. AIDS-III (Meta Tech.)
3. AR/INV (The Software Terminal)
4. Autogrammer (Roklan Corporation)
5. Bill of Materials Processor (ELTECH Associates)
6. Check Register Plus (SoftCo)
7. Church Attendance (Custom Data)
8. Church Donations (Custom Data)
9. CMICS (Dynatek Information Systems)
10. Commercial Cooling & Heating Load (McClintock Corp.)
11. Construction Spreadsheet Templates (Software Models)

2. Microtyping (Hayden)
3. NutriCalc (PCD Systems)
4. Random Access Vol. I Basic File Handling (D.S.C. Publishing)
5. Random Access Vol. II Advanced File Handling (D.S.C. Publishing)

II/12/16—Engineering

1. Auto-Load for Finite Element Analysis (McClintock Corp.)
2. Commercial Cooling & Heating Load (McClintock Corp.)
3. Concrete Beam Design (McClintock Corp.)
4. Concrete Column Design (McClintock Corp.)
5. Critical Path Project Management (McClintock Corp.)
6. Duct Design (McClintock Corp.)
7. Enhanced Finite Element Analysis (McClintock Corp.)
8. Fault Current Analysis (McClintock Corp.)
9. Finite Element Analysis (McClintock Corp.)
10. Fire Sprinkler Grid System (McClintock Corp.)
11. Fuse & Breaker Coordinator (McClintock Corp.)
12. Hardy Cross Water System Analysis (McClintock Corp.)
13. Heating Fuel Cost (McClintock Corp.)
14. HVAC Energy Consumption (McClintock Corp.)
15. Hydraulic Pipe Design (McClintock Corp.)
16. Life Cycle Cost (McClintock Corp.)
17. Lighting Design (McClintock Corp.)
18. One-Way, Two-Way Concrete Slab Design (McClintock Corp.)
19. Pipe Bending (McClintock Corp.)
20. Residential Cooling & Heating Load (McClintock Corp.)
21. Shear Wall Design (McClintock Corp.)
22. Solar Collector F-Chart Calculation (McClintock Corp.)
23. Steel Beam Design (McClintock Corp.)
24. Steel Column Design (McClintock Corp.)

II/12/16—Games

1. Adventure (Adventure International)
2. Chess (Kuzel Computer Services)
3. Galactic Invaders (Kuzel Computer Services)
4. Interactive Fiction (Adventure International)
5. Maryland Model II Game (two/sixteen magazine)

6. Munchman (Kuzel Computer Services)
7. Othello (Kuzel Computer Services)
8. Quest for Adventure (Kuzel Computer Services)
9. Sargon II (Hayden)
10. Starship/1 (two/sixteen magazine)
11. Wormy (Kuzel Computer Services)

II/12/16—Home/Personal Management

1. Astro Star I (AGS Software)
2. Astro-Scope (AGS Software)
3. Home Budget (Howe Software)
4. Home Spreadsheet Templates (Software Models)
5. Mailer (PCD Systems)
6. Personal Datebook (PCD Systems)
7. Powermail (Powersoft Products)
8. Sectar (Sykam Systems Limited)
9. Sex-O-Scope (AGS Software)
10. Superprogram II (AGS Software)
11. Supertax (Rockware Data Corporation)
12. Transit Star (AGS Software)

II/12/16—Spelling Checkers

1. Grammatik (Aspen Software)
2. Scripsit Dictionary (Radio Shack)

II/12/16—Utilities

1. 3D Plotter (Maxtek)
2. BACKPACK (Format/Backup/Reorganize) (Skyline Software)
3. Basic Compiler (PCD Systems)
4. Basic Cross Reference (Good-Lyddon Data Systems)
5. Basic Surrogate (ATON International)
6. CP/M to p-System (PCD Systems)
7. Development Package (Racet Computes)
8. Development Utilities (Allen Ashley)
9. Disassembler (Program Innovations)
10. Disassembler/Memory Map (Skyline Software)
11. Disk Sort (Good-Lyddon Data Systems)
12. Editor/Assembler (Radio Shack)
13. Extended Built In Functions (Snapware)
14. File Transfer Program (Personal Computer Products)
15. Fortran Compiler (PCD Systems)
16. Fortran Extension Library (The Proper Touch)

17. Graph Plotter (Maxtek)
18. Graphics Terminal (Maxtek)
19. IBM 2741 to p-System (PCD Systems)
20. KEYEDIT (Basic Keyboard Handler) (Skyline Software)
21. Lisp Interpreter (PCD Systems)
22. Menu Generator (Radio Shack)
23. OmniWriter Video Text Editor (ATON International)
24. Pascal Compiler (PCD Systems)
25. Profile Archive (Radio Shack)
26. Program Editor (Radio Shack)
27. Reformatter (Radio Shack)
28. RSMII (Small System Software)
29. Screen Printer (Maxtek)
30. Surface Plotter (Maxtek)
31. Symbol Generator (Maxtek)
32. System-18 (Allen Ashley)
33. System-20 (Allen Ashley)
34. System-320 (Allen Ashley)
35. System-3870 (Allen Ashley)
36. System-48 (Allen Ashley)
37. System-51 (Allen Ashley)
38. System-70 (Allen Ashley)
39. System-75 (Allen Ashley)
40. System-99 (Allen Ashley)
41. System-CP4 (Allen Ashley)
42. System-TMS7 (Allen Ashley)
43. System-Z8 (Allen Ashley)
44. Versaflex (Radio Shack)
45. VIS/Bridge/GL (Solutions)
46. VIS/Bridge/Report (Solutions)
47. VIS/Bridge/Sort (Solutions)
48. VisiCalc Surrogate (ATON International)
49. XRMak-18 (Allen Ashley)
50. XRMak-FB (Allen Ashley)
51. XRMak-Z8 (Allen Ashley)
52. Z-COM (Allen Ashley)

II/12/16—Word Processors

1. Electric Pencil (Michael Shrayor)
2. Electric Pencil (McClintock Corp.)
3. Formlet (Contract Services Associates)
4. Formlet for Churches (Custom Data)
5. KWIX (Key Word Index for Scripsit) (Skyline Software)
6. Scripsit 2.0 (Radio Shack)
7. Typ/Prt (Contract Services Associates)
8. WordStar (Micro Pro)

Color Computer Software

CoCo—Accounting

1. Accounts Payable (Universal Data Research)
2. Accounts Receivable (Universal Data Research)
3. Balanced Billing (Universal Data Research)
4. Church Contributions (Universal Data Research)
5. General Ledger (Universal Data Research)
6. Inventory II (Universal Data Research)
7. Non-Disk Check System (Futureview)
8. Non-Disk Electric Bookkeeper (Futureview)
9. Payroll (Universal Data Research)
10. Single Entry General Ledger (Universal Data Research)

CoCo—Business

1. Accounts Receivable (Brantex)
2. Data Plotting Software (Kern Publications)
3. General Ledger (Brantex)
4. Graphic Software (Kern Publications)
5. Non-Disk Check System (Futureview)
6. Non-Disk Electric Bookkeeper (Futureview)
7. Non-Disk Sales/Inventory (Futureview)
8. Personal Finance (Radio Shack)
9. Small Business Accounting (Brantex)
10. Spectaculator (Radio Shack)
11. Stock Portfolio Management (Superior Graphics Software)

CoCo—Data-Base Management

1. C.C. File (Trans Tek)

2. C.C. Mailer (Trans Tek)
3. Data Base Manager (Universal Data Research)
4. Data Plotting Software (Kern Publications)
5. TIMS (Sugar Software)

CoCo—Data Communications

1. COLORCOM/E (Eigen Systems)
2. Microtext (The Micro Works)
3. Remoterm (Star-Kits)
4. Super Color Terminal (Nelson Software)

CoCo—Disk Operating Systems

1. FLEX/FMate (RS) (Data-Comp)
2. Forth (Forthright Software)
3. Star-DOS (Star-Kits)
4. TRSDOS (Radio Shack)

CoCo—Education

1. Advanced Graphics (Radio Shack)
2. Alpha Key (Radio Shack)
3. Author I (Radio Shack)
4. Beatles, The (Radio Shack)
5. Bingo Math (Radio Shack)
6. C.A.R.D. I (Radio Shack)
7. Change (Brantex)
8. Charles Lindbergh/Amelia Earhart (Radio Shack)
9. Color LOGO (Radio Shack)

10. Computer Discovery for Junior High (Radio Shack)
11. Computer Discovery for Senior High (Radio Shack)
12. Data Plotting Software (Kern Publications)
13. Dracula (Radio Shack)
14. Early Games for Young Children (Counterpoint Software)
15. Electric Typing Teacher (Soft Sector Marketing)
16. Flashcards (Forthright Software)
17. Galactic Hangman (Sugar Software)
18. Geography Pack (Radio Shack)
19. Graphical Analysis of Experimental Data (Radio Shack)
20. Graphic Software (Kern Publications)
21. History of American Learning Unit (Radio Shack)
22. Hound of the Baskervilles, The (Radio Shack)
23. Interpreting Graphs in Physics (Radio Shack)
24. Inventions That Change Our Lives (Radio Shack)
25. Matrices, Determinants, and Simultaneous Equations (Radio Shack)
26. Micro PILOT (Radio Shack)
27. Moby Dick (Radio Shack)
28. Number Theory (Radio Shack)
29. Numeric Data Entry Practice (Radio Shack)
30. Pioneers in Technology (Radio Shack)
31. Plane Analytic Geometry (Radio Shack)
32. Quadratic Equations (Radio Shack)
33. Quick Quiz (Radio Shack)
34. Silly Syntax (Sugar Software)
35. 20,000 Leagues Under the Sea (Radio Shack)
36. Typing Teacher (Instant Software)
37. Typing Tutor (Radio Shack)
38. Vector Addition (Radio Shack)
39. Vocabulary Tutor 1 (Radio Shack)
40. Vocabulary Tutor 2 (Radio Shack)



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CoCo—Games

1. Air Flight Simulator (Instant Software)
2. Alchemist's Laboratory, The (Real Software Company)
3. Animated Hangman (Soft Sector Marketing)
4. Astro Blast (Mark Data Products)
5. Bedlam (Radio Shack)
6. Bingo Math (Radio Shack)
7. Black Sanctum (Mark Data Products)
8. Breakthru (Avalon Hill)
9. Brickaway (Britt Monk, CDP)
10. Callixto Island (Mark Data Products)
11. Canyon Climber (Radio Shack)
12. Card Games (Radio Shack)
13. Cassette Copy (B. Erickson Software)
14. Cassette Dump (B. Erickson Software)
15. Castle Guard (Radio Shack)
16. Cave Hunter (Mark Data Products)
17. Chek-Ches/Starship-3 (B. Erickson Software)
18. Chess (Radio Shack)
19. Chess (Flex) (Data-Comp)
20. Clowns and Balloons (Radio Shack)
21. Color Backgammon (Radio Shack)
22. Color Berserk (Mark Data Products)
23. Color Bonanza (Soft Sector Marketing)
24. Color Caterpillar (Soft Sector Marketing)
25. Color Craps (Adventure International)
26. Color Cubes (Radio Shack)
27. Color Pac Attack (The Micro Works)
28. Color Robot Battle (Radio Shack)
29. Concentration/Connect (Soft Sector Marketing)
30. Cosmic Dogfight (American Small Business Computers)
31. Craps/Slot Machine (B. Erickson Software)
32. Crosswords (Radio Shack)
33. DC Ohms Law/FLC-FRC (B. Erickson Software)
34. Death Planet: The Dogstar Adventure (Adventure International)
35. Death Trap (Soft Sector Marketing)
36. Dino Wars (Radio Shack)
37. Double Back (Radio Shack)
38. Escape (Brantex)
39. Galactic Attack (Radio Shack)
40. Galactic Hangman (Sugar Software)
41. Gauntlet (Avalon Hill)
42. Gin Champion (Radio Shack)
43. Glaxxons (Mark Data Products)
44. Gone Fishing/Concentration (B. Erickson Software)
45. Graphics Pack (Radio Shack)
46. Haywire (Mark Data Products)
47. Horse Race Handicapping System (3G Company)
48. Hurdlers Tape (Soft Sector Marketing)
49. IC-Timer-1/IC-Timer-2 (B. Erickson Software)
50. In-Between/Shell Game (B. Erickson Software)
51. Kid Stuff I (Forthright Software)
52. Lokar's Magic Staff (Real Software Company)
53. Madness and the Minotaur (Radio Shack)
54. Mega-Bug (Radio Shack)
55. MegaMaze (Real Software Company)
56. Microbes (Radio Shack)
57. Micro Painter (Radio Shack)
58. Monster Maze (Radio Shack)
59. Moon Shuttle (DataSoft)
60. Moonlander (American Small Business Computers)
61. Mortar Battle/Puzzle (B. Erickson Software)
62. Name That Tune (Forthright Software)
63. Night Tower Descent (Real Software Company)
64. Number Guess/Dice Roll (B. Erickson Software)
65. Offender (American Small Business Computers)
66. P.T. Boat/Turtle Race (B. Erickson Software)
67. Packet Man (American Small Business Computers)
68. Phase VII 3.0 (Futureview)
69. Polaris (Radio Shack)
70. Poltergeist (Radio Shack)
71. Popcorn (Radio Shack)
72. Project Nebula (Radio Shack)
73. Pyramid (Radio Shack)
74. Raaka-Tu (Radio Shack)
75. Roman Checkers (Radio Shack)
76. ROM-Save (B. Erickson Software)
77. Safari/Starship-2 (B. Erickson Software)
78. Sands of Egypt (Radio Shack)
79. Santa Paravia and Fiumaccio (Instant Software)
80. Shooting Gallery (Radio Shack)
81. Shootout at the OK Galaxy (Avalon Hill)
82. Silly Syntax (Sugar Software)
83. Skiing (Radio Shack)
84. Space Assault (Radio Shack)
85. Space Raiders (Mark Data Products)

86. Squeeze (Real Software Company)
87. Star Blaster (The Micro Works)
88. Starship/Sherlock Holmes (B. Erickson Software)
89. Strip Concentration (Adventure International)
90. Strip Dice (Adventure International)
91. Strip Tease (Britt Monk, CDP)
92. Super Bustout (Radio Shack)
93. Tank Attack/Association (B. Erickson Software)
94. Teasers/Mouse (B. Erickson Software)
95. Tennis (Radio Shack)
96. Think/Luck & Logic (B. Erickson Software)
97. Three-D Tic-Tac-Toe (Adventure International)
98. Treasure Island/Rescue (B. Erickson Software)
99. VC (Avalon Hill)
100. Voyager (Avalon Hill)
101. Wildcatting (Radio Shack)
102. Zaxxon (DataSoft)

CoCo—Graphics

1. Art Gallery (Radio Shack)
2. Color Show Displays (Real Software Company)
3. Images I (Radio Shack)
4. Images II (Radio Shack)
5. MPP Graphics (Superior Graphics Software)

CoCo—Home/Personal Management

1. Audio Spectrum Analysis (Radio Shack)
2. Bridge Tutor (Radio Shack)
3. C.C. Calc (Trans Tek)
4. Champs (Radio Shack)
5. Check 'N Tax (Star-Kits)
6. Color Accountant, The (Programmer's Institute)
7. Color File (Radio Shack)
8. Data Plotting Software (Kern Publications)
9. Diet-Trac (Flex) (Data-Comp)
10. Graphic Software (Kern Publications)
11. Handyman (Radio Shack)
12. Personal File (Radio Shack)
13. Personal Finance (Radio Shack)
14. REKORD Planner (Radio Shack)
15. Stock Analyzer (Brantex)
16. Tax Handler, The (Programmer's Institute)

CoCo—Spelling Checkers

1. Spell 'N Fix (Star-Kits)
2. Spell-Rite (Eigen Systems)

CoCo—Utilities

1. 80C Disassembler (The Micro Works)
2. AutoRun (Sugar Software)
3. Basic Aid (Eigen Systems)
4. CBUG Monitor (The Micro Works)
5. CCEAD (Eigen Systems)
6. Color Graphic Editor (Soft Sector Marketing)
7. ColorZAP (Software Options)
8. CPrint (Micro-Labs)
9. Diagnostic ROM (Radio Shack)
10. Disassembler 6809 (Soft Sector Marketing)
11. Editor/Assembler (The Micro Works)
12. EDTASM + (Radio Shack)
13. Graphics Character Set (Forthright Software)
14. Graphics Screen Editor (Real Software Company)
15. Humbug (Star-Kits)
16. JBUG Monitor Program (J.P.C. Products Co.)
17. MACRO-80c Editor/Assembler Monitor (The Micro Works)
18. Master Control II (Soft Sector Marketing)
19. Monitor (Forthright Software)
20. Newtalk (Star-Kits)
21. Ok!-Print (Soft Sector Marketing)
22. SDS80C Editor/Assembler/Monitor (The Micro Works)
23. Sigmon (Data Soft)
24. Stripper (Eigen Systems)
25. Tape Dir (Soft Sector Marketing)
26. Term (Flex) (Data-Comp)
27. WOBOS I (Western Operations)

CoCo—Word Processors

1. C.C. Writer (Trans Tek)
2. Color Scripsit (Radio Shack)
3. Super Color Writer II (Nelson Software)
4. Telewriter-64 (Cognitac)

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*8" drive operation requires special cable. 8" double density requires 3.55MHz CPU speed-up modification of LNW-80 4MHz computer.

Talk to the Big Guys

by Douglas Payne

You can use your Model III as a dumb terminal to access mainframes and minicomputers, taking advantage of their advanced computing features.

At times, I need the computing power and speed of a mainframe or minicomputer, but I also want the convenience of working at home or at my office desk. Since I write terminal emulation software for minicomputer and microcomputer systems as part of my job, I decided to do the same for my Model III. This way, I could take advantage of the capabilities of the larger systems using my computer as a terminal. I've used the software with a large IBM mainframe as well as a UNIX-based minicomputer system.

I'm familiar with a wide variety of in-

teractive terminal systems and programming languages, so my software needs all the functions of a conventional "dumb" terminal. The most important consideration is the ability to enter, from the keyboard, the full 128-character ASCII character set, as well as implement the break signal. It must correctly display all normally displayable characters as well as the control characters that cause cursor movement. It also has to set transmission speed, parity, number of stop bits, and duplex.

I also included features found only in more sophisticated terminals: an audible bell, tab stops, and alternate cursor types. And since I was not really using a terminal, but a computer, I added functions to transfer disk files to and from another computer, load Intel-format object code from a remote computer, and save a profile of all terminal characteristics.

Like most software, this program doesn't provide features that satisfy everyone. I have not included user-translate tables and special function keys, since most of the systems I use already provide them. Anyone familiar with Z80 machine language would have little trouble adding them.

Program Overview

Since the program is fairly large (in excess of 2,000 lines), I divided it into six parts. Although the listings shown here are in Radio Shack's EDTASM

format, a more viable approach would be to use an assembler that generates relocatable code and a linkage-editor to combine object files into an executable module (Microsoft's MACRO-80 and LINK-80, for instance). I have used equates to absolute addresses for those symbols referenced in modules other than the one in which they are defined. Although this method works, it is prone to error and makes changes to the program difficult. I would highly recommend the use of MACRO-80 to anyone contemplating making substantial changes to the program.

The six Program Listings are called UT1/SRC, UT2/SRC, and so on up to UT6/SRC. The first listing consists of the program start-up routines, the basic keyboard, and RS-232 character-handling routines. The second program contains the Intel-format object code loader and its support routines. The third listing comprises the RS-232 I/O drivers. The fourth program deals with parameter selection, and the fifth with file transfers. The sixth listing contains some program variables and constants.

The following is a description of each of the six program listings.

Program Listing 1

The first 48 bytes of Program Listing 1 are reserved for the program stack.

Escape Sequence	Character	
[ESC] 0	[NULL]	X'00'
[ESC] 1	]	X'5D'
[ESC] 2	\	X'5C'
[ESC] 3	^	X'5E'
[ESC] 4	—	X'5F'
[ESC] 5	{	X'7B'
[ESC] 6	}	X'7D'
[ESC] 7	|	X'7C'
[ESC] 8	~	X'7E'
[ESC] 9	[DEL]	X'7F'
[ESC] A	[SOH]	X'01'
[ESC] B	[ESC]	X'1B'
[ESC] C	[US]	X'1F'
[ESC] D	[EM]	X'19'
[ESC] >	Receive a file	
[ESC] <	Transmit a file	
[ESC] [ESC]	Exit to the main menu	

Table 1. Escaped characters.

The Key Box

Model III
16K RAM
Assembly Language
Radio Shack Editor Assembler
One Disk Drive

Entry to the program from the system occurs at label UTERM, in line 01360. The old stack pointer is saved and restored prior to exiting to the system, and a new one is set. System routine INITIO ensures that the display input/output (I/O) driver is in its original state so special graphics characters and space compression characters in the various menus display properly. Since RS-232 input is interrupt-driven, the receive interrupt vector points to my interrupt handler (see Program Listing 3).

While the sign-on logo is displayed, the program checks for the existence of the file Profile/TRM. Once found, the file should contain the various option settings saved through option 8 of the main menu (see Program Listing 4).

“Most control characters received from the RS-232 are ignored. Those that aren’t receive special treatment because they don’t display correctly.”

The file consists of a single 256-byte record containing all optional terminal characteristics, as well as the character representations of those settings displayed in the menus. The program reads the record and initializes those settings. Afterward, control passes to LOGON (see Listing 4) to display the main menu, letting the user alter any terminal characteristics.

The remainder of Listing 1 comprises the program’s main loop. Control always returns to label CHKRMT in line 02430 to process characters received from the RS-232 interface. If no input is available, control passes to label CHK-KBD (line 03290), to process keyboard input. All available characters from the RS-232 input are processed before any keyboard input with the exception of break, but only one keyboard character is processed before returning control to CHKRMT. This scheme gives the RS-232 input priority over the keyboard.

Most control characters received from the RS-232 are ignored. Those that aren’t receive special treatment because they don’t display correctly. Since

Program Listing 1

```

00100 ;
00110 ;          UT1/SRC
00120 ;
00130          ORG          5200H
00140 ;
00150 ;          EXTERNALS
00160 ;
00170 BKKTIM EQU          6036H
00180 CBDMSG EQU          5780H
00190 CDMSG  EQU          57C6H
00200 CPMSG  EQU          5798H
00210 CSTMSG EQU          57B2H
00220 CVB   EQU          562BH
00230 DCB   EQU          6044H
00240 ESCHRS EQU          6025H
00250 FILBUF EQU          617DH
00260 FILERX EQU          5E59H
00270 FILETX EQU          5EFFH
00280 FLAGS  EQU          6033H
00290 FLOOFF EQU          56E2H
00300 FLOON  EQU          5703H
00310 FPHEOF EQU          5CE7H
00320 FPHEOR EQU          5C9EH
00330 FPHPRM EQU          5CC0H
00340 FPHSTF EQU          5C75H
00350 LOADER EQU          54FAH
00360 LOGON  EQU          5720H
00370 RSBAUD EQU          6034H
00380 RSRVC  EQU          565CH
00390 RSTX   EQU          56CEH
00400 RSTYPE EQU          6035H
00410 RXINT  EQU          568CH
00420 SPSAVE EQU          607BH
00430 TABTBL EQU          6038H
00440 TRMOPT EQU          6033H
00450 ;
00460 ;          PORT ADDRESSES
00470 ;
00480 RSUART EQU          0EAH          ; RS-232 UART CONTROL PORT
00490 TXENB  EQU          04H          ; - ENABLE TRANSMIT, 0=BREAK
00500 B1200  EQU          077H          ; 1200 BAUD
00510 CASPRT EQU          0FFH          ; CASSETTE PORT
00520 ;
00530 ;          ROM ROUTINES
00540 ;
00550 KBCHAR EQU          002BH          ; GET KEYBOARD CHARACTER
00560 VDCHAR EQU          0033H          ; DISPLAY CHAR ON SCREEN
00570 DELAY  EQU          0060H          ; DELAY FOR SPECIFIED TIME
00580 INITIO EQU          0069H          ; INITIALIZE I/O DRIVERS
00590 VDCLS  EQU          01C9H          ; CLEAR SCREEN
00600 VDLINE EQU          021BH          ; DISPLAY LINE ON SCREEN
00610 KBBRK  EQU          028DH          ; FAST KBD SCAN FOR BREAK
00620 SCROLL EQU          0587H          ; SCROLL SCREEN UP 1 LINE
00630 ;
00640 ;          DOS RAM ROUTINES
00650 ;
00660 OPEN   EQU          4424H          ; OPEN DISK FILE
00670 CLOSE EQU          4428H          ; CLOSE DISK FILE
00680 READ   EQU          4436H          ; READ DISK FILE RECORD
00690 ;
00700 ;          RAM ADDRESSES
00710 ;
00720 VIDRAM EQU          3C00H          ; VIDEO RAM
00730 LIN16  EQU          15<6          ; - VIDEO LINE 16
00740 CAPSLK EQU          4019H          ; CAPS LOCK (0=UPLW)
00750 CURSBL EQU          401CH          ; CURSOR BLINK (0=BLINK)
00760 CURSAD EQU          4020H          ; CURSOR ADDRESS
00770 CURSCH EQU          4023H          ; CURSOR CHARACTER
00780 RXIVEC EQU          4207H          ; RS-232 RX INTERRUPT VECTOR
00790 ;
00800 ;          ASCII CHARACTERS
00810 ;
00820 STX    EQU          02H          ; START OF TEXT (CTRL-B)
00830 BEL   EQU          07H          ; BELL (CTRL-G)
00840 BS    EQU          08H          ; BACK-SPACE
00850 TAB   EQU          09H          ; TAB
00860 LF    EQU          0AH          ; LINE-FEED
00870 FF    EQU          0CH          ; FORM-FEED (CTRL-L)
00880 CR    EQU          0DH          ; CARRIAGE RETURN
00890 ESC   EQU          1BH          ; ESCAPE
00900 DEL   EQU          7FH          ; DELETE
00910 BREAK EQU          01H          ; <BREAK> KEY
00920 TABUP EQU          19H          ; UPPERCASE <TAB> KEY
00930 CLEAR EQU          1FH          ; <CLEAR> KEY
00940 ;
00950 ;          SCREEN CHARACTERS
00960 ;
00970 CURSON EQU          0EH          ; CURSOR ON
00980 CURSOF EQU          0FH          ; CURSOR OFF

```

Listing 1 continued

Listing 1 continued

```

00990 SWPGRF EQU 15H ; SWAP TO GRAPHICS CHRS
01000 DBLCHR EQU 17H ; SWITCH TO DOUBLE SIZE CHRS
01010 CURSLT EQU 18H ; CURSOR LEFT
01020 CURSRT EQU 19H ; CURSOR RIGHT
01030 CURSDN EQU 1AH ; CURSOR DOWN
01040 CURSHM EQU 1CH ; CURSOR HOME
01050 CURSSL EQU 1DH ; CURSOR TO START OF LINE
01060 CLSCRN EQU 1FH ; CLEAR TO END OF SCREEN
01070 SPCOMP EQU 0C0H ; SPACE COMPRESSION CHRS
01080 MICRO EQU 0D3H ; MICRO SYMBOL
01090 ;
01100 ; FLAG BITS
01110 ;
01120 DUPLEX EQU 0 ; - FULL DUPLEX
01130 ESCKBD EQU 1 ; - <ESC> RECEIVED FROM KBD
01140 ESCLIN EQU 2 ; - <ESC> RECV'D FROM REMOTE
01150 XOFTX EQU 3 ; - <XOFF> SENT TO REMOTE
01160 CRTX EQU 4 ; - <CR> SENT TO REMOTE
01170 XOFRX EQU 5 ; - <XOFF> RECV'D FROM RMT
01180 ;
01190 ; PROFILE FILE RECORD FORMAT
01200 ;
01210 PRFOPT EQU 0 ; TERMINAL OPTIONS
01220 PRFBD EQU PRFOPT+1 ; 'BAUD'
01230 PRFPAR EQU PRFBD+6 ; 'PARITY'
01240 PRFDUP EQU PRFPAR+4 ; 'DUPLEX'
01250 PRFSTP EQU PRFDUP+4 ; 'STOP BITS'
01260 PRFCCH EQU PRFSTP+1 ; CURSOR CHARACTER
01270 PRFCBL EQU PRFCCH+1 ; CURSOR BLINK
01280 PRFSTF EQU PRFCBL+1 ; 'START-OF-FILE'
01290 PRFEOR EQU PRFSTF+2 ; 'END-OF-RECORD'
01300 PRFPRM EQU PRFEOR+2 ; 'PROMPT'
01310 PRFEOP EQU PRFPRM+2 ; 'END-OF-FILE'
01320 ;
01330 ; ENTER AND SET STACK POINTER
01340 ;
01350 DEFS 48 ; RESERVE STACK SPACE
01360 UTERM EQU $ ; EXECUTION STARTS HERE
01370 LD (SPSAVE),SP ; SAVE OLD STACK PTR
01380 LD SP,UTERM ; SET STACK POINTER
01390 CALL INITIO ; INITIALIZE I/O DRIVERS
01400 ;
01410 ; INITIALIZE RS-232 INTERRUPT VECTOR
01420 ;
01430 LD HL,RXINT ; SET NEW RX VECTOR
01440 LD (RXIVC),HL
01450 ;
01460 ; INITIALIZE KEYBOARD AND SCREEN
01470 ;
01480 LD A,'_' ; SET CURSOR = UNDERSCORE
01490 LD (CURSCH),A
01500 XOR A ; RESET CAPS LOCK
01510 LD (CAPSLK),A
01520 LD (CURSBL),A ; SET CURSOR BLINK
01530 ;
01540 ; DISPLAY SIGN-ON LOGO
01550 ;
01560 LD HL,LOGO
01570 CALL VDLIN
01580 XOR A ; DELAY ABOUT 5 SECS.
01590 LD B,A
01600 LD C,7
01610 WTLOOP EQU $
01620 DJNZ WTLOOP
01630 DEC A
01640 JR NZ,WTLOOP
01650 DEC C
01660 JR NZ,WTLOOP
01670 ;
01680 ; CHECK FOR PROFILE/TRM
01690 ;
01700 LD HL,FILBUF ; OPEN PROFILE FILE
01710 LD DE,DCB ; EXIT IF ERROR
01720 LD B,0 ; LRL = 0
01730 CALL OPEN
01740 JP NZ,LOGON ; GO TO MAIN MENU IF NONE
01750 ;
01760 ; READ PROFILE, SET PARAMETERS
01770 ;
01780 CALL READ ; READ RECORD
01790 JP NZ,LOGON ; EXIT IF ERROR
01800 LD DE,TRMOPT ; GET TERMINAL OPTIONS
01810 LD BC,17
01820 LDIR
01830 LD DE,CBMSG ; GET 'BAUD'
01840 LD BC,6
01850 LDIR
01860 LD DE,CPMSG ; GET 'PARITY'
01870 LD BC,4
01880 LDIR

```

Listing 1 continued

a carriage return (X'0D') moves the cursor to the start of the next line, rather than the current one, the cursor-to-start-of-line character (X'1D') appears. The LNFEED routine at line 05230 displays line feed characters (X'0A').

The TRS-80 displays line feed the same as carriage return, so line feed becomes a cursor-down character. However, since a cursor-down displayed on the bottom line of the screen causes the cursor to move to the top line, the system calls the Scroll routine to scroll up one line instead. Back-space (X'08') appears as a cursor-left character so it doesn't erase any characters.

The bell character (X'07') generates an audible tone through the cassette port. In order to hear it you need to connect a small amplifier and speaker to the AUX jack of the cassette cable.

"If the remote system does not support the protocol, characters are lost whenever scrolling takes place, the screen is cleared, a carriage return is displayed, or line-wrap occurs."

The form-feed character (X'0C') clears the screen. The tab character (X'09') moves the cursor to the next tab stop. The sequence ESC, STX (X'1B', X'02') signals that the data following it is Intel-format object code to be loaded into memory (see Listing 2).

Since interrupts are disabled during output to the screen, XON/XOFF flow control occurs whenever the possibility exists that characters will be lost due to scrolling or other lengthy operations. See Listing 3 for a description of this protocol.

If the remote system does not support the protocol, characters are lost whenever scrolling takes place, the screen is cleared, a carriage return is displayed, or line-wrap occurs. The problem occurs only at transmission speeds greater than 300 baud.

The code at label CHKKBD processes keyboard input. Since part of the ASCII character set is unavailable from the keyboard, I devised a method to enter those omitted characters. The two-character sequence [ESC] [character] represents the nonexistent characters.

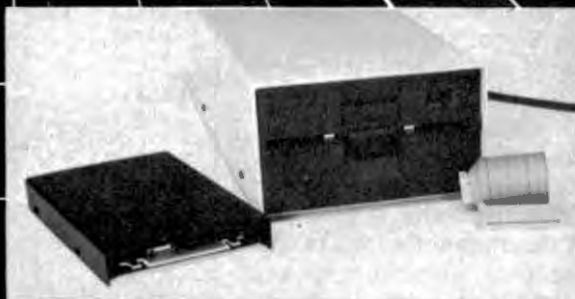
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Enter the Escape command by pressing the shift and up-arrow keys. This sequence is also used to initiate file transfers, and to exit to the main menu display. Table 1 summarizes the escaped characters.

The break signal is a frequently misunderstood part of terminal-to-computer communications. It generates an error condition in the transmission of data by causing a character to be sent with no stop bit(s). The Model III user's manual contains a good description of the composition of a character as it is transmitted via the RS-232 port. This error condition is detected by the receiving hardware as a framing error and signals an interrupt to the computer.

The TRS-80 generates a break by turning off the transmitter for a period of time. Therefore, when the break key is pressed, the transmitter turns off for the time it takes to send two characters, and then turns back on. Since the time off depends on the transmission speed (baud rate), the delay factor is kept in the variable BRKTIM, which is changed whenever the baud rate is changed. This ensures that the computer receiving the break signal detects it, regardless of the transmission speed.

Control characters received from the keyboard are treated in much the same manner as those received from the

Listing 1 continued

```

01890 LD DE,CDMSG ; GET 'DUPLEX'
01900 LD BC,4
01910 LDIR
01920 LD A,(FILBUF+PRFSTP) ; GET 'STOP BITS'
01930 LD (CSTMSG),A
01940 LD A,(FILBUF+PRFCCH) ; GET CURSOR CHAR
01950 LD (CURSCH),A
01960 LD A,(FILBUF+PRFCBL) ; GET CURSOR BLINK
01970 LD (CURSBL),A
01980 LD HL,(FILBUF+PRFSTF) ; 'START-OF-FILE'
01990 LD (FPHSTF),HL
02000 LD HL,(FILBUF+PRFEOR) ; 'END-OF-RECORD'
02010 LD (FPHEOR),HL
02020 LD HL,(FILBUF+PRFPRM) ; GET 'PROMPT'
02030 LD (FPHPRM),HL
02040 LD HL,(FILBUF+PRPEOF) ; GET 'END-OF-FILE'
02050 LD (FPHEOF),HL
02060 LD DE,DCB ; CLOSE FILE
02070 CALL CLOSE
02080 JP LOGON ; GO TO MAIN MENU
02090 ;
02100 ; SIGN-ON LOGO
02110 ;
02120 LOGO EQU $
02130 DEFB CURSHM
02140 DEFB CLSCRN
02150 DEFB DBLCHR
02160 DEFB LF
02170 DEFB LF
02180 DEFB LF
02190 DEFB LF
02200 DEFB SPCOMP+13
02210 DEFB SWPGRF
02220 DEFB MICRO
02230 DEFB SWPGRF
02240 DEFM 'TERM'
02250 DEFB LF
02260 DEFB LF
02270 DEFB SPCOMP+10
02280 DEFM 'Intelligent'
02290 DEFB LF
02300 DEFB SPCOMP+12
02310 DEFM 'Terminal'
02320 DEFB LF
02330 DEFB SPCOMP+12
02340 DEFM 'Emulator'
02350 DEFB LF
02360 DEFB LF
02370 DEFB SPCOMP+9
02380 DEFM 'by Doug Payne'
02390 DEFB CR
02400 ;
02410 ; CHECK FOR REMOTE INPUT (RS-232)
02420 ;
02430 CHKRMT EQU $
02440 CALL KBBRK ; SCAN FOR KBD BREAK
02450 JP NZ,CHKKBD ; PROCESS KBD INPUT IF SO
02460 CALL RSRCV ; CHECK FOR INPUT
02470 JP C,CHKKBD ; CHECK KEYBOARD IF NONE
02480 CP DEL ; IS IT <DEL> ?
02490 JR Z,NDISPC ; YES - IGNORE
02500 CP ' ' ; IS IT A CONTROL CHAR ?
02510 JR NC,DISPC ; NO - DISPLAY IT
02520 LD HL,FLAGS ; YES - POINT TO FLAG BYTE
02530 ;
02540 ; CHECK FOR SPECIAL CHARACTERS
02550 ;
02560 CP CR
02570 JR Z,RMTCR ; - <CR>
02580 CP LF
02590 JR Z,RMTLF ; - <LF>
02600 CP BEL
02610 JR Z,RMTBEL ; - <BEL>
02620 CP BS
02630 JR Z,RMTBS ; - <BS>
02640 CP FF
02650 JR Z,RMTFF ; - <FF>
02660 CP TAB
02670 JR Z,RMTTAB ; - <TAB>
02680 CP ESC
02690 JR Z,RMTEsc ; - <ESC>
02700 CP STX
02710 JR NZ,NDISPC ; - <STX>
02720 ;
02730 ; HANDLE SPECIAL CONTROL CHARACTERS
02740 ;
02750 RMTSTX EQU $
02760 BIT ESCLIN,(HL) ; WAS <ESC> LAST CHARACTER ?
02770 JR Z,CHKRMT ; NO - IGNORE <STX>
02780 CALL LOADER ; YES - START LOADER

```

Listing 1 continued

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Listing 1 continued

```

02790 JR NDISPC
02800 RMTCR EQU $
02810 LD A,CURSSL ; USE CURSOR START LINE
02820 JR DISPC
02830 RMTBS EQU $
02840 LD A,CURSLT ; USE CURSOR LEFT
02850 JR DISPC
02860 RMTFF EQU $
02870 LD A,(RSBAUD) ; IF BAUD >= 1200
02880 CP B1200
02890 CALL NC,FLOOFF ; TURN OFF FLOW
02900 CALL VDCLS ; CLEAR SCREEN
02910 JR NDISPC ; NO EXTRA DISPLAY
02920 RMTBEL EQU $
02930 CALL BRINGG ; RING BELL
02940 JR NDISPC ; NO DISPLAY
02950 RMTTAB EQU $
02960 CALL TABCHR ; TAB TO NEXT STOP
02970 JR NDISPC ; NO EXTRA DISPLAY
02980 RMTESC EQU $
02990 SET ESCLIN,(HL) ; INDICATE <ESC> RECEIVED
03000 JR CHKRMT ; CHECK REMOTE AGAIN
03010 RMTLF EQU $
03020 LD A,(RSBAUD) ; TURN FLOW OFF ...
03030 CP B1200 ; ... IF BAUD >= 1200
03040 CALL NC,FLOOFF
03050 CALL LNFEED ; DISPLAY LINE FEED
03060 JR NDISPC ; NO EXTRA DISPLAY
03070 ;
03080 ; DISPLAY RECEIVED CHARACTER
03090 ;
03100 DISPC EQU $
03110 PUSH AF ; SAVE CHARACTER
03120 CALL CURCOL ; IF IN COLUMN 63 ...
03130 CP 63
03140 JR NZ,NFLOW
03150 LD A,(RSBAUD) ; AND BAUD >= 1200
03160 CP B1200
03170 CALL NC,FLOOFF ; TURN OFF FLOW
03180 NFLOW EQU $
03190 POP AF ; RESTORE CHARACTER
03200 CALL VDCHAR ; DISPLAY CHARACTER
03210 NDISPC EQU $
03220 LD HL,FLAGS ; RESET <ESC> FLAG
03230 RES ESCLIN,(HL)
03240 CALL FLOON ; TURN FLOW BACK ON
03250 JP CHKRMT ; CHECK REMOTE INPUT AGAIN
03260 ;
03270 ; CHECK KEYBOARD INPUT
03280 ;
03290 CHKKBD EQU $
03300 CALL KBCHAR ; CHECK FOR KBD CHARACTER
03310 OR A
03320 JP Z,CHKRMT ; CHECK REMOTE AGAIN IF NONE
03330 LD B,A ; SAVE CHARACTER
03340 LD HL,FLAGS ; WAS <ESC> RECEIVED ?
03350 BIT ESCKBD,(HL)
03360 JR Z,NOESC ; NO - CONTINUE
03370 RES ESCKBD,(HL) ; YES - RESET FLAG
03380 ;
03390 ; HANDLE ESCAPE CODES
03400 ;
03410 CP ESC ; IS IT DOUBLE <ESC> ?
03420 JP Z,LOGON ; YES - GO TO LOGON
03430 CP '>' ; IS IT > ?
03440 JP Z,FILERX ; YES - RECEIVE FILE
03450 CP '<' ; IS IT < ?
03460 JP Z,FILETX ; YES - SEND FILE
03470 CP 61H ; IS IT LOWER-CASE ?
03480 JR C,NOTLOW
03490 AND 255-' ' ; YES - MAKE UPPER-CASE
03500 NOTLOW EQU $
03510 CALL CVB ; IS IT '0' TO 'D' ?
03520 JR C,NOESC ; NO - TREAT AS NORMAL
03530 CP 0EH
03540 JR NC,NOESC
03550 LD B,0
03560 LD C,A
03570 LD HL,ESCHRS ; TRANSLATE
03580 ADD HL,BC
03590 LD A,(HL)
03600 CP ' ' ; IS IT NOW A CTL CHAR ?
03610 JP C,SENDC ; YES - DON'T DISPLAY
03620 LD B,A ; INDICATE DISPLAY
03630 JR SENDC ; GO SEND THE CHARACTER
03640 ;
03650 ; HANDLE STANDARD KEYBOARD INPUT
03660 ;
03670 NOESC EQU $
03680 LD A,B ; RESTORE CHARACTER

```

Listing 1 continued

RS-232; that is, they are made to display correctly on the screen when necessary. However, all control characters from the keyboard are sent to the RS-232 whether or not they are displayed. Most control characters are generated with the shift-down-arrow characters sequence described in the Model III user's manual. Those that aren't require the escape key mechanism described earlier.

Tabs are entered with the right-arrow key. Tab stops are set and cleared with shift-right arrow. To set a tab stop, position the cursor where the stop is desired and press the shift and right-arrow keys. This works as a toggle. Tab stops previously set are cleared.

“... if you select the full-duplex option, characters don't appear when they're entered. The remote computer should echo them back to you if necessary, and they are displayed as received.”

The clear key has the same effect as CTRL L: it clears the screen and sends an FF character to the RS-232 port. The up-arrow key generates a [, and pressing control-G rings the bell. Line feed is entered with the down-arrow key. Note that if you select the full-duplex option, characters don't appear when they're entered. The remote computer should echo them back to you if necessary, and they are displayed as received.

The routine TABSET at line 04530 sets or clears tab stops. An 8-byte table TABTBL (see Program Listing 6), stores tab settings. Each of the 64 bits in this table represents a column on the screen. A 1 bit signifies the presence of a tab stop. The routine TABCHR at line 04770 moves the cursor to the next tab stop. Note that once the cursor reaches the end of a line, it advances no further. The BRINGG routine at line 05420 rings the bell, and CURCOL (line 05590) computes the cursor's current screen column relative to zero.

Continued on p. 239

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Listing 1 continued

```

03690 CP ' ' ; IS IT A CONTROL CHAR ?
03700 JR NC,SENDC ; NO - JUST SEND IT
03710 LD B,0 ; INDICATE NO DISPLAY
03720 LD HL,FLAGS ; POINT TO FLAG BYTE
03730 ;
03740 ; CHECK FOR SPECIAL CHARACTERS
03750 ;
03760 CP BREAK
03770 JR Z,TXBRK ; - <BREAK>
03780 CP CR
03790 JR Z,KBDCR ; - <CR>
03800 CP BS
03810 JR Z,KBDBS ; - <BS>
03820 CP ESC
03830 JR Z,KBDESC ; - <ESC>
03840 CP LF
03850 JR Z,KBDFL ; - <LF>
03860 CP BEL
03870 JR Z,KBDBEL ; - <BEL>
03880 CP TAB
03890 JR Z,KBDTAB ; - <TAB>
03900 CP TABUPR
03910 JR Z,TABSET ; - <TAB> UPPERCASE
03920 CP FF
03930 JR Z,KBDFL ; - <FF>
03940 CP CLEAR
03950 JR NZ,SENDC ; - <CLEAR>
03960 ;
03970 ; HANDLE SPECIAL CONTROL CHARACTERS
03980 ;
03990 KBDFF EQU $
04000 BIT DUPLEX, (HL) ; FULL-DUPLEX ?
04010 CALL Z,VDCLS ; NO - CLEAR SCREEN
04020 LD A,FF ; SEND <FF>
04030 JR SENDC
04040 KBDRCR EQU $
04050 LD B,CURSSL ; DISP CURSOR START LINE
04060 JR SENDC
04070 KBDBS EQU $
04080 LD B,CURSLT ; DISPLAY CURSOR LEFT
04090 JR SENDC
04100 KBDBEL EQU $
04110 BIT DUPLEX, (HL) ; FULL-DUPLEX ?
04120 CALL Z,BRINGG ; NO - RING BELL
04130 LD B,0 ; NO DISPLAY
04140 JR SENDC
04150 KBDESC EQU $
04160 SET ESCKBD, (HL) ; INDICATE <ESC> RECEIVED
04170 JP CHRMT ; NO TX OR DISPLAY
04180 KBDTAB EQU $
04190 BIT DUPLEX, (HL) ; FULL-DUPLEX ?
04200 CALL Z,TABCHR ; NO - TAB TO NEXT STOP
04210 LD A,TAB ; SEND <TAB>
04220 LD B,0 ; NO DISPLAY
04230 JR SENDC
04240 TXBRK EQU $
04250 LD A,(RSTY) ; GET CHARACTERISTICS BYTE
04260 AND 255-TXENB ; TURN OFF TX TO SEND BREAK
04270 OUT (RSUART),A
04280 LD BC,(BRKTIM) ; DELAY 2 CHARACTER TIMES
04290 CALL DELAY
04300 LD A,(RSTY) ; TURN TRANSMIT BACK ON
04310 OUT (RSUART),A
04320 JP CHRMT ; NO TX OR DISPLAY
04330 KBDLF EQU $
04340 BIT DUPLEX, (HL) ; FULL DUPLEX ?
04350 CALL Z,LNFEE ; NO - DISPLAY LINE FEED
04360 LD A,LF ; SEND <LF>
04370 LD B,0 ; NO DISPLAY
04380 ;
04390 ; SEND RECEIVED CHARACTER TO REMOTE
04400 ;
04410 SENDC EQU $
04420 CALL RSTX ; SEND CHARACTER TO REMOTE
04430 LD A,B ; ANY DISPLAY ?
04440 OR A
04450 JP Z,CHRMT ; NO - CHECK REMOTE AGAIN
04460 LD HL,FLAGS ; FULL-DUPLEX ?
04470 BIT DUPLEX, (HL)
04480 CALL Z,VDCHAR ; NO - DISPLAY IT
04490 JP CHRMT ; CHECK REMOTE AGAIN
04500 ;
04510 ; TAB SET PROCESSING
04520 ;
04530 TABSET EQU $
04540 CALL CURCOL ; GET CURSOR COLUMN
04550 LD C,A
04560 AND 7
04570 INC A ; A = BIT OFFSET 1-8
04580 SRL C

```

Listing 1 continued

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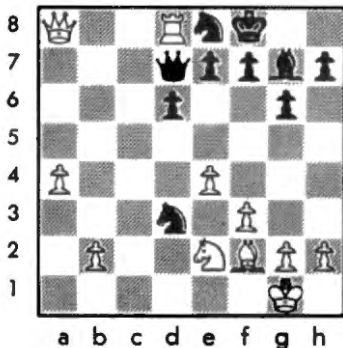
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Listing 1 continued

```
04590 SRL C
04600 SRL C
04610 LD B,0 ; C = BYTE OFFSET 0-7
04620 LD HL,TABTBL
04630 ADD HL,BC ; HL = TABLE ADDRESS
04640 LD B,A
04650 XOR A
04660 SCF
04670 TBSBIT EQU $
04680 RR A ; SET OBJECT BIT
04690 DJNZ TBSBIT
04700 LD B,(HL) ; INVERT TAB SETTING
04710 XOR B
04720 LD (HL),A
04730 JP CHRMT ; NO TX OR DISPLAY
04740 ;
04750 ;
04760 ;
04770 TABCHR EQU $
04780 CALL CURCOL ; GET CURSOR COLUMN
04790 CP 63 ; EXIT IF AT END OF LINE
04800 JR Z,TBEXIT
04810 LD C,A ; CURSOR COLUMN
04820 LD HL,TABTBL ; TAB TABLE ADDRESS
04830 XOR A ; COLUMN COUNTER
04840 LD D,B ; TAB TABLE COUNTER
04850 TBTGET EQU $
04860 LD E,(HL) ; GET TABLE BYTE
04870 LD B,B ; SHIFT COUNT
04880 PUSH AF
04890 LD A,E
04900 OR A ; IF TABLE BYTE = 0
04910 JR NZ,TBNONZ
04920 POP AF
04930 ADD A,B ; INCREMENT COL COUNT + 8
04940 JR TBNEXT ; CHECK NEXT TABLE BYTE
04950 TBNONZ EQU $
04960 POP AF
04970 TBSHFT EQU $
04980 RL E ; GET TAB SET BIT
04990 JR NC,TBOFF ; IF ON ...
05000 CP C ; IF PAST CURRENT COLUMN ...
05010 JR Z,TBOFF
05020 JR NC,TBCOMP ; HAVE NEXT TAB STOP
05030 TBOFF EQU $
05040 INC A ; INCREMENT COL COUNT
05050 DJNZ TBSHFT ; CHECK NEXT BIT
05060 TBNEXT EQU $
05070 INC HL ; POINT TO NEXT TABLE BYTE
05080 DEC D ; UNTIL ALL DONE
05090 JR NZ,TBTGET
05100 DEC A ; FORCE COL 64
05110 TBCOMP EQU $
05120 SUB C ; TAB DISTANCE
05130 LD B,A
05140 LD A,CURSRT ; TAB TO NEXT STOP
05150 TBTAB EQU $
05160 CALL VDCHAR
05170 DJNZ TBTAB
05180 TBEXIT EQU $
05190 RET ; RETURN TO CALLER
05200 ;
05210 ;
05220 ;
05230 LNFEED EQU $
05240 LD HL,(CURSAD) ; ON LINE 16 ?
05250 LD BC,VIDRAM+LIN16
05260 OR A
05270 SBC HL,BC
05280 JR C,NOSCRL ; NO - DON'T SCROLL
05290 LD A,CURSOF ; TURN OFF CURSOR
05300 CALL VDCHAR
05310 CALL SCROLL ; SCROLL UP 1 LINE
05320 LD A,CURSON ; TURN CURSOR BACK ON
05330 CALL VDCHAR
05340 RET ; RETURN TO CALLER
05350 NOSCRL EQU $
05360 LD A,CURSDN ; MOVE CURSOR DOWN
05370 CALL VDCHAR
05380 RET ; RETURN TO CALLER
05390 ;
05400 ;
05410 ;
05420 BRINGG EQU $
05430 LD C,CASPRT ; CASSETTE PORT ADDRESS
05440 LD A,1 ; INITIAL SOUND VALUE
05450 LD B,128 ; DELAY VALUE
05460 NXTWAV EQU $
05470 PUSH BC ; SAVE DELAY
05480 OUT (C),A ; OUTPUT WAVE LOGIC
```

Listing 1 continued

Listing 1 continued

```

05490      LD      B,32      ; FREQUENCY COUNTER
05500      DJNZ   $          ; WAIT A BIT
05510      XOR    3          ; FLIP WAVE LOGIC
05520      POP    BC         ; RESTORE DELAY COUNT
05530      DJNZ   NXTWAV     ; UNTIL DONE
05540      LD    A,BEL      ; RESTORE CHARACTER
05550      RET                     ; RETURN TO CALLER
05560 ;
05570 ;      COMPUTE CURRENT CURSOR COLUMN
05580 ;
05590 CURCOL EQU    $
05600      LD    HL,(CURSAD) ; GET CURSOR ADDRESS
05610      LD    DE,VIDRAM   ; MAKE RELATIVE TO 0
05620      XOR    A
05630      SBC   HL,DE
05640      LD    A,L         ; COMPUTE COLUMN
05650      AND   63
05660      RET                     ; RETURN TO CALLER
05670      END    UTERM

```

Program Listing 2

Program Listing 2 calls the Loader routine at line 00330 whenever it receives the escape key-[STX] sequence from the RS-232. It loads Intel-format object code into memory. Table 2 describes this object code. The object file must have this format for the loader to work correctly.

The lowest and highest address locations loaded are stored and displayed along with the entry point address when the load is complete. The program displays the load address of each record as it is received. A message informs you when a checksum error occurs, but the

Offset Contents

0	: (indicates start of record)
1	Two hexadecimal characters representing the length of object code in the record.
3	Four hexadecimal characters specifying the address at which the code will be loaded.
7	Two hex digits giving the record type: '00' the record contains object code. '01' end record, load address is the entry point address.
9	n pairs of hexadecimal digits containing the object code, where n is the length specified at offset 1.
9+2n	Two hexadecimal digits representing the checksum, which is such that the sum of all the bytes of code, address, length, record type, and checksum is equal to 0 modulo 256.

Table 2. Intel-format object code.

“When the load is complete, regular terminal operations resume.”

load continues. When the load is complete, regular terminal operations resume. To save the loaded code, exit to TRSDOS and use the Dump command to create a command file.

The routines GETBYT (line 01590), GETDIG (line 01790), and CVB (line 01890) read a pair of hexadecimal (hex) digits and return their binary value. The routine CVH at line 02070 converts a word to four hex digits for display.

This loader doesn't check for invalid load addresses or program code that overlays part of the terminal program. It could hang up waiting for correct data if you failed to use a valid Intel-format object file.

Program Listing 2

```

00100 ;
00110 ;      UT2/SRC
00120 ;
00130      ORG    54FAH
00140 ;
00150 ;      EXTERNALS
00160 ;
00170 RSRCV  EQU    565CH
00180 ;
00190 ;      ROM ROUTINES
00200 ;
00210 VDCLS  EQU    01C9H      ; CLEAR SCREEN
00220 ;
00230 ;      RAM ADDRESSES
00240 ;
00250 VIDRAM EQU    3C00H      ; VIDEO RAM
00260 LIN14  EQU    13<6      ; - VIDEO LINE 14
00270 LIN15  EQU    14<6      ; - VIDEO LINE 15
00280 LIN16  EQU    15<6      ; - VIDEO LINE 16
00290 ;
00300 ;      LOAD INTEL FORMAT OBJECT CODE
00310 ;      :NN AAAA TT B1 B2 ... BN CS
00320 ;
00330 LOADER EQU    $
00340      LD    HL,-1          ; SET INITIAL LOAD LIMITS
00350      LD    (LOADDR),HL
00360      INC  HL
00370      LD    (HIADDR),HL
00380      CALL VDCLS          ; DISPLAY INITIAL MESSAGE
00390      LD    HL,LDMMSG
00400      LD    DE,VIDRAM+LIN14
00410      LD    BC,LDMMSG
00420      LDIR
00430 ;
00440 ;      READ CONTROL DATA
00450 ;
00460 CONTRL EQU    $

```

Listing 2 continued

:DISTANCE=:X1: VELOCITY: *X2: TIME:

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Listing 2 continued

```

00470 CALL RSRVC ; READ A BYTE
00480 JR C,CONTRL
00490 CP ': ' ; UNTIL COLON RECEIVED
00500 JR NZ,CONTRL
00510 XOR A ; ZERO CHECKSUM BYTE
00520 LD C,A
00530 CALL GETBYT ; READ TEXT LENGTH BYTE
00540 LD B,A ; SAVE FOR LATER
00550 CALL GETBYT ; READ LOAD ADDRESS
00560 LD H,A
00570 CALL GETBYT
00580 LD L,A
00590 CALL GETBYT ; READ CONTROL BYTE
00600 CP 1 ; 1 => END CARD
00610 JR Z,LDREND
00620 OR A ; 0 => TEXT CARD
00630 JR NZ,CONTRL ; IGNORE ALL OTHER TYPES
00640 ;
00650 ; PROCESS NEW LOAD ADDRESS
00660 ;
00670 PUSH HL ; SAVE LOAD ADDRESS
00680 LD DE,(LOADDR) ; NEW LOW ?
00690 OR A
00700 SBC HL,DE
00710 POP HL
00720 JR NC,LADISP
00730 LD (LOADDR),HL ; YES - SAVE IT
00740 LADISP EQU $
00750 PUSH BC
00760 PUSH HL
00770 LD DE,LDADDR ; DISPLAY LOAD ADDRESS
00780 CALL CVH
00790 LD HL,LDADDR
00800 LD DE,VIDRAM+LIN14+LDMSGL
00810 LD BC,4
00820 LDIR
00830 POP HL
00840 POP BC
00850 LD A,B ; LOAD LENGTH = 0 ?
00860 OR A
00870 JR Z,CHKSUM ; YES - PROCESS CHKSUM BYTE
00880 ;
00890 ; LOAD OBJECT TEXT
00900 ;
00910 TEXT EQU $
00920 CALL GETBYT ; READ OBJECT BYTE
00930 LD (HL),A ; LOAD OBJECT BYTE
00940 INC HL ; INCREMENT LOAD ADDRESS
00950 DJNZ TEXT ; DECREMENT LOAD LENGTH
00960 PUSH HL ; SAVE LOAD ADDRESS
00970 LD DE,(HIADDR) ; HAVE NEW HIGH ?
00980 OR A
00990 SBC HL,DE
01000 POP HL
01010 JR C,CHKSUM
01020 LD (HIADDR),HL ; YES - SAVE IT
01030 ;
01040 ; CHECKSUM BYTE IS NEXT
01050 ;
01060 CHKSUM EQU $
01070 CALL GETBYT ; READ CHECKSUM BYTE
01080 LD A,C ; CHECKSUM = 0 ?
01090 OR A
01100 JR Z,CONTRL ; YES - CONTINUE LOAD
01110 LD HL,LDADDR ; NO - DISPLAY WARNING
01120 LD DE,CSUMAD
01130 LD BC,4
01140 LDIR
01150 LD HL,CSUMER
01160 LD DE,VIDRAM+LIN15
01170 LD BC,CSUMEL
01180 LDIR
01190 JR CONTRL ; LOOK FOR NEXT CARD
01200 ;
01210 ; END CARD ENCOUNTERED
01220 ;
01230 LDREND EQU $
01240 CALL GETBYT ; READ LAST CHECKSUM BYTE
01250 LD DE,LDTRA ; INSERT TRA IN MESSAGE
01260 CALL CVH
01270 LD HL,(LOADDR) ; INSERT START IN MESSAGE
01280 LD DE,LDSTA
01290 CALL CVH
01300 LD HL,(HIADDR) ; INSERT END IN MESSAGE
01310 DEC HL
01320 LD DE,LDEND
01330 CALL CVH
01340 LD HL,LDONE ; DISPLAY DONE MESSAGE
01350 LD DE,VIDRAM+LIN16
01360 LD BC,LDONEL

```

Listing 2 continued

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Listing 2 continued

```

01370 LDIR
01380 RET ; RETURN TO CALLER
01390 ;
01400 ; LOADER MESSAGES
01410 ;
01420 LOADDR DEFW -1 ; LOWEST ADDRESS LOADED
01430 HIADDR DEFW 0 ; HIGHEST ADDRESS LOADED
01440 LDMSG DEFM 'Loading '
01450 LDMSG EQU $-LDMSG
01460 LDADDR DEFM 'NNNN'
01470 CSUMER DEFM 'Checksum error near '
01480 CSUMAD DEFM 'NNNN'
01490 CSUMEL EQU $-CSUMER
01500 LDONE DEFM 'Load complete: START='
01510 LDSTA DEFM 'NNNN,END='
01520 LDEND DEFM 'NNNN,TRA='
01530 LDTRA DEFM 'NNNN'
01540 LDONEL EQU $-LDONE
01550 ;
01560 ; READ 2 HEX DIGITS
01570 ; CONVERT TO BINARY, RETURN IN A
01580 ;
01590 GETBYT EQU $
01600 PUSH DE ; SAVE REGISTER
01610 CALL GETDIG ; GET HIGH DIGIT
01620 SLA A ; SHIFT LEFT 4
01630 SLA A
01640 SLA A
01650 SLA A
01660 LD D,A ; SAVE HIGH NIBBLE
01670 CALL GETDIG ; GET LOW DIGIT
01680 OR D ; COMBINE NIBBLES
01690 PUSH AF ; SAVE BYTE
01700 ADD A,C ; ADD TO CHECKSUM
01710 LD C,A ; RESTORE CHECKSUM
01720 POP AF ; RESTORE BYTE
01730 POP DE ; RESTORE REGISTER
01740 RET ; RETURN TO CALLER
01750 ;
01760 ; READ 1 HEX DIGIT
01770 ; CONVERT TO BINARY, RETURN IN A
01780 ;
01790 GETDIG EQU $
01800 CALL RSRVC ; READ A BYTE
01810 JR C,GETDIG
01820 CALL CVB ; CONVERT TO BINARY
01830 JR C,GETDIG ; IGNORE IF NOT HEX DIGIT
01840 RET ; RETURN TO CALLER
01850 ;
01860 ; CONVERT HEX DIGIT IN A TO BINARY
01870 ; RETURN RESULT IN A, CARRY SET IF ERROR
01880 ;
01890 CVB EQU $
01900 SUB '0' ; IS IT < '0' ?
01910 JR C,CVBRET ; YES - ERROR
01920 ADD A,'0'-'G' ; IS IT > 'F' ?
01930 JR C,CVBRET ; YES - ERROR
01940 ADD A,6 ; IS IT 'A' TO 'F' ?
01950 JP P,CVBADJ ; YES - OK
01960 ADD A,7 ; IS IT '0' TO '9' ?
01970 JR C,CVBRET ; NO - ERROR
01980 CVBADJ EQU $
01990 ADD A,10 ; MAKE IT BINARY
02000 OR A ; INDICATE NO ERROR
02010 CVBRET EQU $
02020 RET ; RETURN TO CALLER
02030 ;
02040 ; CONVERT WORD IN HL TO 4 HEX DIGITS
02050 ; PLACE RESULT (DE)
02060 ;
02070 CVH EQU $
02080 LD C,4 ; DIGIT COUNTER
02090 CVH1 EQU $
02100 LD B,4 ; SHIFT COUNTER
02110 CVH2 EQU $
02120 RL L ; SHIFT NEXT DIGIT INTO A
02130 RL H
02140 RL A
02150 DJNZ CVH2
02160 AND 0FH ; ISOLATE DIGIT
02170 OR '0' ; MAKE HEX CHAR
02180 CP '9'+1 ; IS IT A - F ?
02190 JR C,NOAPLH
02200 ADD A,'A'-'9'-1 ; YES - ADJUST
02210 NOAPLH EQU $
02220 LD (DE),A ; SAVE IN OUTPUT AREA
02230 INC DE ; INCREMENT OUTPUT PTR
02240 DEC C ; DECREMENT DIGIT COUNT
02250 JR NZ,CVH1 ; UNTIL DONE
02260 RET ; RETURN TO CALLER
02270 END

```

Program Listing 3

This part of the program contains the RS-232 I/O drivers and receive interrupt handler. Interrupts allow the RS-232 interface to function at a high transmission rate without the possibility of losing characters. The I/O drivers also properly handle XON/XOFF flow control. This form of protocol is very useful in transferring data at high speed. In fact, some computer network interfaces don't function properly without it.

The protocol states that the sending system must stop transmitting immediately upon receipt of the XOFF character (X'13'), and may resume transmission when it receives an XON signal (X'11'). In reality, most computers can't stop sending immediately, because it may be impossible to halt characters

“This form of protocol is very useful in transferring data at high speeds. In fact, some computer network interfaces don't function properly without it.”

in the process of being sent. For this reason, the receiving system must be prepared to accept some additional data after sending XOFF.

Characters received at the RS-232 interface are read by the interrupt handler RXINT (line 00880) and stored in a 256-byte circular buffer IBUFF (see Program Listing 6). Pointers address the next available spot in the buffer and the oldest character in the buffer (IBUFI and IBUFO). The counter IBUFC contains the current number of characters in the buffer.

When this count approaches an upper limit (240 in this case), FLOOFF at line 01460 is called to halt the incoming flow of data. Because the remote computer supports XON/XOFF flow control, no characters are lost due to the main program's inability to empty the buffer as fast as it is filled. This is particularly useful, if data is received while one of the menus is displayed.

The main program receives and processes characters through calls to

Program Listing 3

```

00100 ;
00110 ;      UT3/SRC
00120 ;
00130      ORG      565CH
00140 ;
00150 ;      EXTERNALS
00160 ;
00170 BRKTIM EQU      6036H
00180 FLAGS EQU      6033H
00190 IBUFC EQU      607AH
00200 IBUFE EQU      617DH
00210 IBUFF EQU      607DH
00220 IBUFI EQU      6076H
00230 IBUFO EQU      6078H
00240 ;
00250 ;      PORT ADDRESSES
00260 ;
00270 RSUART EQU      0EAH      ; RS-232 UART CONTROL
00280 TXDONE EQU      40H      ; - TRANSMIT BUFFER EMPTY
00290 RSBUFF EQU      0EBH      ; RS-232 DATA
00300 ;
00310 ;      ROM ROUTINES
00320 ;
00330 DELAY EQU      0060H      ; DELAY FOR SPECIFIED TIME
00340 ;
00350 ;      ASCII CHARACTERS
00360 ;
00370 PARBIT EQU      80H      ; PARITY BIT
00380 XON EQU      11H      ; AUX ON (CTRL-Q)
00390 XOFF EQU      13H      ; AUX OFF (CTRL-S)
00400 ;
00410 ;      FLAG BITS
00420 ;
00430 DUPLEX EQU      0      ; - FULL DUPLEX
00440 ESCRBD EQU      1      ; - <ESC> RECEIVED FROM KBD
00450 ESCLIN EQU      2      ; - <ESC> REC' D FROM REMOTE
00460 XOFFTX EQU      3      ; - <XOFF> SENT TO REMOTE
00470 CRTX EQU      4      ; - <CR> SENT TO REMOTE
00480 XOFFRX EQU      5      ; - <XOFF> REC' D FROM RMT
00490 ;
00500 ;      RS-232 RECEIVE ROUTINE
00510 ;      RETURN CHARACTER IN A OR CARRY SET IF NONE
00520 ;
00530 RSRCV EQU      $
00540      DI      ; DISABLE INTERRUPTS
00550      PUSH HL      ; ; SAVE REGISTERS
00560      PUSH DE
00570      PUSH BC
00580      LD      A,(IBUFC)      ; ; GET INPUT BUFFER COUNT
00590      OR      A      ; ; CHECK IF NON-ZERO
00600      JR      NZ,GETINP      ; ; CONTINUE IF HAVE INPUT
00610      SCF      ; ; OTHERWISE INDICATE NONE
00620      JR      RSRVCVE      ; ; EXIT
00630 GETINP EQU      $
00640      DEC      A      ; ; DECREMENT INPUT COUNT
00650      LD      (IBUFC),A      ; ; SAVE NEW COUNT
00660      LD      HL,(IBUFO)      ; ; GET BUFFER OUTPUT PTR
00670      LD      A,(HL)      ; ; GET NEXT CHARACTER
00680      INC      HL      ; ; INCREMENT PTR
00690      LD      (IBUFO),HL      ; ; SAVE NEW PTR
00700      LD      DE,IBUFE      ; ; CHECK FOR WRAP
00710      OR      A
00720      SBC      HL,DE
00730      JR      NZ,NOOWRP
00740      LD      HL,IBUFF      ; ; WRAP TO START IF AT END
00750      LD      (IBUFO),HL
00760 NOOWRP EQU      $
00770      OR      A      ; ; CLEAR CARRY BIT
00780 RSRVCVE EQU      $
00790      POP      BC      ; ; RESTORE REGISTERS
00800      POP      DE
00810      POP      HL
00820      EI      ; ; ENABLE INTERRUPTS
00830      CALL   FLOON      ; ; RESUME FLOW IF NECESSARY
00840      RET      ; ; RETURN TO CALLER
00850 ;
00860 ;      RS-232 RECEIVE INTERRUPT HANDLER
00870 ;
00880 RXINT EQU      $
00890      IN      A,(RSBUFF)      ; ; READ CHARACTER
00900      AND      255-PARBIT      ; ; CLEAR PARITY BIT
00910      LD      HL,FLAGS      ; ; FLAGS ADDRESS
00920      CP      XOFF      ; ; IS IT <XOFF> ?
00930      JR      NZ,CHKXON      ; ; NO - CONTINUE
00940      BIT      XOFFRX,(HL)      ; ; YES - FLOW ALREADY OFF ?
00950      JR      NZ,RXIBUF      ; ; YES - KEEP <XOFF>
00960      SET      XOFFRX,(HL)      ; ; NO - INDICATE RECEIVED
00970      JR      RXINTE      ; ; EXIT
00980      CHKXON EQU      $

```

Listing 3 continued

RSRCV at line 00530. This routine returns the next character from the input buffer, or, if none is available, sets the Carry flag to indicate that. FLOON at line 01720 resumes input if the number of characters in the input buffer decreases to a safe level.

The routine RSTX (line 01280) outputs characters to the RS-232 interface. It does so only if an XOFF is not received previously from the remote computer, thus maintaining its own flow control support. If the flow halts, RSTX waits until it receives an XON before sending the character and returning.

This section of code shows one of the flaws of this form of flow control. If an XOFF is sent (perhaps inadvertently as data), without being followed by an XON at some later time, the data flow is permanently suspended. This is a significant problem, particularly in computer networks, where large numbers of systems and differing forms of data are involved. One possible solution would be to ignore the XOFF and resume output if no corresponding XON is received within a reasonable amount of time.

The FLOOFF routine turns off remote input by transmitting an XOFF character. This only occurs if XOFF is not already sent with no corresponding XON. A four-character time delay lets the computer receive any characters in transit before returning to the caller.

FLOON is the counterpart of FLOOFF. It allows input to resume by sending an XON to the remote system. This happens only if an XOFF is previously sent to halt input, and if the input buffer contains fewer than 128 characters.

Listing 3 continued

```

00990 CP XON ;;; IS IT <XON> ?
01000 JR NZ,RXIBUF ;;; NO - CONTINUE
01010 BIT XOFFRX,(HL) ;;; YES - WAS FLOW OFF ?
01020 JR Z,RXIBUF ;;; NO - KEEP <XON>
01030 RES XOFFRX,(HL) ;;; YES - IND OK TO SEND
01040 JR RXINTE ;;; EXIT
01050 RXIBUF EQU $
01060 LD HL,(IBUFI) ;;; GET INPUT PTR
01070 LD (HL),A ;;; ADD CHARACTER TO BUFFER
01080 INC HL ;;; INCREMENT PTR
01090 LD (IBUFI),HL ;;; SAVE NEW PTR
01100 LD DE,IBUFE ;;; CHECK FOR WRAP
01110 OR A
01120 SBC HL,DE
01130 JR NZ,NOIWRP
01140 LD HL,IBUFF ;;; WRAP TO START IF AT END
01150 LD (IBUFI),HL
01160 NOIWRP EQU $
01170 LD A,(IBUFC) ;;; INCREMENT BUFFER COUNT
01180 INC A
01190 LD (IBUFC),A
01200 CP 240 ;;; BUFFER NEARLY FULL ?
01210 CALL Z,FLOOFF ;;; YES - TURN OFF FLOW
01220 RXINTE EQU $
01230 RET ;;; RETURN TO SYSTEM
01240 ;
01250 ; RS-232 TRANSMIT ROUTINE
01260 ; SEND CHARACTER IN A TO REMOTE
01270 ;
01280 RSTX EQU $
01290 PUSH HL ; SAVE REGISTER
01300 LD HL,FLAGS ; FLAGS ADDRESS
01310 FLOTST EQU $
01320 BIT XOFFRX,(HL) ; FLOW OFF ?
01330 JR NZ,FLOTST ; YES - WAIT FOR <XON>
01340 POP HL ; RESTORE REGISTER
01350 PUSH AF ; SAVE CHARACTER
01360 TXTST EQU $
01370 IN A,(RSUART) ; WAIT FOR TRANSMITTER READY
01380 AND TXDONE
01390 JR Z,TXTST
01400 POP AF ; RESTORE CHARACTER
01410 OUT (RSBUFF),A ; SEND CHARACTER
01420 RET ; RETURN TO CALLER
01430 ;
01440 ; SEND <XOFF> TO HALT RS-232 INPUT
01450 ;
01460 FLOOFF EQU $
01470 PUSH AF ; SAVE REGISTERS
01480 PUSH BC
01490 PUSH HL
01500 DI ; DISABLE INTERRUPTS
01510 LD HL,FLAGS ;;; <XOFF> ALREADY SENT ?
01520 BIT XOFFTX,(HL)
01530 JR NZ,FLOOFF ;;; YES - DON'T SEND ANOTHER
01540 SET XOFFTX,(HL) ;;; NO - INDICATE BEING SENT
01550 EI ;;; ENABLE INTERRUPTS
01560 LD A,XOFF ; SEND XOFF
01570 CALL RSTX
01580 LD HL,(BRKTIM) ; DELAY 4 CHARACTER TIMES
01590 ADD HL,HL
01600 PUSH HL
01610 POP BC
01620 CALL DELAY
01630 FLOOFF EQU $
01640 EI ; ENABLE INTERRUPTS
01650 POP HL ; RESTORE REGISTERS
01660 POP BC
01670 POP AF
01680 RET ; RETURN TO CALLER
01690 ;
01700 ; SEND <XON> TO RESUME RS-232 INPUT
01710 ;
01720 FLOON EQU $
01730 PUSH AF ; SAVE REGISTERS
01740 PUSH HL
01750 DI ; DISABLE INTERRUPTS
01760 LD HL,FLAGS ;;; WAS <XOFF> SENT ?
01770 BIT XOFFTX,(HL)
01780 JR Z,FLOONE ;;; NO - DON'T SEND <XON>
01790 LD A,(IBUFC) ;;; BUFFER COUNT > 127
01800 CP 128
01810 JR NC,FLOONE ;;; NO - DON'T SEND <XON>
01820 RES XOFFTX,(HL) ;;; YES - RESET FLAG
01830 EI ;;; ENABLE INTERRUPTS
01840 LD A,XON ; SEND <XON>
01850 CALL RSTX
01860 FLOONE EQU $
01870 EI ; ENABLE INTERRUPTS
01880 POP HL ; RESTORE REGISTERS
01890 POP AF
01900 RET ; RETURN TO CALLER
01910 END

```

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Program Listing 4

This section of the program contains the various menus and associated routines to select terminal characteristics, start terminal emulation, or terminate the program. (The file transfer menus are contained in Program Listing 5).

Each routine calls MENDSP at line 004760 to display its menu, prompt for a response, and return the value of the response.

MENDSP requires, as parameters, the address of the menu to be displayed, the option number which is to be the default, and the maximum option number that can be selected. It returns to the caller the number of the option selected less one. (This makes it easier for the calling routine to index into a table of values or addresses with the result.) MENDSP displays the menu until a valid response is entered.

LOGON (line 00920) displays the main menu from which other menus are chosen, terminal emulation started, the profile created, or control returned to TRSDOS.

SLBAUD (line 01630) allows selection of the RS-232 baud rate. Eight values are allowed from a possible 16, ranging from 110 to 19,200 baud. When the desired rate is chosen, it is inserted into the main menu for display. The break signal timer value is set at this time, along with the actual data output to the baud rate control port. These values are saved in BRKTIM and RSBAUD (see Listing 6). If you want to alter this menu to allow other baud rates, note that you also have to update the tables at BDTABL, CBDTAB, and BRKTTB.

Program Listing 4

```

00100 ;
00110 ;           UT4/SRC
00120 ;
00130 ;           ORG      5720H
00140 ;
00150 ;           EXTERNALS
00160 ;
00170 BRKTIM EQU      6036H
00180 CHKRMT EQU      5307H
00190 FLAGS  EQU      6033H
00200 RSBAUD EQU      6034H
00210 RSTYPE EQU      6035H
00220 SAVPRF EQU      5DCBH
00230 SLFPRM EQU      5BEAH
00240 SPSAVE EQU      607BH
00250 ;
00260 ;           PORT ADDRESSES
00270 ;
00280 IMPORT EQU      0E0H           ; INTERRUPT MASKS
00290 RXIENB EQU      20H           ; - ENABLE RS-232 RX
00300 RTCENB EQU      04H           ; - ENABLE RTC INTERRUPTS
00310 RSPTST EQU      0E8H           ; RS-232 MASTER RESET
00320 MSTRST EQU      02H           ; - MASTER RESET, UART CTL
00330 RSBKRG EQU      0E9H           ; RS-232 BAUD RATE
00340 B110   EQU      022H
00350 B150   EQU      044H
00360 B300   EQU      055H
00370 B1200  EQU      077H
00380 B2400  EQU      0AAH
00390 B4800  EQU      0CCH
00400 B9600  EQU      0EEH
00410 B19200 EQU      0FFH
00420 RSUART EQU      0EAH           ; RS-232 UART CONTROL
00430 PAREVN EQU      80H           ; - EVEN PARITY
00440 SB1    EQU      00H           ; - 1 STOP BIT
00450 SB2    EQU      10H           ; - 2 STOP BITS
00460 PARDIS EQU      08H           ; - PARITY DISABLE
00470 ;
00480 ;           ROM ROUTINES
00490 ;
00500 VDCHAR EQU      0033H           ; DISPLAY CHAR ON SCREEN
00510 KBWAIT EQU      0049H           ; WAIT FOR KEYBOARD INPUT
00520 DELAY  EQU      0060H           ; DELAY FOR SPECIFIED TIME
00530 INITIO EQU      0069H           ; INITIALIZE I/O DRIVERS
00540 VDCLS  EQU      01C9H           ; CLEAR SCREEN
00550 VDLINE EQU      021BH           ; DISPLAY LINE ON SCREEN
00560 ;
00570 ;           RAM ADDRESSES
00580 ;
00590 CURSBL EQU      401CH           ; CURSOR BLINK (0=BLINK)
00600 CURSCH EQU      4023H           ; CURSOR CHARACTER
00610 SYSTEM EQU      402DH           ; SYSTEM RETURN JUMP ADDRESS
00620 ;
00630 ;           ASCII CHARACTERS
00640 ;
00650 ETX    EQU      03H           ; END OF TEXT (CTRL-C)
00660 LF     EQU      0AH           ; LINE-FEED
00670 CR     EQU      0DH           ; CARRIAGE RETURN (ENTER)
00680 ;
00690 ;           SCREEN CHARACTERS
00700 ;
00710 CURSON EQU      0EH           ; CURSOR ON
00720 SWPGRF EQU      15H           ; SWAP TO GRAPHICS CHARS
00730 CURSHM EQU      1CH           ; CURSOR HOME
00740 CLSCRN EQU      1FH           ; CLEAR TO END OF SCREEN
00750 CBLOCK EQU      08FH           ; CURSOR BLOCK CHARACTER
00760 SPCOMP EQU      0C0H           ; SPACE COMPRESSION CHARS
00770 PTR1   EQU      0F4H           ; GRAPHIC HAND POINTER
00780 PTR2   EQU      0F5H
00790 PTR3   EQU      0F6H
00800 ;
00810 ;           FLAG BITS
00820 ;
00830 DUPLEX EQU      0           ; - FULL DUPLEX
00840 ESKKBD EQU      1           ; - <ESC> RECEIVED FROM KBD
00850 ESCLIN EQU      2           ; - <ESC> RECV'D FROM REMOTE
00860 XOFFTX EQU      3           ; - <XOFF> SENT TO REMOTE
00870 CRTX   EQU      4           ; - <CR> SENT TO REMOTE
00880 XOFFRX EQU      5           ; - <XOFF> RECV'D FROM RMT
00890 ;
00900 ;           GET INITIALIZATION PARAMETERS
00910 ;
00920 LOGON  EQU      $
00930 LD     HL,MNMENU           ; DISP MENU - READ RESPONSE
00940 LD     BC,0609H           ; DEFAULT 6, MAX 9
00950 CALL MENDSP
00960 SLA    C                   ; GET PROCESSOR ADDRESS
00970 LD     IX,LGPROC
00980 ADD   IX,BC
00990 LD     H,(IX+1)

```

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Listing 4 continued

Listing 4 continued

```

01000 LD L,(IX+0)
01010 JP (HL) ; GO TO PROCESSOR
01020 ;
01030 ; LOGON MENU PROCESSORS
01040 ;
01050 LGPROC EQU $
01060 DEFW SLBAUD
01070 DEFW SLPRTY
01080 DEFW SLSTPS
01090 DEFW SLDUPL
01100 DEFW SLCURS
01110 DEFW SLSTRT
01120 DEFW SLFPRM
01130 DEFW SAVPRF
01140 DEFW SYSRET
01150 ;
01160 ; MAIN LOGON MENU
01170 ;
01180 MNMENU EQU $
01190 DEFB CURSON
01200 DEFB CURSHM
01210 DEFB CLSCRN
01220 DEFM 'Current values shown in (...)'
01230 DEFB LF
01240 DEFB LF
01250 DEFB SPCOMP+4
01260 DEFM '1 - Set BAUD rate ('
01270 CBDMMSG DEFM '300) '
01280 DEFB LF
01290 DEFB SPCOMP+4
01300 DEFM '2 - Set parity ('
01310 CPMSG DEFM 'EVEN)'
01320 DEFB LF
01330 DEFB SPCOMP+4
01340 DEFM '3 - Set stop bits ('
01350 CSTMSG DEFM '1)'
01360 DEFB LF
01370 DEFB SPCOMP+4
01380 DEFM '4 - Set duplex ('
01390 CDMSG DEFM 'HALF)'
01400 DEFB LF
01410 DEFB SPCOMP+4
01420 DEFM '5 - Set cursor'
01430 DEFB LF
01440 DEFB SWPGRF
01450 DEFB PTR1
01460 DEFB PTR2
01470 DEFB PTR3
01480 DEFB SWPGRF
01490 DEFM '6 - Start terminal emulation'
01500 DEFB LF
01510 DEFB SPCOMP+4
01520 DEFM '7 - Set file transfer parameters'
01530 DEFB LF
01540 DEFB SPCOMP+4
01550 DEFM '8 - Save terminal PROFILE'
01560 DEFB LF
01570 DEFB SPCOMP+4
01580 DEFM '9 - Return to TRSDOS'
01590 DEFB CR
01600 ;
01610 ; DISPLAY BAUD RATE MENU
01620 ;
01630 SLBAUD EQU $
01640 LD HL,BDMENU ; DISP MENU, READ RESPONSE
01650 LD BC,0308H ; DEFAULT 3, MAX 8
01660 CALL MENDSP
01670 LD HL,BDTABL ; SET BAUD RATE
01680 ADD HL,BC
01690 LD A,(HL)
01700 LD (RSBAUD),A
01710 PUSH BC ; INDEX * 6
01720 POP HL
01730 ADD HL,HL ; - * 2
01740 ADD HL,BC ; - * 3
01750 ADD HL,HL ; - * 6
01760 PUSH HL
01770 SLA C ; INDEX * 2
01780 LD HL,BRKTBT ; SET BREAK TIMER
01790 ADD HL,BC
01800 LD DE,BRKTIM
01810 LD BC,2
01820 LDIR
01830 POP BC
01840 LD HL,CBDTAB ; INSERT IN OPTIONS MSG
01850 ADD HL,BC
01860 LD DE,CBDMMSG
01870 LD BC,6
01880 LDIR
01890 JP LOGON ; RETURN TO MAIN MENU
01900 ;

```

Listing 4 continued

SLPRTY (line 02570) changes the terminal parity to even, odd, or none. Even parity is the default. The program enters the new parity into the main menu for display and also includes it in the variable RSTYPE.

SLSTPS (line 03130) chooses the number of stop bits to be used. Normally, 1 stop bit is sufficient; 2 stop bits are used mainly in conjunction with 110 baud. As with baud and parity, the new setting is saved for display in the main menu and in RSTYPE.

SLCURS (line 03560) changes from half-duplex operation to full-duplex and vice versa. In half-duplex mode, characters entered at the keyboard display immediately on the screen. No display occurs with full-duplex. The new value is saved in the main menu, and the Duplex flag in Flags reflects the new setting.

SLDUPL (line 03990) allows the use of one of four different cursors. The cursor can be either an underscore or a block, blinking or nonblinking. The system locations CURSCH and CURSBL set the cursor type.

SLSTRT (line 04480) is called when you select the default option from the main menu. The RS-232 interface is re-initialized to reflect any changes in baud rate, parity, or stop bits. RS-232 receiver interrupts are enabled, the screen is cleared, and terminal emulation mode is entered.

SYSRET (line 04620) returns control to TRSDOS. RS-232 interrupts are disabled to prevent spurious interrupts after the program is terminated, I/O drivers are restored by a call to INITIO, and control returns to the system.

Continued on p. 252

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Listing 4 continued

```

01910 ;      BAUD RATE MENU
01920 ;
01930 BDMENU EQU      $
01940 DEFNB CURSHM
01950 DEFNB CLSCRN
01960 DEFNB 'BAUD rate selection:'
01970 DEFNB LF
01980 DEFNB LF
01990 DEFNB LF
02000 DEFNB SPCOMP+4
02010 DEFNB '1 - 110'
02020 DEFNB LF
02030 DEFNB SPCOMP+4
02040 DEFNB '2 - 150'
02050 DEFNB LF
02060 DEFNB SWPGRF
02070 DEFNB PTR1
02080 DEFNB PTR2
02090 DEFNB PTR3
02100 DEFNB SWPGRF
02110 DEFNB '3 - 300'
02120 DEFNB LF
02130 DEFNB SPCOMP+4
02140 DEFNB '4 - 1200'
02150 DEFNB LF
02160 DEFNB SPCOMP+4
02170 DEFNB '5 - 2400'
02180 DEFNB LF
02190 DEFNB SPCOMP+4
02200 DEFNB '6 - 4800'
02210 DEFNB LF
02220 DEFNB SPCOMP+4
02230 DEFNB '7 - 9600'
02240 DEFNB LF
02250 DEFNB SPCOMP+4
02260 DEFNB '8 - 19200'
02270 DEFNB CR
02280 ;
02290 ;      BAUD RATE SETTING TABLE
02300 ;
02310 BDTABL EQU      $
02320 DEFNB B110
02330 DEFNB B150
02340 DEFNB B300
02350 DEFNB B1200
02360 DEFNB B2400
02370 DEFNB B4800
02380 DEFNB B9600
02390 DEFNB B19200
02400 CBDTAB DEFNB '110) 150) 300) 1200)'
02410 DEFNB '2400) 4800) 9600) 19200)'
02420 ;
02430 ;      BREAK TIMER TABLE
02440 ;
02450 BRKTTB EQU      $
02460 DEFNB 3333H ; 2/10 SEC.
02470 DEFNB 2222H ; 2/15 SEC.
02480 DEFNB 1111H ; 2/30 SEC.
02490 DEFNB 0444H ; 2/120 SEC.
02500 DEFNB 0222H ; 2/240 SEC.
02510 DEFNB 0111H ; 2/480 SEC.
02520 DEFNB 0089H ; 2/960 SEC.
02530 DEFNB 0044H ; 2/1920 SEC.

```

```

02540 ;
02550 ;      DISPLAY PARITY MENU
02560 ;
02570 SLPRTY EQU      $
02580 LD      HL,PRMENU ; DISP MENU, READ RESPONSE
02590 LD      BC,0103H ; DEFAULT 1, MAX 3
02600 CALL   MENDSP
02610 LD      HL,PRTABL ; GET PARITY SETTING
02620 ADD    HL,BC
02630 LD      A,(RSTYPE)
02640 AND    255-PAREVN-PARDIS
02650 OR     (HL) ; SET NEW PARITY
02660 LD      (RSTYPE),A
02670 PUSH  BC ; INDEX * 4
02680 POP   HL
02690 ADD  HL,HL
02700 ADD  HL,HL
02710 PUSH HL
02720 POP  BC
02730 LD   HL,CPTAB ; INSERT IN OPTIONS MSG
02740 ADD  HL,BC
02750 LD   DE,CMSG
02760 LD   BC,4
02770 LDIR
02780 JP   LOGON ; RETURN TO MAIN MENU
02790 ;
02800 ;      PARITY MENU
02810 ;
02820 PRMENU EQU      $
02830 DEFNB CURSHM
02840 DEFNB CLSCRN
02850 DEFNB 'Parity selection:'
02860 DEFNB LF
02870 DEFNB LF
02880 DEFNB LF
02890 DEFNB SWPGRF
02900 DEFNB PTR1
02910 DEFNB PTR2
02920 DEFNB PTR3
02930 DEFNB SWPGRF
02940 DEFNB '1 - Even parity'
02950 DEFNB LF
02960 DEFNB SPCOMP+4
02970 DEFNB '2 - Odd parity'
02980 DEFNB LF
02990 DEFNB SPCOMP+4
03000 DEFNB '3 - No parity'
03010 DEFNB CR
03020 ;
03030 ;      PARITY SETTING TABLE
03040 ;
03050 PRTABL EQU      $
03060 DEFNB PAREVN ; 1 - EVEN PARITY
03070 DEFNB 0 ; 2 - ODD PARITY
03080 DEFNB PARDIS ; 3 - NO PARITY (DISABLED)
03090 CPTAB DEFNB 'EVEN ODDNONE'
03100 ;
03110 ;      DISPLAY STOP BITS MENU
03120 ;
03130 SLSTPS EQU      $
03140 LD      HL,SBMENU ; DISP MENU, READ RESPONSE
03150 LD      BC,0102H ; DEFAULT 1, MAX 2

```

Listing 4 continued

```

03160      CALL      MENDSP
03170      LD        HL,STPTAB      ; GET STOP BIT SETTING
03180      ADD       HL,BC
03190      LD        A,(RSTYPE)      ; CLEAR OLD SETTING
03200      AND       255-SB2
03210      OR        (HL)           ; SET NEW ONE
03220      LD        (RSTYPE),A
03230      LD        A,C             ; CONVERT TO CHARACTER
03240      ADD       A,'1'
03250      LD        (CSTMSG),A     ; INSERT IN OPTIONS MSG
03260      JP        LOGON          ; RETURN TO MAIN MENU
03270 ;
03280 ;      STOP BIT MENU
03290 ;
03300 SBMENU EQU      $
03310      DEFB     CURSHM
03320      DEFB     CLSCRN
03330      DEFM     'Stop bit selection:'
03340      DEFB     LF
03350      DEFB     LF
03360      DEFB     LF
03370      DEFB     SWPGRF
03380      DEFB     PTR1
03390      DEFB     PTR2
03400      DEFB     PTR3
03410      DEFB     SWPGRF
03420      DEFM     ' 1 - 1 stop bit'
03430      DEFB     LF
03440      DEFB     SPCOMP+4
03450      DEFM     '2 - 2 stop bits'
03460      DEFB     CR
03470 ;
03480 ;      STOP BIT SETTING TABLE
03490 ;
03500 STPTAB EQU      $
03510      DEFB     SB1
03520      DEFB     SB2
03530 ;
03540 ;      DISPLAY HALF/FULL DUPLEX MENU
03550 ;
03560 SLDUPL EQU      $
03570      LD        HL,DPMENU      ; DISP MENU, READ RESPONSE
03580      LD        BC,0102H      ; DEFAULT 1, MAX 2
03590      CALL     MENDSP
03600      LD        A,(FLAGS)      ; CLEAR CURRENT DUPLEX
03610      RES      DUPLEX,A
03620      OR        C             ; MAKE NEW SETTING
03630      LD        (FLAGS),A
03640      LD        A,C
03650      LD        HL,CDHALF     ; ASSUME HALF DUPLEX
03660      OR        A
03670      JR        Z,MOVDUP
03680      LD        HL,CDFULL     ; MAKE FULL IF SO
03690      MOVDUP EQU      $
03700      LD        DE,CDMSG       ; INSERT IN OPTIONS MSG
03710      LD        BC,4
03720      LDIR
03730      JP        LOGON          ; RETURN TO MAIN MENU
03740 ;

```

```

03750 ;      DUPLEX MENU
03760 ;
03770 DPMENU EQU      $
03780      DEFB     CURSHM
03790      DEFB     CLSCRN
03800      DEFM     'Terminal duplex selection:'
03810      DEFB     LF
03820      DEFB     LF
03830      DEFB     LF
03840      DEFB     SWPGRF
03850      DEFB     PTR1
03860      DEFB     PTR2
03870      DEFB     PTR3
03880      DEFB     SWPGRF
03890      DEFM     ' 1 - Half-duplex'
03900      DEFB     LF
03910      DEFB     SPCOMP+4
03920      DEFM     '2 - Full-duplex'
03930      DEFB     CR
03940      CDHALF DEFM     'HALF'
03950      CDFULL DEFM     'FULL'
03960 ;
03970 ;      DISPLAY CURSOR MENU
03980 ;
03990 SLCURS EQU      $
04000      LD        HL,CRMENU      ; DISP MENU, READ RESPONSE
04010      LD        BC,0304H      ; DEFAULT 3, MAX 4
04020      CALL     MENDSP
04030      LD        A,C             ; GET SETTING
04040      LD        B,CBLOCK      ; ASSUME BLOCK
04050      BIT        0,A           ; IS IT UNDERSCORE ?
04060      JR        NZ,NOUNDS
04070      LD        B,'_'         ; YES - USE UNDERSCORE
04080      NOUNDS EQU      $
04090      PUSH     BC             ; SAVE CURSOR CHARACTER
04100      CP        2             ; IS IT BLINKING ?
04110      JR        C,NOBLNK
04120      LD        B,0           ; YES - SET BLINKING
04130      NOBLNK EQU      $
04140      LD        A,B
04150      LD        (CURSBL),A
04160      POP      AF             ; RESTORE CURSOR CHARACTER
04170      LD        (CURSCH),A    ; SET NEW CURSOR CHARACTER
04180      JP        LOGON          ; RETURN TO MAIN MENU
04190 ;
04200 ;      CURSOR TYPE MENU
04210 ;
04220 CRMENU EQU      $
04230      DEFB     CURSHM
04240      DEFB     CLSCRN
04250      DEFM     'Cursor type selection:'
04260      DEFB     LF
04270      DEFB     LF
04280      DEFB     LF
04290      DEFB     SPCOMP+4
04300      DEFM     '1 - Underscore'
04310      DEFB     LF
04320      DEFB     SPCOMP+4
04330      DEFM     '2 - Block'

```

```

04640 OUT (IMPORT),A
04650 CALL INITIO ; RESTORE I/O DRIVERS
04660 LD SP,(SPSAVE) ; RESTORE STACK POINTER
04670 CALL VDCLS ; CLEAR SCREEN
04680 JP SYSTEM ; RETURN TO SYSTEM
04690 ;
04700 ;
04710 ; DISPLAY MENU
04720 ; (HL) = MENU MESSAGE
04730 ; B = DEFAULT VALUE
04740 ; C = MAX VALUE
04750 ; RETURNS VALUE-1 IN BC
04760 MENDSP EQU $
04770 PUSH HL ; SAVE MENU ADDRESS
04780 CALL VDLIN ; DISPLAY MENU
04790 LD HL,ENTERM ; DISPLAY ENTER MESSAGE
04800 CALL VDLIN
04810 CALL KBWAIT ; WAIT FOR RESPONSE
04820 CALL VDCHAR ; ECHO
04830 CP CR ; <ENTER> ?
04840 JR NZ,NODEFL
04850 LD C,B ; YES - USE DEFAULT
04860 DEC C ; MAKE RELATIVE TO 0
04870 JR MENRET ; RETURN
04880 NODEFL EQU $
04890 SUB 'I' ; LESS THAN 'I' ?
04900 JR C,MENERR ; YES - ERROR
04910 CP C ; TOO HIGH ?
04920 JR NC,MENERR ; YES - ERROR
04930 LD C,A ; NO - GET RETURN VALUE
04940 JR MENRET ; EXIT
04950 MENERR EQU $
04960 PUSH BC ; SAVE PARMS
04970 LD HL,LOGEMS ; DISPLAY ERROR MESSAGE
04980 CALL VDLIN
04990 LD BC,0 ; DELAY ABOUT 2 SEC.
05000 CALL DELAY
05010 LD BC,0
05020 CALL DELAY
05030 POP BC ; RESTORE PARMS
05040 POP HL ; RESTORE MENU ADDRESS
05050 JR MENDSP ; RETRY
05060 MENRET EQU $
05070 LD B,0
05080 POP HL ; CLEAN UP STACK
05090 RET ; RETURN TO CALLER
05100 ;
05110 ; MENU DISPLAY INPUT PROMPT
05120 ;
05130 ENTERM EQU $
05140 DEFB LF
05150 DEFM 'Type a number to select an option'
05160 DEFM ' or <ENTER> for default '
05170 DEFB SWPGRF
05180 DEFB PTR1
05190 DEFB PTR2
05200 DEFB PTR3
05210 DEFB SWPGRF
05220 DEFM ' '
05230 DEFB ETX
05240 LOGEMS DEFB LF
05250 DEFM 'Invalid option selected'
05260 DEFB CR
05270 END

```

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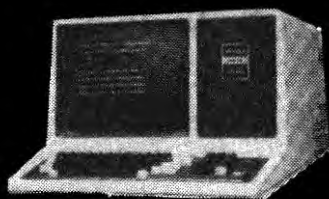
Listing 4 continued

```

04340 DEFB LF
04350 DEFB SWPGRF
04360 DEFB PTR1
04370 DEFB PTR2
04380 DEFB PTR3
04390 DEFB SWPGRF
04400 DEFM ' 3 - Underscore blinking'
04410 DEFB LF
04420 DEFB SPCOMP+4
04430 DEFM '4 - Block blinking'
04440 DEFB CR
04450 ;
04460 ; START UP TERMINAL EMULATOR
04470 ;
04480 SLSTRT EQU $
04490 LD A,MSTRST ; MASTER RESET RS-232
04500 OUT (RSPORT),A
04510 LD A,(RSBAUD) ; SET BAUD RATE
04520 OUT (RSBRG),A
04530 LD A,(RSTYPE) ; SET UART CONTROL
04540 OUT (RSUART),A
04550 LD A,RXIENB+RTCENB ; ENABLE RX INTERRUPTS
04560 OUT (IMPORT),A
04570 CALL VDCLS ; CLEAR SCREEN
04580 JP CHRMT ; RETURN TO MAINLINE
04590 ;
04600 ; RETURN TO SYSTEM
04610 ;
04620 SYSRET EQU $
04630 LD A,RTCENB ; DISABLE RX INTERRUPTS

```

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```

00100 ;
00110 ;      UT5/SRC
00120 ;
00130      ORG      5BEAH
00140 ;
00150 ;      EXTERNALS
00160 ;
00170 CBDMSG EQU      5780H
00180 CDMSG  EQU      57C6H
00190 CHKRMT EQU      5307H
00200 CPMSG  EQU      5798H
00210 CSTMSG EQU      57B2H
00220 CVB   EQU      562BH
00230 DCB   EQU      6044H
00240 FILBUF EQU      617DH
00250 FLAGS EQU      6033H
00260 FLOOFF EQU      56E2H
00270 FLOON  EQU      5703H
00280 HPROMP EQU      6042H
00290 HSTEOF EQU      6043H
00300 HSTEOR EQU      6041H
00310 HSTSTF EQU      6040H
00320 LOGON  EQU      5720H
00330 MENDSP EQU      5B53H
00340 RSRVC  EQU      565CH
00350 RSTX   EQU      56CEH
00360 TRMOPT EQU      6033H
00370 ;
00380 ;      ROM ROUTINES
00390 ;
00400 VDCHAR EQU      0033H      ; DISPLAY CHAR ON SCREEN
00410 KBLINE EQU      0040H      ; READ LINE FROM KEYBOARD
00420 DELAY EQU      0060H      ; DELAY FOR SPECIFIED TIME
00430 VDCLS  EQU      01C9H      ; CLEAR SCREEN
00440 VDLINE EQU      021BH      ; DISPLAY LINE ON SCREEN
00450 KBBRK  EQU      028DH      ; FAST KBD SCAN FOR BREAK
00460 ;
00470 ;      RAM ROUTINES
00480 ;
00490 ERRDSP EQU      4409H      ; DISPLAY DOS ERROR MSG
00500 MSGDSP EQU      0C0H       ; - DSP MESSAGE, NO DOS RET
00510 ERBFN  EQU      13H       ; - INVALID FILENAME
00520 ERREOF EQU      1CH       ; - END-OF-FILE
00530 ERRNRF EQU      1DH       ; - NO-RECORD-FOUND
00540 SYNTAX EQU      441CH      ; SYNTAX CHECK FILENAME
00550 INIT   EQU      4420H      ; INIT DCB, OPEN DISK FILE
00560 OPEN   EQU      4424H      ; OPEN DISK FILE
00570 CLOSE  EQU      4428H      ; CLOSE DISK FILE
00580 READ   EQU      4436H      ; READ DISK FILE RECORD
00590 WRITE  EQU      4439H      ; WRITE DISK FILE RECORD
00600 ;
00610 ;      RAM ADDRESSES
00620 ;
00630 VIDRAM EQU      3C00H      ; VIDEO RAM
00640 CAPSLK EQU      4019H      ; CAPS LOCK (0=UPLW)
00650 CURSBL EQU      401CH      ; CURSOR BLINK (0=BLINK)
00660 CURSCH EQU      4023H      ; CURSOR CHARACTER
00670 ;
00680 ;      ASCII CHARACTERS
00690 ;
00700 PARBIT EQU      80H        ; PARITY BIT
00710 ETX   EQU      03H        ; END OF TEXT (CTRL-C)
00720 TAB   EQU      09H        ; TAB
00730 LF    EQU      0AH        ; LINE-FEED
00740 PF    EQU      0CH        ; FORM-FEED (CTRL-L)
00750 CR    EQU      0DH        ; CARRIAGE RETURN (ENTER)
00760 XON   EQU      11H        ; AUX ON (CTRL-Q)
00770 XOFF  EQU      13H        ; AUX OFF (CTRL-S)
00780 DEL   EQU      7FH        ; DEL
00790 ;
00800 ;      SCREEN CHARACTERS
00810 ;
00820 CURSON EQU      0EH        ; CURSOR ON
00830 SWPGRF EQU      15H        ; SWAP TO GRAPHICS CHARS
00840 CURSHM EQU      1CH        ; CURSOR HOME
00850 CLSCRN EQU      1FH        ; CLEAR TO END OF SCREEN
00860 SPCOMP EQU      0C0H      ; SPACE COMPRESSION CHARS
00870 PTR1  EQU      0F4H      ; GRAPHIC HAND POINTER
00880 PTR2  EQU      0F5H
00890 PTR3  EQU      0F6H
00900 ;
00910 ;      FLAG BITS
00920 ;
00930 DUPLEX EQU      0          ; - FULL DUPLEX
00940 ESKCDB EQU      1          ; - <ESC> RECEIVED FROM KBD
00950 ESCLLN EQU      2          ; - <ESC> REVC'D FROM REMOTE
00960 XOFFTX EQU      3          ; - <XOFF> SENT TO REMOTE
00970 CRTX  EQU      4          ; - <CR> SENT TO REMOTE
00980 XOFFRX EQU      5          ; - <XOFF> RECV'D FROM RMT
00990 ;
01000 ;      PROFILE FILE RECORD FORMAT

```

Program Listing 5

This part of the program deals with disk file transfers and with the creation of the Profile/TRM file.

SLFPRM (line 01160) alters the values of various special characters used in the file transfer routines. It functions in the same manner as the menu routines in Listing 4. The program calls one of four routines to read and save the new value of a special character. The default option returns to the main menu. Although each of these routines allows input of characters in the range X'00' to X'FF', the file transfer system deals with characters from which the parity bit (bit 7) has been removed. Therefore, characters in the range X'80' to X'FF' are not recognized.

FPSTFC (line 01850) changes the start-of-file character. This character signifies the beginning of a file received from a remote computer. Data

“Most computers use some form of prompt to signify that they are able to accept input. . .”

received before the start-of-file character is ignored.

FPEOFC (line 02090) chooses the end-of-file character, used to signify the end of a file from the remote system.

FPEORC (line 01930) selects the end-of-record character. This character marks the end of a logical record of data in a file being received.

FPPRCH (line 02010) selects the remote computer's prompt character. Most computers use some form of prompt to signify that they are able to accept input; in fact, most large main-frame systems require that input not begin until this character is sent.

Each of these four routines calls GETHEX to prompt for and read the two hexadecimal digits representing the character.

SAVPRF at line 02770 appears after you select option 8 from the main menu. It creates a record of the current terminal characteristics: duplex, baud rate, parity, stop bits, tab stops, cursor type, and the four special file transfer

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characters, and writes this record to the file Profile/TRM. This destroys any previously saved profile.

Routines FILERX and FILETX complete file transfer. The mechanism for initiating a file transfer is simple. The remote system command to start the file transfer is entered from the keyboard as usual, without its terminating CR. It is assumed that the input-termination character is the CR. Then simultaneously press the escape and < keys to send a file or the escape and > keys to receive a file, followed by the TRSDOS file name, followed by CR. The escape-key sequence and the file name are not sent to the remote computer, but are used to open a TRSDOS file.

As soon as it receives the escape-key sequence, the program does a shift lock, so that the file name input is in upper-case, and calls READFN (line 05630) to read the file name. This input is accomplished using the system routine

“The remote system command to start the file transfer is entered from the keyboard as usual, without its terminating CR.”

KBLINE, so all the usual TRS-80 input-editing characters may be used. For example, assuming that the command “type file name” lists a file at the terminal, the following transfers the remote file “myfile” to the TRSDOS file Myfile/TXT:

```
type myfile [ESC] > MYFILE/TXT [CR]
```

Frequently, an editor is used to receive a file from the TRS-80. For example:

```
edit myfile [CR]
input [ESC] < MYFILE/TXT [CR]
```

causes the TRSDOS file Myfile/TXT to be input to the remote file myfile. The Input command causes the editor to enter input mode.

Receiving a File

To receive a file, FILERX (line 03370) opens the TRSDOS file, sends off the terminating CR and waits for the start-of-file character. When this char-

Listing 5 continued

```

01010 ;
01020 PRFOPT EQU 0 ; TERMINAL OPTIONS
01030 PRFBD EQU PRFOPT+17 ; 'BAUD'
01040 PRFPAR EQU PRFBD+6 ; 'PARITY'
01050 PRFDUP EQU PRFPAR+4 ; 'DUPLEX'
01060 PRFSTP EQU PRFDUP+4 ; 'STOP BITS'
01070 PRFCCH EQU PRFSTP+1 ; CURSOR CHARACTER
01080 PRFCBL EQU PRFCCH+1 ; CURSOR BLINK
01090 PRFSTF EQU PRFCBL+1 ; 'START-OF-FILE'
01100 PRFEOR EQU PRFSTF+2 ; 'END-OF-RECORD'
01110 PRFPRM EQU PRFEOR+2 ; 'PROMPT'
01120 PRFEOF EQU PRFPRM+2 ; 'END-OF-FILE'
01130 ;
01140 ; SELECT FILE TRANSFER PARMS
01150 ;
01160 SLFPRM EQU $
01170 LD HL, FPMENU ; DISP MENU - READ RESPONSE
01180 LD BC, 0505H ; DEFAULT 5, MAX 5
01190 CALL MENDSP
01200 SLA C ; COMPUTE PROCESSOR ADDRESS
01210 LD IX, FPPROC
01220 ADD IX, BC
01230 LD H, (IX+1)
01240 LD L, (IX+0)
01250 JP (HL) ; GO TO PROCESSOR
01260 ;
01270 ; FILE PARM PROCESSOR ADDRESSES
01280 ;
01290 FPPROC EQU $
01300 DEFW FPSTFC
01310 DEFW FPPEORC
01320 DEFW FPPRCH
01330 DEFW FPPEOFC
01340 DEFW LOGON
01350 ;
01360 ; FILE PARAMETER MENU
01370 ;
01380 FPMENU EQU $
01390 DEFB CURSON
01400 DEFB CURSHM
01410 DEFB CLSCRN
01420 DEFM 'File transfer parameter selection:'
01430 DEFB LF
01440 DEFM 'Current values shown in (...)'
01450 DEFB LF
01460 DEFB LF
01470 DEFB SPCOMP+4
01480 DEFM '1 - Set start-of-file character (X'
01490 DEFB '''
01500 FPHSTF DEFM '02'
01510 DEFB '''
01520 DEFB ') '
01530 DEFB LF
01540 DEFB SPCOMP+4
01550 DEFM '2 - Set end-of-record character (X'
01560 DEFB '''
01570 FPHEOR DEFM '0D'
01580 DEFB '''
01590 DEFB ') '
01600 DEFB LF
01610 DEFB SPCOMP+4
01620 DEFM '3 - Set prompt character (X'
01630 DEFB '''
01640 FPHPRM DEFM '11'
01650 DEFB '''
01660 DEFB ') '
01670 DEFB LF
01680 DEFB SPCOMP+4
01690 DEFM '4 - Set end-of-file character (X'
01700 DEFB '''
01710 FPHEOF DEFM '03'
01720 DEFB '''
01730 DEFB ') '
01740 DEFB LF
01750 DEFB SWPGRF
01760 DEFB PTR1
01770 DEFB PTR2
01780 DEFB PTR3
01790 DEFB SWPGRF
01800 DEFM '5 - Return to main menu'
01810 DEFB CR
01820 ;
01830 ; SET START-OF-FILE CHARACTER
01840 ;
01850 FPSTFC EQU $
01860 LD HL, FPHSTF
01870 LD DE, HSTSTF
01880 CALL GETHEX
01890 JP SLFPRM
01900 ;

```

Listing 5 continued

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```

01910 ;      SET END-OF-RECORD CHARACTER
01920 ;
01930 FPEORC EQU    $
01940      LD      HL,FPHEOR
01950      LD      DE,HSTTEOR
01960      CALL   GETHEX
01970      JP      SLFPRM
01980 ;
01990 ;      SET PROMPT CHARACTER
02000 ;
02010 FPPRCH EQU    $
02020      LD      HL,FPHPRM
02030      LD      DE,HPROMP
02040      CALL   GETHEX
02050      JP      SLFPRM
02060 ;
02070 ;      SET END-OF-FILE CHARACTER
02080 ;
02090 FPEOFC EQU    $
02100      LD      HL,FPHEOF
02110      LD      DE,HSTTEOF
02120      CALL   GETHEX
02130      JP      SLFPRM
02140 ;
02150 ;      READ 2 HEX CHARS FROM KEYBOARD
02160 ;      SAVE CHARS (HL), SAVE BINARY (DE)
02170 ;
02180 GETHEX EQU    $
02190      PUSH   HL                ; SAVE REGISTERS
02200      PUSH   DE
02210      CALL   VDCLS             ; CLEAR SCREEN
02220 HXPRMP EQU    $
02230      LD      HL,HEXMSG        ; PROMPT FOR INPUT
02240      CALL   VDLINE
02250      LD      A,1              ; SHIFT LOCK
02260      LD      (CAPSLK),A
02270      LD      HL,FILBUF      ; READ RESPONSE
02280      LD      B,2
02290      CALL   KBLINE
02300      XOR    A                ; SHIFT UNLOCK
02310      LD      (CAPSLK),A
02320      LD      DE,FILBUF      ; CONVERT 1ST CHAR TO BINARY
02330      LD      A,(DE)
02340      LD      B,A
02350      CALL   CVB
02360      JR     C,GHXERR        ; EXIT IF ERROR
02370      SLA    A                ; SHIFT LEFT 4
02380      SLA    A
02390      SLA    A
02400      SLA    A
02410      LD      H,A           ; SAVE HIGH DIGIT
02420      INC    DE
02430      LD      A,(DE)        ; GET 2ND DIGIT
02440      LD      C,A
02450      CALL   CVB            ; CONVERT TO BINARY
02460      JR     C,GHXERR        ; EXIT IF ERROR
02470      OR     H                ; COMBINE DIGITS
02480      POP    DE              ; SAVE BINARY (DE)
02490      LD      (DE),A
02500      POP    HL              ; SAVE CHAR (HL)
02510      LD      (HL),B
02520      INC    HL
02530      LD      (HL),C
02540      RET                    ; RETURN TO CALLER
02550 GHXERR EQU    $
02560      LD      HL,HEXERR        ; DISPLAY ERROR MESSAGE
02570      CALL   VDLINE
02580      JR     HXPRMP         ; TRY AGAIN
02590 ;
02600 ;      GETHEX MESSAGES
02610 ;
02620 HEXMSG EQU    $
02630      DEFB   CURSON
02640      DEFM   'Enter character as 2 hexadecimal digits '
02650      DEFB   SWPGRF
02660      DEFB   PTR1
02670      DEFB   PTR2
02680      DEFB   PTR3
02690      DEFB   SWPGRF
02700      DEFM   ' '
02710      DEFB   ETX
02720 HEXERR DEFM   'Invalid hexadecimal input'
02730      DEFB   CR
02740 ;
02750 ;      SAVE TERMINAL PROFILE
02760 ;
02770 SAVPRF EQU    $
02780      LD      DE,FILBUF      ; POINT TO DISK FILE BUFFER
02790      LD      HL,TRMOPT     ; INSERT TERMINAL OPTIONS

```

Listing 5 continued

acter is received, the data following is saved for disk output in a 256-byte buffer FILBUF. When the buffer is full, it is written to disk with a call to DSKOP. All control characters except Tab and FF are discarded. Each character received that matches the end-of-record character is translated to CR, and added to the buffer. This cycle continues until the end-of-file character is received, or until you press the break key at which time the file closes and normal terminal operations resume.

Sending a File

Like FILERX, FILETX at line 04260 reads the TRSDOS file name and opens the file, which must exist. Each disk record is read into FILBUF. Before each logical record of data is sent, the remote prompt character must be received. A logical record is a block of data termi-

*“Once the file is sent,
control returns to normal
terminal operations.”*

nated by CR. Once the prompt character is received, data is transmitted up to and including the next CR. This process continues until either end-of-file is encountered, or the break key is pressed on the keyboard.

Because many of the editors used to receive such a file treat a logical record consisting of a single CR as the signal to exit from input mode, a blank (X'20') is inserted between any consecutive CRs found in the file. Once the file is sent, control returns to normal terminal operations. At this point you must exit from input mode in the editor and issue whatever command is necessary to save your new file on the remote system.

Disk Operations

Because most TRS-80 disk I/O operations disable interrupts for a considerable length of time, it is necessary to guard against the possibility of losing data received during such operations. Therefore, the routine DSKOP (line 05490) performs all disk I/O. The address of the TRSDOS I/O routine is passed as a parameter.

Prior to performing the operation, FLOFF is called to halt the incoming flow of data from the remote. Then the I/O operation is done, and FLOON is called to resume the flow of data, if necessary. It is essential that the remote sys-

Continued on p. 264

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Listing 5 continued

```

02800 LD BC,17
02810 LDIR
02820 LD HL,CBDMMSG ; INSERT 'BAUD'
02830 LD BC,6
02840 LDIR
02850 LD HL,CPMSG ; INSERT 'PARITY'
02860 LD BC,4
02870 LDIR
02880 LD HL,CDMSG ; INSERT 'DUPLEX'
02890 LD BC,4
02900 LDIR
02910 LD A,(CSTMSG) ; INSERT 'STOP BITS'
02920 LD (FILBUF+PRFSTP),A
02930 LD A,(CURSCH) ; INSERT CURSOR CHARACTER
02940 LD (FILBUF+PRFCCH),A
02950 LD A,(CURSBL) ; INSERT CURSOR BLINK
02960 LD (FILBUF+PRFCBL),A
02970 LD HL,(FPHSTF) ; INSERT 'START-OF-FILE'
02980 LD (FILBUF+PRFSTF),HL
02990 LD HL,(FPHEOR) ; INSERT 'END-OF-RECORD'
03000 LD (FILBUF+PRFEOR),HL
03010 LD HL,(FPHPRM) ; INSERT 'PROMPT'
03020 LD (FILBUF+PRFPRM),HL
03030 LD HL,(FPHEOF) ; INSERT 'END-OF-FILE'
03040 LD (FILBUF+PRPEOF),HL
03050 ;
03060 ; WRITE PROFILE DISK RECORD
03070 ;
03080 LD HL,TPRFFN ; MOVE FILENAME TO DCB
03090 LD DE,DCB
03100 LD BC,TPRFFL
03110 LDIR
03120 LD HL,FILBUF ; OPEN FILE
03130 LD B,0 ; LRL = 0
03140 LD IX,INIT
03150 CALL DSKOP
03160 JR Z,PRFWRT ; IF ERROR ...
03170 CALL ERRMSG ; DISPLAY ERROR MESSAGE
03180 JR TPRFE ; EXIT
03190 PRFWRT EQU $
03200 LD IX,WRITE ; WRITE RECORD
03210 CALL DSKOP
03220 CALL NZ,ERRMSG ; DISP ERROR MESSAGE IF ANY
03230 LD IX,CLOSE ; CLOSE FILE
03240 CALL DSKOP
03250 CALL NZ,ERRMSG ; DISP ERROR MESSAGE IF ANY
03260 TPRFE EQU $
03270 JP LOGON ; RETURN TO MAIN MENU
03280 ;
03290 ; PROFILE FILENAME
03300 ;
03310 TPRFFN DEFM 'PROFILE/TRM' ; PROFILE FILENAME
03320 DEFB CR
03330 TPRFFL EQU $-TPRFFN
03340 ;
03350 ; RECEIVE FILE FROM REMOTE
03360 ;
03370 FILERX EQU $
03380 LD HL,FRXIND ; DISPLAY >
03390 CALL VDLIN
03400 CALL READFN ; GET DISK FILENAME
03410 JP NC,CHKRMT ; EXIT IF ERROR
03420 LD HL,FILBUF ; OPEN FILE
03430 LD B,0 ; LRL = 0
03440 LD IX,INIT ; OPEN FILE
03450 CALL DSKOP
03460 PUSH AF ; SAVE ERROR CODE
03470 LD A,CR ; SEND <CR>
03480 CALL RSTX
03490 POP AF ; RESTORE ERROR CODE
03500 JR Z,WTSTF ; IF ERROR ...
03510 CALL ERRMSG ; DISPLAY ERROR MESSAGE
03520 JP CHKRMT ; EXIT TO MAINLINE
03530 ;
03540 ; WAIT FOR HOST START-OF-FILE
03550 ;
03560 WTSTF EQU $
03570 LD HL,HSTSTF ; WAIT FOR START-OF-FILE
03580 WTSTFL EQU $
03590 CALL KBBRK ; EXIT IF <BREAK>
03600 JR NZ,FILEOF
03610 CALL RSRVC ; READ CHARACTER
03620 JR C,WTSTFL
03630 CP (HL) ; START-OF-FILE ?
03640 JR NZ,WTSTFL ; NO - READ NEXT CHARACTER
03650 ;
03660 ; READ DATA FROM REMOTE, CREATE DISK FILE
03670 ;
03680 RDREC EQU $
03690 LD B,0 ; FILE BUFFER COUNT
03700 LD HL,FILBUF ; POINT TO FILE BUFFER
03710 RDBYTE EQU $
03720 CALL KBBRK ; EXIT IF <BREAK>
03730 JR NZ,FILEOF
03740 CALL RSRCV ; READ A BYTE FROM LINE
03750 JR C,RDBYTE
03760 LD DE,(HSTEOF) ; END-OF-FILE CHARACTER ?
03770 CP E
03780 JR Z,FILEOF ; YES - CLOSE FILE
03790 LD DE,(HSTEOR) ; END-OF-RECORD CHARACTER ?
03800 CP E
03810 JR NZ,CHKCTL
03820 LD A,CR ; YES - MAKE IT <CR>
03830 JR FBUPB
03840 CHKCTL EQU $
03850 CP DEL ; IGNORE <DEL>
03860 JR Z,RDBYTE
03870 CP TAB ; KEEP <TAB>
03880 JR Z,FBUPB
03890 CP ' ' ; IGNORE CONTROL CHARS
03900 JR C,RDBYTE
03910 FBUPB EQU $
03920 LD (HL),A ; ADD CHAR TO FILE BUFFER
03930 INC HL ; INCREMENT BUFFER PTR
03940 LD (VIDRAM+63),A ; DISPLAY CHARACTER
03950 DJNZ RDBYTE ; UNTIL BUFFER FULL
03960 LD IX,WRITE ; WRITE DISK RECORD
03970 CALL DSKOP
03980 JR Z,RDREC ; IF ERROR ...
03990 CALL ERRMSG ; DISPLAY ERROR MESSAGE
04000 JR PCLOSE ; CLOSE FILE
04010 ;
04020 ; END-OF-FILE SIGNALLED
04030 ;
04040 FILEOF EQU $
04050 LD A,B ; PARTIAL BUFFER ?
04060 OR A

```

Listing 5 continued

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Listing 5 continued

```

04070 JR Z,FCLOSE ; NO - CLOSE FILE
04080 NEG ; YES - COMP LEN REMAINING
04090 LD (DCB+5),A ; SET RECORD DELIM OFFSET
04100 LD IX,WRITE ; WRITE LAST RECORD
04110 CALL DSKOP
04120 CALL NZ,ERRMSG ; DISP ERROR MESSAGE IF ANY
04130 LD HL,(DCB+12) ; DECREMENT ERN
04140 DEC HL
04150 LD (DCB+12),HL
04160 FCLOSE EQU $
04170 LD IX,CLOSE ; CLOSE FILE
04180 CALL DSKOP
04190 CALL NZ,ERRMSG ; DISP ERROR MESSAGE IF ANY
04200 LD HL,FILEXD ; DISPLAY DONE MESSAGE
04210 CALL VDLIN
04220 JP CHRMT ; EXIT TO MAINLINE
04230 ;
04240 ; SEND FILE TO REMOTE
04250 ;
04260 FILETX EQU $
04270 LD HL,FTXIND ; DISPLAY <
04280 CALL VDLIN
04290 CALL READFN ; READ FILENAME
04300 JP NC,CHRMT ; EXIT IF ERROR
04310 LD HL,FLAGS ; INDICATE INITIAL <CR> SENT
04320 SET CRTX,(HL)
04330 LD HL,FILBUF ; OPEN FILE
04340 LD B,0 ; LRL=0
04350 LD IX,OPEN
04360 CALL DSKOP
04370 PUSH AF ; SAVE ERROR CODE
04380 LD A,CR ; SEND <CR>
04390 CALL RSTX
04400 POP AF ; RESTORE ERROR CODE
04410 JR Z,GETREC ; IF ERROR ...
04420 CALL ERRMSG ; DISPLAY ERROR MESSAGE
04430 JP CHRMT ; EXIT TO MAINLINE
04440 ;
04450 ; READ NEXT DISK FILE RECORD
04460 ;
04470 GETREC EQU $
04480 LD HL,FILBUF ; READ DISK RECORD
04490 LD B,0
04500 LD IX,READ
04510 CALL DSKOP
04520 JR Z,GOTREC ; IF ERROR ...
04530 CP ERREOF ; IF NOT END-OF-FILE
04540 JR Z,FTXEOF
04550 CP ERRNRF
04560 CALL NZ,ERRMSG ; DISP ERROR MESSAGE IF ANY
04570 JR FTXEOF
04580 GOTREC EQU $
04590 LD HL,(DCB+10) ; NEXT RECORD #
04600 DEC HL ; CURRENT RECORD #
04610 LD DE,(DCB+12) ; LAST RECORD #
04620 OR A ; IS THIS THE LAST RECORD ?
04630 SBC HL,DE
04640 LD HL,FILBUF
04650 JR NZ,HAVREC ; NO - CONTINUE
04660 LD A,(DCB+8) ; YES - GET BYTE COUNT
04670 LD B,A
04680 ;

```

```

04690 ; SEND DATA TO REMOTE
04700 ;
04710 HAVREC EQU $
04720 EX DE,HL ; SAVE BUFFER PTR
04730 LD HL,FLAGS ; WAS <CR> LAST CHAR SENT ?
04740 BIT CRTX,(HL)
04750 JR Z,NOWTPR ; NO - DON'T NEED TO WAIT
04760 LD HL,HPRMP ; YES - WAIT FOR HOST PROMPT
04770 WTPRMP EQU $
04780 CALL KBBRK ; EXIT IF <BREAK>
04790 JR NZ,FTXEOF
04800 CALL RSRVC ; READ CHARACTER
04810 JR C,WTPRMP
04820 CP (HL) ; PROMPT ?
04830 JR NZ,WTPRMP ; NO - READ NEXT CHARACTER
04840 NOWTPR EQU $
04850 EX DE,HL ; RESTORE BUFFER PTR
04860 WRTREC EQU $
04870 LD A,(HL) ; GET NEXT BYTE
04880 AND 255-PARBIT ; CLEAR PARITY BIT
04890 INC HL ; INCREMENT BUFFER PTR
04900 CP CR ; IS IT <CR> ?
04910 JR Z,ENDREC ; YES - END-OF-RECORD
04920 CP TAB ; IS IT <TAB> ?
04930 JR Z,WRTCHR ; YES - OK
04940 CP FF ; IS IT <FF> ?
04950 JR Z,WRTCHR ; YES - OK
04960 CP ' ' ; IS IT A CONTROL CHAR ?
04970 JR C,WRTNXT ; YES - IGNORE
04980 WRTCHR EQU $
04990 LD (VIDRAM+63),A ; NO - DISPLAY IT
05000 CALL RSTX ; SEND IT TO REMOTE
05010 LD A,(FLAGS) ; INDICATE <CR> NOT LAST
05020 RES CRTX,A
05030 LD (FLAGS),A
05040 WRTNXT EQU $
05050 DJNZ WRTREC ; UNTIL BUFFER EMPTY
05060 JR GETREC ; READ NEXT DISK RECORD
05070 ;
05080 ; END OF LOGICAL RECORD
05090 ;
05100 ENDREC EQU $
05110 EX DE,HL ; SAVE BUFFER PTR
05120 LD HL,FLAGS ; POINT TO FLAG BYTE
05130 BIT CRTX,(HL) ; WAS <CR> LAST CHAR SENT ?
05140 JR Z,WRTEND ; NO - CONTINUE
05150 LD A,' ' ; YES - INSERT A BLANK
05160 CALL RSTX
05170 WRTEND EQU $
05180 SET CRTX,(HL) ; INDICATE SENDING <CR>
05190 EX DE,HL ; RESTORE BUFFER PTR
05200 LD A,CR ; SEND <CR>
05210 CALL RSTX
05220 DJNZ HAVREC ; BUFFER NOT EMPTY, WAIT
05230 JP GETREC ; OTHERWISE READ NEXT RECORD
05240 ;
05250 ; END-OF-FILE REACHED
05260 ;
05270 FTXEOF EQU $
05280 LD IX,CLOSE ; CLOSE FILE
05290 CALL DSKOP
05300 CALL NZ,ERRMSG ; DISP ERROR MESSAGE IF ANY

```

Listing 5 continued

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```

05310 LD HL,FILEXD ; DISPLAY DONE MESSAGE
05320 CALL VDLIN ; EXIT TO MAINLINE
05330 JP CHRMT
05340 ;
05350 ; FILE TRANSFER UTILITIES MESSAGES
05360 ;
05370 FRXIND ;
05380 DEFB ' > '
05390 DEFB ETX
05400 DEFB ' < '
05410 DEFB ETX
05420 EQU $
05430 DEFB LF
05440 DEFB CR
05450 ;
05460 ; TURN OFF REMOTE, PERFORM DISK OPERATION
05470 ; (IX) = DISK ROUTINE
05480 ;
05490 DSKOP $
05500 CALL FLOOFF ; TURN OFF REMOTE
05510 LD DE,DSKOPR ; PUSH RETURN ADDRESS
05520 PUSH DE
05530 LD DE,DCB ; GET DCB ADDRESS
05540 JP ('CALL', DISK ROUTINE) ; 'CALL' DISK ROUTINE
05550 DSKOPR $
05560 CALL FLOON ; TURN REMOTE BACK ON
05570 RET ; RETURN TO CALLER
05580 ;
05590 ; READ FILENAME FROM KEYBOARD
05600 ; VALIDATE, MOVE TO DCB
05610 ; RETURNS (DE) = DCB, CARRY CLEAR IF ERROR
05620 ;
05630 READFN $
05640 LD A,1 ; SHIFT LOCK
05650 LD (CAPSLK),A ;
05660 LD B,23 ; READ FILENAME
05670 LD HL,FILBUF
05680 CALL KBLINE
05690 LD A,CURSON ; TURN CURSOR BACK ON !
05700 CALL VDCHAR ; SHIFT UNLOCK
05710 XOR A ;
05720 LD (CAPSLK),A ; VALIDATE, MOVE TO DCB
05730 LD DE,DCB ;
05740 CALL SYNTAX ;
05750 SCF ; INDICATE NO ERROR
05760 JR IFERR ; IF ERROR
05770 LD A,ERRBFN ; DISPLAY ERROR MESSAGE
05780 CALL ERRMSG ;
05790 LD A,CR ; SEND <CR> TO HOST
05800 CALL RSTX ;
05810 OR A ; INDICATE ERROR
05820 EQU $ ; RETURN TO CALLER
05830 RET ;
05840 ;
05860 ; $
05870 ERMMSG EQU MSGDSP
05880 OR ERRDSP
05890 CALL ERRDSP
05900 RET
05910 END

```

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- 1 or 2 Stop Bits per word
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- Baud rates 110 to 9600

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```

00100 ;
00110 ;      UT6/SRC
00120 ;
00130      ORG      6025H
00140 ;
00150 ;      PORT ADDRESSES
00160 ;
00170 RSBRG  EQU      0E9H      ; RS-232 BAUD RATE PORT
00180 B110   EQU      022H
00190 B150   EQU      044H
00200 B300   EQU      055H
00210 B1200  EQU      077H
00220 B2400  EQU      0AAH
00230 B4800  EQU      0CCH
00240 B9600  EQU      0EEH
00250 B19200 EQU      0FFH
00260 RSUART EQU      0EAH      ; RS-232 UART CONTROL PORT
00270 PAREVN  EQU      80H      ; - EVEN PARITY
00280 WD7     EQU      20H      ; - 7-BIT WORDS
00290 SB1    EQU      00H      ; - 1 STOP BIT
00300 SB2    EQU      10H      ; - 2 STOP BITS
00310 PARDIS  EQU      08H      ; - PARITY DISABLE
00320 TXENB  EQU      04H      ; - ENABLE TRANSMIT, 0=BREAK
00330 DTR    EQU      01H      ; - DATA TERMINAL READY
00340 ;
00350 ;      ASCII CHARACTERS
00360 ;
00370 STX    EQU      02H      ; START OF TEXT (CTRL-B)
00380 ETX    EQU      03H      ; END OF TEXT (CTRL-C)
00390 CR     EQU      0DH      ; CARRIAGE RETURN (ENTER)
00400 XON    EQU      11H      ; AUX ON (CTRL-Q)
00410 ;
00420 ;      KEYBOARD ESCAPE CHARACTERS
00430 ;
00440 ESCHRS DEFB      00H      ; ESC-0 <NUL>
00450 DEFB      5DH      ; ESC-1 RIGHT SQUARE
00460 DEFB      5CH      ; ESC-2 BACKSLASH
00470 DEFB      5EH      ; ESC-3 CARET
00480 DEFB      5FH      ; ESC-4 UNDERSCORE
00490 DEFB      7BH      ; ESC-5 LEFT CURLY
00500 DEFB      7DH      ; ESC-6 RIGHT CURLY
00510 DEFB      7CH      ; ESC-7 BAR
00520 DEFB      7EH      ; ESC-8 TILDE
00530 DEFB      7FH      ; ESC-9 <DEL>
00540 DEFB      01H      ; ESC-A <SOH>
00550 DEFB      1BH      ; ESC-B <ESC>
00560 DEFB      1FH      ; ESC-C <US>
00570 DEFB      19H      ; ESC-D <EM>
00580 ;
00590 ;      TERMINAL OPTION VARIABLES
00600 ;
00610 TRMOPT EQU      $      ; START OF TERMINAL OPTIONS
00620 FLAGS  DEFB      0      ; FLAGS BYTE
00630 DUPLEX EQU      0      ; - FULL DUPLEX
00640 ESCKBD EQU      1      ; - <ESC> RECEIVED FROM KBD
00650 ESCLIN EQU      2      ; - <ESC> RECEIVED FROM LINE
00660 XOFFTX EQU      3      ; - <XOFF> SENT TO REMOTE
00670 CRTX  EQU      4      ; - <CR> SENT TO REMOTE
00680 RSBAUD DEFB      B300    ; RS-232 BAUD RATE
00690 RSTYPE DEFB      PAREVN+WD7+TXENB+DTR ; RS-232 UART VALUES
00700 BRKTIM DEFW      1111H   ; BREAK TRANSMIT TIME
00710 TABTBL DEFW      0      ; TAB SETTING TABLE
00720 DEFW      0
00730 DEFW      0
00740 DEFW      0
00750 HSTSTP DEFB      STX      ; START-OF-FILE CHARACTER
00760 HSTEOR DEFB      CR      ; END-OF-RECORD CHARACTER
00770 HPROMP DEFB      XON      ; PROMPT CHARACTER
00780 HSTEOF DEFB      ETX      ; END-OF-FILE CHARACTER
00790 ;      ; END OF TERMINAL OPTIONS
00800 ;
00810 ;      DISK FILE AND RS-232 VARIABLES
00820 ;
00830 DCB    DEFB      'PROFILE/TRM' ; DISK FILE DCB
00840 DEFB      CR
00850 DCBFNL EQU      $-DCB
00860 DEFS      50-DCBFNL
00870 IBUFI  DEFW      IBUFF     ; INPUT BUFFER INPUT PTR
00880 IBUFO  DEFW      IBUFF     ; INPUT BUFFER OUTPUT PTR
00890 IBUFC  DEFB      0         ; INPUT BUFFER COUNTER
00900 SPSAVE DEFS      2         ; STACK POINTER SAVE AREA
00910 IBUFF  DEFS      256      ; RS-232 INPUT BUFFER
00920 IBUFE  EQU      $         ; END OF INPUT BUFFER
00930 FILBUF DEFS      256      ; DISK FILE BUFFER
00940 END

```

tem support the XON/XOFF protocol for the file transfer to work correctly. All TRSDOS error messages encountered as the result of disk I/O are displayed in full by calls to ERRDSP.

Program Listing 6

This last section of the program contains only data. Table 3 describes each variable and its function.

Building the Program

Since the program is assembled in six sections, it is necessary to create a single executable command file. Load the six separate command files with the Load command and use the Dump command to create the final module. Since the program is ORGed to start at X'5200', and the Dump command doesn't dump memory lower than X'6000', you must relocate the six parts first with the RELO command, and then use the RELO option of the Dump command, to relocate the final code to its original location.

The easiest way to accomplish this is with a Build command. Each of the six parts is relocated upward in memory by adding X'1E00' to its start address. The offset is then subtracted from the start address in the Dump command. Once EDTASM has been used to assemble each of the six parts of the program, the following sequence of commands creates the final command file.

```

RELO UT1/CMD (ADD=7030)
RELO UT2/CMD (ADD=72FA)
RELO UT3/CMD (ADD=745C)
RELO UT4/CMD (ADD=7520)
RELO UT5/CMD (ADD=79EA)
RELO UT6/CMD (ADD=7E25)
LOAD UT1/CMD
LOAD UT2/CMD
LOAD UT3/CMD
LOAD UT4/CMD
LOAD UT5/CMD
LOAD UT6/CMD
DUMP UTERM (START=7030,END=7E7A,
TRA=5230,RELO=5230)

```

Enhancements

Enhancements are always possible. If you need to have several different profiles available, you could pass the profile file name as a parameter to the program, rather than having a fixed name. The ability to display all control characters received in a visible format (transparency) is sometimes useful when communicating with an unknown system. Cursor addressing could be added to communicate with systems that support such a feature, although

the small screen size could make this impractical.

Additional code in the Intel-format loader could provide checks for load addresses outside of the bounds of available RAM, or for addresses that would overlay the loader program. I did not provide the ability to escape from the loader once it had started (by pressing the break key, for instance), so you might want to add that.

The file-transfer utilities do not send control characters, with the exception of Tab, FF, and CR. Remove this restriction if you want to move files containing such characters. However, you must be careful, since most interactive systems interpret some control characters as something other than data. XON and XOFF are good examples. Backspace is usually treated as the erase character. If you know which control characters cannot be sent as data, you can translate them to something else prior to sending them, or not send them at all.

The file transfer routines strip the parity bit from each character, making it impossible to send or receive any of the special graphics or space compression characters. If the system with which you are communicating can tolerate data with no parity, then you could remove this restriction as well.

Translate tables could be provided to translate each character received or sent. It would require an additional 512 bytes of memory for the two tables. The actual translation is easily implemented in the RS-232 transmit and receive routines, but the mechanism allowing the user to define the contents of the tables would be costly in terms of the code required. These tables would also be saved in the profile, requiring extra code to read and write them on disk.

You could add a number of special-function keys. These would be implemented by the escape sequence described in Listing 1 to generate a string of characters with two keystrokes. Again, such a feature is costly in terms of the amount of code and data area required.

My study of existing communications software for the TRS-80 convinced me that my software program functions as well as most packages costing in excess of \$100. If you tailor it to suit yourself, it should prove to be an adequate tool for most of your communications requirements. ■

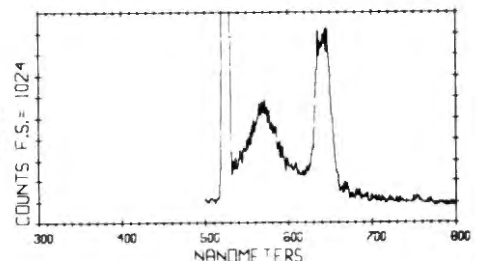
Write to Douglas Payne at 56 Bren-dawood Crescent, Waterloo, Ontario N2J 4J5, Canada.

Name	Function
ESCHRS	Table of characters used by the escape sequence
TRMOPT	Start-of-terminal option variables which are saved in the profile.
FLAGS	Program flag byte
DUPLEX	Full duplex when set
ESCKBD	Last character typed was (ESC)
ESCLIN	Last character from RS-232 was (ESC)
XOFFTX	(XOFF) sent to RS-232
CRTX	Last character sent during file transfer was (CR)
XOFFRX	(XOFF) received
RSBAUD	Value output to baud rate generator port
RSTYPE	Value output to UART control/status port
BRKTIM	Value used by Delay routine to time the break signal
TABTBL	Table of tab stops
HSTSTF	Start-of-file character
HSTEOR	End-of-record character
HPROMP	Prompt character
HSTEOF	End-of-file character
DCB	Disk file DCB
IBUFI	Input buffer fill pointer
IBUFO	Input buffer extract pointer
IBUFC	Input buffer character count
SPSAVE	Stack pointer save area
IBUFF	RS-232 input buffer
IBUFE	End of input buffer
FILBUF	Disk file I/O buffer

Table 3. Program variables.

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Mod II File Transfer Utility

by J.H. Nestor

I think computer disk files breed secretly at night. In the darkened security of my computer room, snug within their paper covers, they multiply. ASCII files marry object code files, big files beget little files. First two, then four. They have no shame.

A fantasy nightmare? Maybe. But the contents of my briefcase make this scenario plausible. I've collected a mass of disks, each with its own family of files.

It seems that no matter how carefully I plan things, the files I need are always on another disk. I can't recall how many times I've typed the Copy and Move commands and then waited in vain for those files to be moved.

The problem is less severe with CP/M and Oasis operating systems,

If you're tired of moving Model II files, you'll find this transfer utility indispensable.

which permit flexible wildcarding of commands. For example, the CP/M command PIP B:=A:ACCT?.* sends the files ACCT1, ACCT1.BAS, ACCT2.FOR, and ACCT9.DAT to Drive B.

TRSDOS 2.0 added a limited wildcard capability to some of their commands. For example, the command

MOVE */BAS:0 TO :1 transfers all files with the extension /BAS from drive zero to drive 1.

The wildcard also works on the other side of the equation. Thus, the command: MOVE MYPROG/*:0 TO :1 is valid. This command copies any file with the name MYPROG, regardless of its extension.

The addition of the wildcard to TRSDOS 2.0 was an improvement, but it is still not the answer to my file-moving woes. It is not uncommon for me to move a list of two dozen files, none of which meets the wildcard parameters. My solution was to write a Model II file move utility.

The Program

The Transfer program lets you type a list of files to be moved from one disk to another. You can examine the list, correct any errors, and then leave while the file transfer takes place.

I could use the Build command to create a Do file with all of the Copy filename/ext:drivespec to filename/ext:drivespec data for each file to be copied, but that requires a lot of typing. Besides, the Build command is slow and cumbersome.

The Transfer Program

The solution is simple. I wrote a program that creates a Do file, executes it, and then erases it. Well, almost . . .

The first priority of Transfer is to minimize typing. Why retype the source and destination drive numbers each time? Transfer prompts for these numbers (see Fig. 1) and uses them in every command line. It also inserts COPY and TO in the command (see Fig. 2).

You are asked to enter a list of the file names to be copied. Pressing enter in

```

TRANSFER—File Copy Utility
Enter SOURCE Drive Number.....0
Enter DESTINATION Drive Number....1

Enter File name # 1 or [ENTER] to end list .....SAMPLE/TXT
Enter File name # 2 or [ENTER] to end list .....TRANSFER/BAS
Enter File name # 3 or [ENTER] to end list .....BASCOM
Enter File name # 4 or [ENTER] to end list .....P66/MAC
Enter File name # 5 or [ENTER] to end list .....[ENTER]
Are there any corrections (Y/N)? N
    
```

Figure 1. Transfer prompts.

```

Assembling COPY File:
COPY SAMPLE/TXT:0 TO :1 ABS
COPY TRANSFER/BAS:0 TO :1 ABS
COPY BASCOM:0 TO :1 ABS
COPY P66/MAC:0 TO :1 ABS
[ENTER] to Execute COPY, [ESC] to Abort
    
```

Figure 2. Inserted transfer commands.

The Key Box

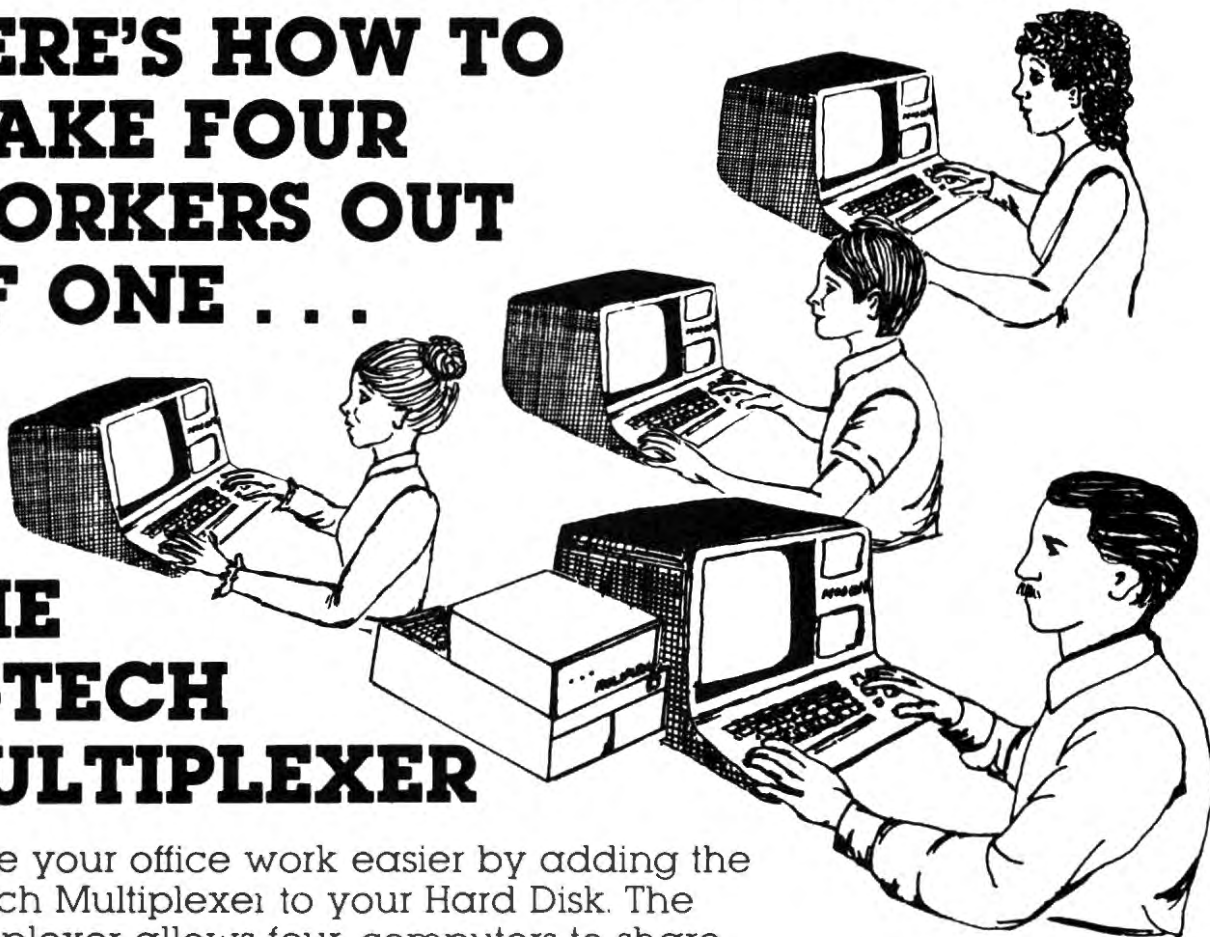
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Program Listing

```

10000 ' TRANSFER/BAS
10010 ' assembles a list of filenames to be copied
10020 ' creates a DO file to be executed
10030 ' written by J.H.Nestor 9/6/82
10040 '
10050 CLS
10060 CLEAR 1000
10070 DIM A$(100)
10080 GOSUB 11000 ' get the list of files
10090 GOSUB 12000 ' any corrections ?
10100 GOSUB 15030 ' open original do file
10110 GOSUB 16000 ' append new commands
10120 GOSUB 13000 ' execute or abort
10130 END
11000 '
11010 ' get the list of files to copy
11020 '
11030 CLS
11040 PRINT TAB(18)CHR$(26) "      TRANSFER - File Copy Utility
"CHR$(25)
11050 PRINT TAB(18)"Enter SOURCE Drive Number.....";:LINEINP
UT D1$
11060 PRINT TAB(18)"Enter DESTINATION Drive Number....";:LINEINP
UT D2$
11070 PRINT
11080 A%=1
11090 PRINT TAB(10)"Enter Filename # ";:PRINT USING "##";A%";PRI
NT " or [ENTER] to end list.....";:LINEINPUT A$(A%)
11100 IF LEN(A$(A%))=0 THEN N%=A%-1:GOTO 11130
11110 A%=A%+1
11120 GOTO 11090 ' next filename
11130 RETURN
12000 '
12010 ' any corrections ?
12020 '
12030 GOSUB 17000 ' erase
12040 PRINT @(21,10),"Are there any corrections (Y/N)?";:LINEI
NPUT AN$
12050 IF AN$<>"Y" THEN 12140
12060 GOSUB 17000 ' erase
12070 PRINT @(21,10),"Enter Filename # ";:LINEINPUT N$
12080 NN%=VAL(N$)
12090 IF NN%<1 OR NN%>N% THEN 12030
12100 GOSUB 17000 ' erase
12110 PRINT @(21,10),"Filename # ";N$;" is ";A$(NN%)
12120 PRINT @(22,10),"Enter new Filename # ";N$;"... ";:LINEINPU
T A$(NN%)
12130 GOTO 12030
12140 PRINT CHR$(2);:RETURN
13000 '
13010 ' execute COPY or abort ?

```

Listing continued

response to the prompt ends the list. Once it is completed, you can reenter any of the file names in case a mistake was made.

Transfer takes the file names and creates a command such as: COPY MYPROG/ASM:0 TO :1. This command is written to the Do file. When the Do file is completed, you can execute the commands or abort the operation.

How Transfer Works

There are five components to the Transfer program.

The first, Enter Transfer Drives (in lines 11030-11060), clears the screen, prints a heading, and accepts the source and destination drive numbers. String variables D1\$ and D2\$ are used for the drive numbers.

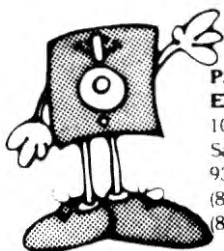
The second, Enter Filenames (in lines 11080-11130), contains the routine to enter the file names. They are entered into the string array A\$(). The array is dimensioned to 100 elements in line 10070, which is actually overkill since TRSDOS accepts only 96 file names including system files. Line 11100 tests the length of the file name entered. Pressing enter without entering a file name produces A\$(A%) with a length of zero, thus ending the entry routine.

The third part of the program, in lines 12000-12140, lets you correct any file name you might have mistyped. Answer Y to the prompt "Are there any corrections (Y/N)?" Enter the offending line number, and reenter the correct file name for that line.

The fourth part builds the Do file. While it should be the easiest part of the

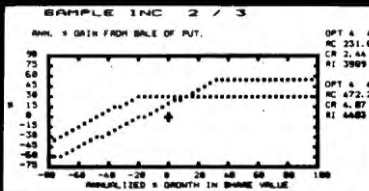
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program, it isn't. I examined a typical Do file and found it to be an ASCII sequential file. When I tried using an editor to create a Do file of the same format, it didn't work. When I issued the command DO MYFILE, TRSDOS responded with error 31, file not found. I checked the directory, and there it was, MYFILE: record length of 1, 87 records long. When I used the TRSDOS Build command to enter the same commands, it worked.

Apparently, the Build file does a special kind of write to the TRSDOS directory when creating a Do file. That could be why it is so slow.

First, I use Build to create a Do file called DOCOPY. The file consists of one statement: CLS. Typing DO DOCOPY clears the screen, and creates a properly designated entry in the TRSDOS directory. To be sure I didn't accidentally erase this precious file, I used the ATTRIB function to give it a password. The command was: ATTRIB DOCOPY (ACC=JHN UPD=JHN PROT=EXEC), and the file is now DOCOPY.JHN.

To append DOCOPY.JHN, the fifth Transfer component, open the file in line 16030 for sequential output. Then write the command strings created in lines 16010-16080 to the file using the statement in line 16090.

When it didn't work, I examined the file DOCOPY.JHN and found that some sort of control character was written into the single CLS statement.

I added program lines 15040 and 16040: line 15040 reads in the first line from DOCOPY.JHN and line 16040 writes it back as the first line of the new file. Whatever was in the file is still there, and it now works.

I mentioned that the program changes the Do file when it is executed; it reuses the same file each time it's used. The OPEN O command in line 15030 erases the existing file when the updated version is written, so that there is only one DOCOPY.JHN file on my disk at any one time.

The fifth part of the program executes or aborts the operation.

There are probably other uses for this method of building and executing a Do file of TRSDOS commands. I plan to explore them as time permits. Perhaps you could even construct a form of Job Control Language. If you find applications for the concept, I would appreciate hearing from you. ■

Dr. J.H. Nestor lives at 39114 Rte. 303, Grafton, OH 44044.

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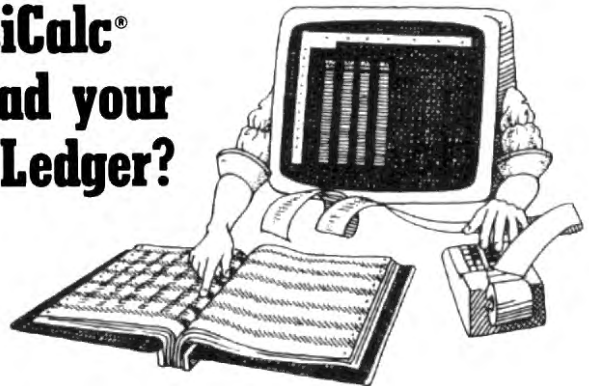
Listing continued

```

13020 '
13030 GOSUB 17000 ' erase
13040 PRINT @ (21,20),CHR$(26) " [ENTER] to Execute COPY, [ESC] t
o Abort ";CHR$(25);CHR$(2)
13050 AN$=INKEY$:IF AN$="" THEN 13050
13060 IF ASC(AN$)<>13 THEN 13110
13070 CLS
13080 PRINT TAB(20)"File Copy in Progress....";CHR$(2);
13090 SYSTEM "DO DOCOPY.JHN"
13100 END
13110 IF ASC(AN$)<>27 THEN 13050
13120 CLS
13130 PRINT TAB(20)"File Copy Aborted....":PRINT
13140 SYSTEM
13150 END
15000 '
15010 ' read 1st line from original do file
15020 '
15030 OPEN "I",1,"DOCOPY.JHN"
15040 LINEINPUT # 1,A$
15050 CLOSE
15060 RETURN
16000 '
16010 ' append new commands to original do file
16020 '
16030 OPEN "O",1,"DOCOPY.JHN"
16040 PRINT # 1,A$ ' 1st line from original do file
16050 '
16060 CLS:PRINT TAB(25)"Assembling COPY File:";CHR$(2):PRINT
16070 FOR X%=1 TO N%
16080 A$="COPY "+A$(X%)+": "+D1$+" TO : "+D2$+" ABS"
16090 PRINT # 1,A$
16100 PRINT TAB(25)A$
16110 NEXT X%
16120 CLOSE
16130 RETURN
17000 '
17010 ' clear bottom of screen
17020 '
17030 PRINT @ (21,0),CHR$(24);
17040 RETURN

```

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Portable Word Processor

by Thomas Hartmann

For anyone who does a lot of writing, word processing is a major boon. A major drawback is the lack of portability of most word-processing systems.

There are a few portable computers around, but try working on an airplane with an Osborne in your lap—without a power source. You might as well be carrying a briefcase full of bricks.

There is a way, though, to combine portability and word-processing capabilities. By interfacing a Sony Typecorder with your Model III, you can have the best of both worlds. That procedure is described here.

Be prepared for the moment when inspiration strikes; carry your word processor with you.

The Typecorder is a small (11 1/8 by 1 3/4 by 8 5/8 inches) and lightweight (3 lbs., 1 oz.) electronic typewriter of sorts. It's actually a dedicated micro-

computer, ROM-equipped to provide a single function—word processing. It has 2K RAM and uses a 40-character liquid crystal display (LCD). Your copy is saved on microcassettes a page at a time, a page being about 30 lines. A single microcassette stores 100 pages of text.

The machine provides a variety of word-processing functions, with dedicated keys for character and word insertion or deletion, and scrolling through a document. You can edit on a page-by-page basis, saving each page on the cassette.

Probably the most exciting feature of the machine, aside from its light weight, thin profile, and versatility, is the fact that its keyboard feels like a conventional typewriter keyboard. The keys are spaced similarly to TRS-80 and other standard keyboards, and emit a faint click when touched. They have just enough of a spring to make them comfortable.

The only differences are the locations of the left shift key (one key over from where it is on the TRS-80), and the apostrophe key (next to the semicolon, as on IBM typewriters). I found these both to be rather inconsequential considerations; my fingers easily adjusted to the slight change.

There's a special display status mode on the Typecorder that locates most documents on the tape without too much trouble and also displays error messages. You can adjust tabs, margins, and the volume of the key clicks from the keyboard.

An unusual feature of the Type-

Character	Word	Suffix	Character	Word	Suffix
A	and	able	V	very	ver
B	been	bility	W	with	ward
C	can	cial	X	experience	
D	down	day	Y	you	
E	even	ent	Z	the	zation
F	from	ful	0	zero	
G	good	ght	1	one	
H	have	hood	2	two	
I	into	ing	3	three	
J	just		4	four	
K	know		5	five	
L	like	less	6	six	
M	more	ment	7	seven	
N	not	ness	8	eight	
O	other	ous	9	nine	
P	people		!	hundred	
Q	quite		@	thousand	
R	right	rent	#	million	
S	said	self	\$	dollar	
T	that	tion	%	percent	
U	united	ugh	°	cent	

Table 1. Basic steno character assignment.

corder originally designed for secretaries and stenographers, but with a little practice usable by anyone, are the Steno keys. These keys, located on either side of the space bar, automatically convert a symbol to a word, or generate suffixes or entire words with a single keystroke.

For example, to type the word "people" you would touch the letter P and hit the Steno key. Instantly the word "people" appears on the display. Each letter has a reserved word that is displayed if that single letter is printed followed by the Steno key.

To produce a suffix, simply type the word without the suffix—for example, "victimiz," and press the Steno key. The word is instantly transformed into "victimization."

Printing a number and then touching the Steno key spells out that number on the screen. This can be done with the words hundred, thousand, million, dollar, percent, and cent. A listing of the Steno key character assignment is shown in Table 1.

The typewriter operates for about five hours on a set of batteries, two or three hours if they're rechargeable NiCads. There's also a rechargeable battery pack available from Sony, as

well as 110-volt ac and 12-volt dc power supplies.

I've used the basic 6-volt dc Universal Battery Eliminator available from Radio Shack to power my Typewriter when I lie in bed in the evening and write. The advantage of the Radio Shack unit is that you can reverse the tip polarity, and the Typewriter uses a negative tip and positive ring, the opposite of most battery eliminators. When traveling, I carry two sets of NiCads and a charger/power supply.

To really make use of the Typewriter, you need some way of getting hardcopy. Sony provides three options: their OA-J1110 Communications/Printer Interface, used to interface the Typewriter with the TRS-80, the Sony Compact Printer, and the Sony Electric Typewriter Actuator.

I haven't used the Compact Printer or the Electric Typewriter Actuator that sits over an IBM or other standard typewriter and strikes the keys, so it's difficult to comment on them. Given the proliferation of inexpensive printers on the market, neither appeared to me to be a good buy for the money (the printer is priced over \$800).

The OA-J1110 Communications/Printer Interface gives you QUME-

compatible printer output, an RS-232C Serial output, and a built-in power supply. This device is necessary to connect the Typewriter to the TRS-80, or to send data along modem lines or to serial printers.

Using the Typewriter and Model III Together

Using the Typewriter with the Model III requires some way of getting the data in through the RS-232C port so that it can be saved as a file. There are probably a number of communications and terminal packages designed to use with modems that do this; I've found one of the most versatile, and one ideally suited to the Typewriter, to be Lance Miklus' ST80III.

This program works so well because it's possible to create specific configuration data bases that tell the program to ignore or modify certain incoming signals. Because the Typewriter sends out a string of control codes containing page numbers and other information that isn't accepted by the Model III, you get some strange screen changes as data is accepted through the serial port with a standard terminal package.

To set up the ST80III, run the Basic program, Tconv/BAS, that comes on

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the ST80III disk. From the menu, go to the Change Video Translation Table and change it so it's set up as in Table 2. From the main menu, save this new translation table with the name Sony/TBL onto the disk with your ST80III/CMD program.

To run the entire system, first write a document on your Typecorder. My first experiment was a 20,000-word sci-fi novella that was great fun. I did it on the train between my home in New Hampshire and my office in New York City, over the course of about three weeks. I'd suggest you set the right margin at 63 on the Typecorder, as this makes things easier later on (the maximum margin on the TRS-80 is 63).

Then, hook the communications interface up to the RS-232C port on the Model III. Plug the cables from the interface into the Typecorder and rewind the tape to the beginning of your document. Touch the play button to load the first page of your document into the Typecorder's RAM.

On the TRS-80, type "ST80III SONY" from TRSDOS. The terminal package loads and accesses your new translation table. Open the memory buffer by performing a TEC "C" command and, if you want the copy to go to

```

05 ENQ = 00 Null
06 ACK = 00 NULL
09 Tab = 00 Null
0A Line Feed = 00 Null
0C Form Feed = 00 Null
0D Return = 20 SPACE
10 DLE = 00 Null
12 DC2 = 00 Nul
14 DC4 = 00 Null
17 ETB = 00 Null
1A Sub = 00 Null
1B Escape = 00 Null
1C FS = 00 Null
1E RS = 00 Null
1F US = 00 NULL

```

Table 2. Video Translation Table for the ST80III package to create the Sony/TBL file.

your printer simultaneously, a TEC "P" command.

Hold down the Code button on the Typecorder and touch either the Y or X key. Code Y sends the entire document, page after page, to the TRS-80. Code X sends only one page at a time.

The Typecorder displays "IN COMMUNICATION" and the screen of your TRS-80 should busily scroll with the document you transferred from the Typecorder tape. After about 15 pages

are loaded (if your document is that long—the display of the Typecorder tells you which page you're on), it's a good idea to break the text with the Typecorder's Reset button and save the file, because this is approaching Scripsit's memory limit on a 48K machine.

Save the file by executing a TEC "X" to close the memory buffer, and a TEC "F" to prompt you for a file name and write the file to disk. Then, you can go back to a TEC "C" to begin with a new file and a clean buffer to load the rest of your document.

The last step is to go to Scripsit or some other word-processing program and edit the document. I've been using Scriplus, a useful modification to Scripsit.

You'll notice when you load the document that at the end of each line is a forced line feed symbol. This occurs because each line on the Typecorder requires a forced line feed. For many applications this presents no problem. I prefer to have more flexibility in formatting my printouts, however, so, after setting my right margin on the screen at 63 with a "Break: W=63" command, I simply run through the document laying a space on top of (replacing) each line feed, except those at the ends of paragraphs. This takes about 25 minutes for a 20,000-character file, and also presents a good opportunity to do some editing and review.

I could have configured the ST80III to ignore all the line feeds, but then I'd have to go back over the document and locate all paragraph beginnings to insert a line feed. I tried this, and it was too confusing, so I settled on the above procedure.

Summary

Anyone who uses a typewriter more than 10 or 15 hours a week and also travels will probably find that the Typecorder/Model III combination is hard to beat. It's versatile, portable, easy to use, and relatively uncomplicated.

Now I can write in bed, on the train or plane, in the car, sitting outside on a sunny afternoon, or anywhere the spirit moves me. If you write for a living or as a hobby, and have the money to spend on a new toy, you can't beat the combination and quality of the Sony Typecorder in concert with a Model III. ■

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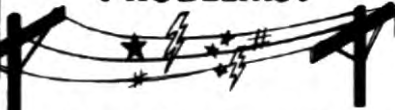
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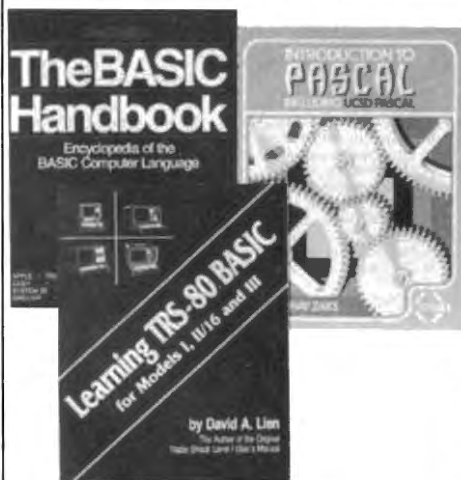
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Model 100 Conversions: Easy as I, II, III

by Beve Woodbury
80 Micro Technical Editor

You can convert many Model I, II, and III programs for the Model 100 with few modifications. In fact, some programs don't require any changes. This article will help you choose and convert programs appropriate for the Model 100.

What to Avoid

Avoid programs that require direct access (disk) file input and output. As of now, the 100 offers only sequential file input and output. Since Model 100 programs and files are stored within the computer, your 100's memory size limits the size of the programs and files you can use.

Also avoid programs that use POKEs and PEEKs. If you're not familiar with machine language and the Model 100's memory map, these commands may give you some strange results.

Finally, avoid programs that require large screen displays such as game graphics. You can alter screen displays for the Model 100 providing you keep in mind the limitations imposed by the 40-character by 8-line display. Change any Print@ statements in your conversion so that it prints at the correct location on your 100.

A Sample Program

Math Program is a Model I/II/III program that I converted to run on the Model 100 as a conversion example (see Program Listing 1).

Once you boot up the program, enter your name and choose from a menu to add, subtract, multiply, divide, or quit. When you choose the function you want, you're given the option of Level 1 (for numbers 0-9) or Level 2 (for numbers 0-100).

The program uses random numbers in the math problems. It prints the problem on the screen and waits for your answer. If you answer correctly, the computer tells you so; if you're wrong, the screen displays WRONG along with the correct answer.

When you quit the program, it reads an input sequential file to see if your name exists in the file. If it does, the program

prints the scores you achieved last time along with your current scores. Scores are calculated for each math function as well as overall.

Your current scores replace your old scores on the output sequential file or, if you aren't already on the file, the program adds your name and scores to the end of the output file.

Establishing Files

Prior to running Math Program on any TRS-80, you must enter Basic with two files and an established sequential input file.

On Models I/II/III, enter Basic by typing BASIC - F:2. To establish the sequential input file for Math Program, type in:

```
OPEN "O",1,"SCORES":CLOSE
```

and press the enter key.

On the Model 100, the command Maxfile=2 in line 10 opens the Basic file channels. Enter the text mode to establish the sequential input file. When the screen prints "File to edit?", type SCORES, press the enter key, and then press the Model 100's F8 key.

You only need to establish the Scores file before the program's first run or when the Scores file has been killed.

Model 100 Math Program Changes

Program Listing 2 is Math Program converted for the Model 100. Compare the two programs. I'll explain what changes were made and why. I have kept the line numbers the same in both programs for easy comparison.

Remark Statements

Remark statements, indicated by REM or an apostrophe, help you understand and debug a program. They illustrate the program's flow, explain what's being done in certain areas of the program, and help locate problem areas. Remarks also define a particularly confusing or unusual command area.

Each character or space in a remark statement takes up 1 byte of memory. Because of the Model 100's memory limitation, it is advisable to remove all spaces and remark statements from the program. But you should keep a printed copy of the complete program for future reference in making changes, debugging, or understanding program flow.

GOTO and GOSUB Statements

Programmers sometimes have GOTO or GOSUB statements reference a remark statement that explains a routine that follows. When you remove REM lines, be sure to change the line number in any GOTO or GOSUB statement that references, the deleted remark line number to the correct number. See program lines 390 and 810. If you miss one of these corrections, you'll get an undefined line error (UL).

Altering the Display Command

Print @ statements require the most changes (see lines 290-360 in Listing 1). You have to modify print locations from a

The Key Box

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64-character by 16-line format (Model I/III) or an 80-character by 23-line format (Model II) to the Model 100's format. Map the necessary changes by plotting the print locations on the 100's screen graph paper (p. 210 in the Model 100 manual) or by trial and error. The 100's screen limitation may make many programs unusable or unpleasant when converted.

If you have many lines of print that don't fit on the eight lines available, you'll want to control the speed of the screen scroll. You can accomplish this with For . . . Next loops every eight lines. I prefer to use an INKEY\$ routine (line 270) that allows the user to go to the next screen at his own rate by pressing any key.

Opening Files

Model 100 commands to open files are different from those

Program Listing 1. Math Program for Models I, II, and III.

```

10 : *****
20 : *
30 : *          MATH PRACTICE
40 : *          by Beve Woodbury
50 : *
60 : *****
70 :
80 :
90 :
100 CLS
110 ON ERROR GOTO 1140
120 PS="      0.00      0.00      0.00      0.00      0.00"
130 REM
140 PRINT@ 215, "MATH PRACTICE"
150 PRINT@ 723, "TYPE YOUR NAME, PLEASE."
160 PRINT@ 855, " ";
170 INPUT NS
180 CLS
190 PRINT "You will now have a chance to practice your math."
200 PRINT
210 PRINT "You may choose what math function you want to practice then I will choose some number problems for you to solve."
220 PRINT
230 PRINT "I will keep score of how many problems you get right and how many you get wrong. When you QUIT, I will tell you your score."
240 PRINT
250 PRINT "I will also tell you if you did better than the last time you practiced."
260 PRINT@ 845, "Press ANY key to continue."
270 IS=INKEY$:IF IS="" THEN 270
280 REM
290 CLS
300 PRINT@153, "MENU"
310 PRINT@340, "1. ADD"
320 PRINT@404, "2. SUBTRACT"
330 PRINT@ 468, "3. MULTIPLY"
340 PRINT@ 532, "4. DIVIDE"
350 PRINT@ 596, "5. QUIT"
360 PRINT@833, "PRESS NUMBER OF MATH FUNCTION WANTED, THEN PRESS THE ENTER KEY"
370 PRINT@ 920, " "; INPUT P
380 IF P>5 THEN 290
390 IF P=5 THEN 750
400 T=T+1
410 CLS:PRINT:PRINT
420 PRINT " LEVEL 1      numbers 0 to 9"
430 PRINT
440 PRINT " LEVEL 2      numbers 0 to 100"
450 PRINT:PRINT
460 INPUT "PRESS 1 OR 2 THEN PRESS THE ENTER KEY";L
470 IF L>2 THEN 410
480 CLS:ON L GOTO 500, 530
490 REM
500 A=RND(9)
510 B=RND(9)
520 GOTO 550
530 A=RND(100)
540 B=RND(100)
550 ON P GOTO 570,620,670,710
560 REM
570 CLS
580 PRINT@400, A+"B=";:INPUT C
590 IF C=A+B THEN AR=AR+1:GOTO1120
600 PRINT@ 530, A+"B="A+B:AW=AW+1:GOTO1130
610 REM
620 IF B>A THEN H=A:A=B:B=H:verify minuend larger number
630 PRINT@400, A-"B=";:INPUT S
640 IF S=A-B THEN SR=SR+1:GOTO 1120
650 PRINT@530, A-"B="A-B:SW=SW+1:GOTO 1130
660 REM
670 PRINT@400, A**B=";:INPUT M
680 IF M=A*B THEN MR=MR+1:GOTO 1120
690 PRINT@530, A**B="A*B :MW=MW+1:GOTO 1130
700 REM

```

Listing 1 continued in next column

Listing 1 continued from previous column

```

710 DV=A*B
720 PRINT@400, DV"/"B=";:INPUT D
730 IF D=DV/B THEN :DR=DR+1:GOTO 1120
740 PRINT@ 530, DV"/"B="DV/B: DW=DW+1:GOTO1130
750 REM
760 REM
770 OPEN "I",1,"SCORES"
780 OPEN "O",2,"NWSCORE"
790 IF EOF(1) THEN 930
800 INPUT#1, N1$,A1,A2,S1,S2,M1,M2,D1,D2,T1
810 IF N1$=NS THEN 840
820 PRINT@2, N1$,";A1;A2;S1;S2;M1;M2;D1;D2;T1
830 GOTO 790
840 REM
850 PA=A1/(A1+A2)
860 PS=S1/(S1+S2)
870 PM=M1/(M1+M2)
880 PD=D1/(D1+D2)
890 PT=(A1+S1+M1+D1)/T1
900 GOSUB 1100
910 Y=1:GOTO 790
920 REM
930 NA=AR/(AR+AW)
940 NS=SR/(SR+SW)
950 NM=MR/(MR+MW)
960 ND=DR/(DR+DW)
970 NT=(AR+SR+MR+DR)/T
980 REM
990 CLS:PRINT:PRINT
1000 PRINT@158,NS
1010 PRINT:PRINT
1020 PRINT"          ADD          SUB          MULT          DIV
TOTAL"
1030 PRINT
1040 IF Y=0 THEN GOSUB 1100:GOTO1070
1050 PRINT "OLD ";:PRINT USING F$;PA,PS,PM,PD,PT
1060 PRINT
1070 PRINT "NEW ";:PRINT USING F$;NA,NS,NM,ND,NT
1080 PRINT:PRINT
1090 CLOSE:KILL"SCORES":CMD"RENAME NWSCORE SCORES":END
1100 PRINT@2,NS,";";AR;AW;SR;SW;MR;MW;DR;DW;T
1110 RETURN
1120 PRINT@530, "RIGHT":GOTO 260
1130 PRINT@420, "WRONG":GOTO 260
1140 IF ERR/2+1=11 THEN RESUME NEXT 'continue if /B error

```

- A Random number—addend, minuend, multiplicand, or quotient
- AR Total of correct additions
- AW Total of wrong additions
- B Random number—addend, subtrahend, multiplier, or divisor
- C Sum in addition
- D Quotient in division
- DR Total of correct divisions
- DV Dividend in division
- DW Total of wrong divisions
- F Math function choice
- F\$ Print format string
- H Hold variable for making minuend larger than subtrahend
- IS Inkey variable
- L Level wanted
- M Product in multiplication
- MR Total of correct multiplications
- MW Total of wrong multiplications
- N\$ Player's name
- NA New addition percentage
- ND New division percentage
- NM New multiplication percentage
- NS New subtraction percentage
- NT New total percentage
- N1\$ Name in file
- PA Old addition percentage
- PD Old division percentage
- PS Old subtraction percentage
- PT Old total percentage
- S Difference in subtraction
- SR Total of correct subtractions
- SW Total of wrong subtractions
- T Total of problems attempted

Table 1. Math Program variable list.

of the other TRS-80s (lines 770 and 780). These commands must appear as shown in Listing 2. Spaces can be inserted between words if desired. Refer to p. 165 in the Model 100 manual for a more detailed explanation of opening files.

Random Numbers

The Model 100's random number generator returns numbers between 0 and 1. Therefore, all random numbers are decimal numbers to 14 places. The program produces whole numbers by multiplying the decimal numbers generated (line 1520 in Listing 2).

The random numbers are not truly random, however, as the same number sequence is generated each time a program runs. The Model 100 manual provides a short program on p. 175 that ties the random number generator to real time. This produces a different number sequence for each program execution (lines 1500-1510 in Listing 2).

Other Conversion Problems

I am aware of two other problems not demonstrated in Math Program. You must include the Then in an If... Then...GOSUB statement. You cannot use If...GOSUB as you can on the Model III. But in an If...Then...GOTO statement, either the Then or the GOTO can be left out.

Character strings (CHR\$) 32-125 are the same on all TRS-80s. Any other character string may or may not be different on the 100 and must be checked carefully to determine the appropriate CHR\$ command for the Model 100.

More Changes?

This covers the changes I've found necessary in converting programs to the Model 100. Give it a try and if you come across any others, let me know about them and I'll include them in a future issue. ■

Program Listing 2. Math Program for the Model 100.

```

10 MAXFILES=2
100 CLS
110 ONERRORGOTO1140
120 F$="  #.##  #.##  #.##  #.##
#.##"
140 PRINT@92,"MATH PRACTICE
150 PRINT@167,"TYPE YOUR NAME, PLEASE.
160 PRINT@254," ";:INPUT N$
210 CLS:PRINT"Choose the math function
you want.
220 PRINT"I will print number problems
to solve.
230 PRINT:PRINT"When you quit, I will
print your scores and your last scores.
260 PRINT@243,"Press ANY key to
continue.
270 I$=INKEY$:IFI$=""THEN270
290 CLS:PRINT@56,"1. ADD
320 PRINT@96,"2. SUBTRACT
330 PRINT@136,"3. MULTIPLY
340 PRINT@176,"4. DIVIDE
350 PRINT@216,"5. QUIT
360 PRINT@280,"ENTER NUMBER OF MATH
FUNCTION WANTED";:INPUTF
380 IFF>5THEN290
390 IFF=5THEN770
400 T=T+1

```

```

410 CLS:PRINT:PRINT"      LEVEL 1
numbers 0 to 9
430 PRINT:PRINT"      LEVEL 2      numbers 0
to 100
460 PRINT:PRINT"ENTER LEVEL SELECTION 1
OR 2  ";:INPUTL
470 IFL>2THEN410
480 CLS:ONLGOTO500,530
500 GOSUB1500:A=X1:GOSUB1500:B=X1
520 GOTO550
530 GOSUB1500:A=X2:GOSUB1500:B=X2
550 ONFGOTO570,620,670,710
570 CLS:PRINT@95,A"+"B"="";:INPUTC
590 IFC=A+BTHENAR=AR+1:GOTO1120
600 PRINT@175,A"+"B"=" A+B:AW=AW+
1:GOTO1130
620 IFB>ATHENH=A:A=B:B=H
630 PRINT@95,A-"B"="";:INPUTS
640 IFS=A-BTHENSR=SR+1:GOTO1120
650 PRINT@175,A-"B"="A-B:SW=SW+
1:GOTO1130
670 PRINT@95,A"*B"="";:INPUTM
680 IFM=A*BTHENMR=MR+1:GOTO1120
690 PRINT@175,A"*B"="A*B:MW=MW+
1:GOTO1130
710 DV=A*B:IFB=0THENB=1
720 PRINT@95,DV"/"B"="";:INPUTD
730 IFD=DV/BTHENDR=DR+1:GOTO1120
740 PRINT@175,DV"/"B"="DV/B:DW=DW+
1:GOTO1130
770 OPEN"RAM:SCORES.DO"FORINPUTAS1
780 OPEN"RAM:NWSCOR.DO"FOROUTPUTAS2
790 IFEOF(1)THEN930
800 INPUT#1,N1$,A1,A2,S1,S2,M1,M2,
D1,D2,T1
810 IFN1$=N$THEN850
820 PRINT#2,N1$," ",A1,A2;S1;S2;M1;M2;
D1;D2;T1
830 GOTO790
850 PA=A1/(A1+A2)
860 PS=S1/(S1+S2)
870 PM=M1/(M1+M2)
890 PT=(A1+S1+M1+D1)/T1
900 GOSUB1100
910 Y=1:GOTO790
930 NA=AR/(AR+AW)
940 NS=SR/(SR+SW)
950 NM=MR/(MR+MW)
960 ND=DR/(DR+DW)
970 NT=(AR+SR+MR+DR)/T
990 CLS:PRINT@18,N$
1020 PRINT@88,"ADD      SUB      MULT      DIV
TOTAL
1040 IFY=0THENGOSUB1100:GOTO1070
1050 PRINT"OLD
";:PRINTUSINGF$;PA,PS,PM,PD,PT:PRINT
1070 PRINT"NEW
";:PRINTUSINGF$;NA,NS,NM,ND,NT
1090 CLOSE:KILL"SCORES.DO":
NAME"NWSCOR.DO"AS"SCORES.DO":END
1100 PRINT#2,N$," ",A1,A2;S1;S2;M1;M2;
DR;DW;T
1110 RETURN
1120 PRINT@178,"RIGHT":GOTO260
1130 PRINT@114,"WRONG":GOTO260
1140 IFERR=11THENRESUMENEXT
1500 S=VAL(RIGHT$(TIMES$,2))
1510 FORI=1TOS:X=RND(1):NEXT
1520 X1=INT(X*10):X2=INT(X*100):RETURN

```

Disassembler

by David Cloutier

Soon after I got my Model 100, I tried to map its ROM and RAM. I downloaded the two disassemblers on CompuServe to do so, but both were too large to run on an 8K machine. So, I had to write my own program (see Program Listing 3).

Run Listing 3 and enter the memory location you wish to examine. You must enter the location in decimal format. Originally, I wrote the program so you could enter it in either decimal or hexadecimal, but, to conserve memory, I had to remove the subroutine that provided this option.

If your machine has more than 8K, you can reinsert this option by changing line 12520 to:

```
12520 INPUT "Start address (suffix with H if hex)";S$
```

and adding the lines in Fig. 1.

After the memory location you're interested in is mapped, press the R key to enter another memory location. Or, press the Q key to end the program.

One problem with this disassembler is its length. If you have an 8K machine, you'll probably have to remove all other files in memory or save them to tape. Between each mnemonic and its operand is a tab—there are no spaces.

When the program first runs, it arrives at memory location

```
10500 MS$=LEFT$(S$,2):L$$=RIGHT$(S$,2)
10510 N$=MS$:GOSUB10610:LM=L:RM=R
10520 N$=L$:GOSUB10610
10530 S=LM*16 3+RM*16 2+L*16+R:RETURN

10610 L$=LEFT$(N$,1):IFASC(L$)>57
THENL=(240ORASC(L$))-231:ELSEL=VAL(L$)
10620 R$=RIGHT$(N$,1):IFASC(R$)>57
THENR=(240ORASC(R$))-231:ELSER=VAL(R$)
10630 RETURN

12525 IFLEN(S$)>5THEN12520
12530 IFRIGHT$(S$,1)="H"ORRIGHT$(S$,1)="
h"THENS$=LEFT$(S$,LEN(S$)-1):GOSUB12700:
GOSUB10500:ELSES=VAL(S$)
12700 IFLEN(S$)<4THENS$="0"+S$:GOTO12700
:ELSERETURN
```

Figure 1. If your Model 100 has more than 8K RAM, add these lines to the disassembler; they give the option of entering the RAM address in decimal or hexadecimal

Program Listing 3. Disassembler.

```
5 CLEAR70:DIMA$(256)
10 DATA "NOP", "LD          BC,#", "LD
(BC),A", "INC          BC", "INC          B"
20 DATA "DEC          B", "LD          B,! ", "RCLA", "EX
AF,AF'", "ADD          HL,BC", "LD          A,(BC)"
30 DATA "DEC          BC", "INC          C", "DEC
C", "LD          C,! ", "RCA", "DJNZ          @"
```

7D33. This isn't surprising since the first command in memory is JP 7D33. When the program reaches locations 7D37-7D3D, it tests for a time delay. If the check comes back negative, the program sends some numbers to port D3.

As it continues through memory, the disassembler eventually arrives at 7EE1. This subroutine tests the memory size by getting the value of the first memory location of a chip and then complementing the value and loading it back into memory. If a read finds the number is the complement of the original, the memory is RAM and the program checks for any remaining RAM chips (see "Monitor 100," 80 Micro, July 1983, p. 178 for a memory map).

If the test fails or if all the chips are accounted for, the program loads the beginning location of all RAM into FAC0.

The subroutine 5A7C copies the default labels from ROM into RAM locations F789-F809. Call 6C93 makes a copy of F789-F809 and puts it into F80A-F88A. Call 6C9C does the reverse—it copies the label line in F80A-F88A to F789-F809.

Call OFE8 retrieves the character in the memory location HL points to; if the character is lowercase, the call converts it to uppercase and returns with the new character in the HL register pair.

Call 2542 is similar to the Z80 command LDIR. It takes the block pointed to by the HL register (block length in register B) and moves it to the memory pointed to by the DE register. ■

Write to David Cloutier at Bullard Road, North Brookfield, MA 01535.

```
40 DATA "LD          DE,#", "LD          (DE),A",
"INC          DE", "INC          D", "DEC          D"
50 DATA "LD          D,! ", "RLA", "JR          @", "ADD
HL,DE", "LD          A,(DE)", "DEC          DE"
60 DATA "INC          E", "DEC          E", "LD          E,! ", "R
RA", "JR          NZ,@", "LD          HL,#", "LD
(####),HL", "INC          HL", "INC          H"
70 DATA "DEC          H", "LD          H,! ", "DAA", "JR
Z,@", "ADD          HL,HL", "LD          HL,(####)
", "DEC          HL", "INC          L", "DEC          L"
80 DATA "LD          L,! ", "CPL", "JR          NC,@", "L
D          SP,#", "LD          (####),A", "INC
SP", "INC          (HL)", "DEC          (HL)"
90 DATA "LD          (HL),! ", "SCF", "JR
C,@", "ADD          HL,SP", "LD          A,(####)
", "DEC          SP", "INC          A", "DEC          A"
100 DATA "LD          A,! ", "CF", "LD          B,B", "LD
B,C", "LD          B,D", "LD
B,E", "LD          B,H", "LD          B,L", "LD
B,(HL)
110 DATA "LD          B,A", "LD          C,B", "LD
C,C", "LD          C,D", "LD
C,E", "LD          C,H", "LD          C,L"
120 DATA "LD          C,(HL)", "LD          C,A", "LD
D,B", "LD          D,C", "LD
D,D", "LD          D,E", "LD          D,H"
130 DATA "LD          D,L", "LD          D,(HL)",
"LD          D,A", "LD          E,B", "LD
E,C", "LD          E,D", "LD          E,E"
140 DATA "LD          E,H", "LD          E,L", "LD
E,(HL)", "LD          E,A", "LD
H,B", "LD          H,C", "LD          H,D"
150 DATA "LD          H,E", "LD          H,H", "LD
H,L", "LD          H,(HL)", "LD
```

Listing 3 continued

Listing 3 continued

```

H,A", "LD L,B", "LD L,C"
160 DATA"LD (HL),C", "LD (HL),D",
"LD (HL),E", "LD (HL),H", "LD
(HL),L", "HALT", "LD (HL),A"
170 DATA"LD (HL),C", "LD (HL),D",
"LD (HL),E", "LD (HL),H", "LD
(HL),L", "HALT", "LD (HL),A"
180 DATA"LD A,B", "LD A,C", "LD
A,D", "LD A,E", "LD
A,H", "LD A,L", "LD A,(HL)"
190 DATA"LD A,A", "ADD A,B", "AD
D A,C", "ADD A,D", "ADD
A,E", "ADD A,H", "ADD A,L"
200 DATA"ADD A,(HL)", "ADD A,A", "AD
C A,B", "ADC A,C", "ADC
A,D", "ADC A,E", "ADC A,H"
210 DATA"ADC A,L", "ADC A,(HL)",
"ADC A,A", "SUB B", "SUB C", "SUB
D", "SUB E", "SUB H", "SUB L", "SUB (HL)"
220 DATA"SUB A", "SBC A,B", "SBC
A,C", "SBC A,D", "SBC A,E", "SB
C A,H", "SBC A,L", "SBC
A,(HL)", "SBC A,A"
230 DATA"AND B", "AND C", "AND D", "AND
E", "AND H", "AND L", "AND (HL)", "AND
A", "XOR B", "XOR C", "XOR D", "XOR E"
240 DATA"XOR H", "XOR L", "XOR (HL)", "X
OR A", "OR B", "OR C", "OR D", "OR
E", "OR H", "OR L", "OR (HL)", "OR
A"
250 DATA"CP B", "CP C", "CP D", "CP
E", "CP H", "CP L", "CP (HL)", "CP
A", "RET NZ", "POP BC"
260 DATA"JP NZ,#", "JP #", "CALL
NZ,#", "PUSH BC", "ADD
A,! ", "RST 0", "RET Z", "RET"
270 DATA"JP Z,#", "Unknown", "CALL
Z,#", "CALL #", "ADC A,! ", "RST
8", "RET NC", "POP DE", "JP NC,#"
280 DATA"OUT (I),A", "CALL NC,#", "P
USH DE", "SUB !", "RST 10H", "RE
T C", "EXX", "JP C,#"
290 DATA"IN A,(I)", "CALL C,#", "Un
known", "SBC A,! ", "RST 18H", "RE
T PO", "POP HL", "JP PO,#"
300 DATA"EX (SP),HL", "CALL PO,#", "P
USH HL", "AND !", "RST 20H", "RE
T PE", "JP (HL)", "JP PE,#"
310 DATA"EX DE,HL", "CALL PE,#", "U
nknown", "XOR !", "RST 28H", "RET
P", "POP AF", "JP P,#", "DI", "CALL P,#"
320 DATA"push AF", "OR !", "RST 30H", "RE
T M", "LD SP,HL", "JP M,#", "EI
", "CALL M,#", "Unknown", "CP !", "RST
38H"
1000 FORX=0TO255:READA$(X):NEXT
1010 X=0:GOTO12500
1012 IFX>65535ORX<0THEN12520
1015 P=PEEK(X):PA$=CHR$(P)
1020 P$=A$(P):ML=X:GOSUB12000
1025 GOSUB1700
1030 P$=ML$+CHR$(9)+P$
1040 IFRIGHT$(P$,1)="!"THENGOSUB11000
1050 IFRIGHT$(P$,1)="#"THENGOSUB11500
1055 IFRIGHT$(P$,1)="@"THENGOSUB1500
1060 GOSUB1900:PRINTP$;TAB(25);PA$

```

```

1065 I$=INKEY$:IFI$="r"ORIS$="R"THEN12520
1070 X=X+1:GOTO1012
1500 P$=LEFT$(P$,LEN(P$)-1):X=X+1:C=PEEK
(X):PA$=PA$+CHR$(C):IFC>127THENC=C-256
1520 ML=X+1+C:GOSUB12000:P$=P$+ML$:RETUR
N
1700 IFP<>34ANDP<>50THEN1720ELSEGOSUB180
0
1710 MID$(P$,5,4)=P2$+P1$:RETURN
1720 IFP=42THENGOSUB1800:MID$(P$,8,4)=P2
$+P1$:RETURN
1740 IFP=58THENGOSUB1800:MID$(P$,7,4)=P2
$+P1$:RETURN
1760 IFP=211THENX=X+1:P=PEEK(X):PA$=PA$+
CHR$(P):C=P:GOSUB10000:P1$=C$:MID$(P$,6,
2)=P1$:RETURN
1770 IFP=219THENX=X+1:P=PEEK(X):PA$=PA$+
CHR$(P):C=P:GOSUB10000:P1$=C$:MID$(P$,7,
2)=P1$:RETURN
1800 X=X+2:P1=PEEK(X-1):P2=PEEK(X):PA$=P
A$+CHR$(P1)+CHR$(P2):C=P1:GOSUB10000:P1$
=C$:C=P2:GOSUB10000:P2$=C$:RETURN
1900 FORR=1TOLEN(PA$):IFASC(MID$(PA$,R,1
))<32THENMID$(PA$,R,1)="."
1910 NEXTR:RETURN
10000 H$="0123456789ABCDEF"
10010 L=INT(C/16):R=C-L*16
10020 C$=MID$(H$,L+1,1)+MID$(H$,R+1,1)
10030 RETURN
11000 P$=LEFT$(P$,LEN(P$)-1)
11010 X=X+1:C=PEEK(X):PA$=PA$+CHR$(C):GO
SUB10000
11020 P$=P$+C$:RETURN
11500 P$=LEFT$(P$,LEN(P$)-1)
11510 X=X+2:C=PEEK(X):P2$=CHR$(C):GOSUB1
0000
11520 P$=P$+C$:C=PEEK(X-1):PA$=PA$+CHR$(
C)+P2$:GOSUB10000
11530 P$=P$+C$:RETURN
12000 MS=INT(ML/256):LS=ML-MS*256
12010 C=MS:GOSUB10000:ML$=C$
12020 C=LS:GOSUB10000:ML$=ML$+C$
12030 RETURN
12500 CLS
12520 INPUT"Start address";S
12550 X=S:GOTO1012

```

Elapsed Time

by Richard Ramella

The Model 100 command PRINT TIMES\$ displays the current time in 24-hour, military format, but the time is embedded in a data string and can't be easily substituted in mathematical equations. Elapsed Time (Program Listing 4) solves this problem by letting you use the enter key to mark start and end times of a program and telling you how much time passes between the two.

I used Elapsed Time as a subroutine in programs. It's helpful when I'm trying to pare the running time of a new program, but it can time any event that lasts fewer than 24 hours. The program has various applications, but since the machine

only states times to the second, it isn't useful for timing events that require split-second accuracy.

The program calculates the hours, minutes, and seconds of start and end times, stores them in separate number variables, and then subtracts the start time from the end time. Remember that the decimal system is not useful when working in 60-second, 60-minute, and 24-hour units.

Running the Program

The program begins with this prompt: "To start, tap enter." Hitting the enter key sets the start time. Another prompt then appears: "Timing has begun. To end, tap enter." This second tap stops the program timer. Then the start time, the end time, and the elapsed time are given in this format: 2 hours 23 minutes 1 second.

How It Works

Lines 150 and 200 set A\$(1) and A\$(2) as start and end times. The For . . . Next loop in lines 240-280 isolates the hour, minute, and second totals of the start and end times and assigns their variable values. This is done using the LEFT\$, MID\$, and RIGHT\$ string commands to isolate the correct two characters for hours, minutes, and seconds, then transforming these into numbers with the VAL command.

Here's an example of how this works:

```
10 Z$="4"
20 W=VAL(Z$)
30 PRINT W
```

Line 30 produces the number 4, which is subject to normal mathematical computation on the computer. This example won't work if, for instance, line 10 reads Z\$="four".

The reverse of this process is STR\$:

```
10 W=4
20 Z$=STR$(4)
30 PRINT Z$
```

Line 30 prints a 4 again, but it's a string 4 and subject to string variable rules.

Elapsed Time changes parts of a string into numbers. These numbers are dealt with in lines 330-380. I won't explain all these lines, but I'll translate one.

In effect, line 330 (in Listing 4) says: If the start- and end-seconds numbers are equal, zero seconds is the answer, so go to the next line. If the end number is higher than the start number, the number of elapsed seconds is the end number minus the start number. The only other possibility is that the start number is bigger than the end number, so the elapsed time number for seconds has to be 60 seconds minus the start number plus the end number. If this is the case, you must borrow the 60 seconds from the minute number.

The minute and hour figures are handled in roughly the same manner. Lines 360-370 print the elapsed time. If no hours or minutes have passed, the program doesn't print "0 hours 0 minutes." But, Elapsed Time does pay attention to plurals and adds an S to the words hour, minute, and second if needed.

In using this routine as a timer for a program in progress, I include program lines to set the value of A\$(1) as the timed routine begins and to set the value of A\$(2) when it is complete. Then I send the test to lines 240-380; the lines in Elapsed

Time are renumbered higher than the lines at the end of the program being timed, so no significant overlap exists. Once the elapsed time is stated, you can go back to the timed program to try to shorten its run time. ■

Write to Richard Ramella at 1493 Mt. View Ave., Chico, CA 95926.

```
100 REM * Elapsed Time * TRS-80 Model
100 * Richard Ramella *
110 CLS
130 PRINT "To start, tap Enter."
140 INPUT X
150 A$(1)=TIME$
160 CLS
170 PRINT "Timing has begun."
180 PRINT "To end, tap Enter."
190 INPUT X
200 A$(2)=TIME$
230 CLS
240 FOR A=1 TO 2
250 H(A)=VAL(LEFT$(A$(A),2))
260 M(A)=VAL(MID$(A$(A),4,2))
270 S(A)=VAL(RIGHT$(A$(A),2))
280 NEXT A
290 PRINT "Start: ";A$(1)
300 PRINT "Finish: ";A$(2)
310 PRINT STRING$(20,"-")
320 PRINT "Elapsed time..."
330 IF S(1)=S(2) THEN 340 ELSE IF S(2)>S
(1) THEN S(3)=S(2)-S(1) ELSE S(3)=(60-S
(1))+S(2):M(3)=-1
340 IF M(2)=M(1) THEN 350 ELSE IF M(2)>M
(1) THEN M(3)=M(3)+(M(2)-M(1)) ELSE M(3)
=M(3)+(60-M(1))+M(2):H(3)=-1
350 IF H(2)=H(1) THEN 360 ELSE IF H(2)>H
(1) THEN H(3)=H(3)+(H(2)-H(1)) ELSE H(3)
=H(3)+(24-H(1))+H(2)
360 IF H(3)>0 THEN PRINT H(3)"hour";:
IFH(3)>1 THEN PRINT "s ";
370 IF M(3)>0 THEN PRINT M(3)"minute";:
IF M(3)>1 THEN PRINT "s ";
380 IF S(3)>0 THEN PRINT S(3)"second";:
IF S(3)>1 THEN PRINT "s"
390 END
```

Program Listing 4. Elapsed Time.

If It's Tuesday . . .

Conversion by Mare-Anne Jarvela
80 Micro Technical Editor

You may have noticed that your corner liquor store stocks your favorite brands in half-liters instead of those familiar fifths and pints. And it's just as likely that the local service station now dispenses gas in liters rather than gallons. Despite these minor concessions to metric conversion, the United States, for the most part, stands apart in a world of kilometers, liters, and grams.

But if travel or business takes you abroad, or even across the border to Canada or Mexico, you may need to convert

U.S. measurements and currency into metric equivalents and foreign monies and back again. Conv.BA does all the hard work (see Program Listing 5).

Measurement Conversions

After boot-up, the program displays the menu shown in Fig. 2. If you choose option 1 or 2, conversions between U.S. and metric measurements, a new menu appears and you choose the conversion you want to make (see Fig. 3). For example, you can convert inches to centimeters or liters to gallons.

After this, enter the number you want converted and the answer appears on the screen. You can then return to the main menu for another conversion.

Currency Conversion

If you select Foreign Currency from the main menu, a submenu displays two options: to convert U.S. dollars into foreign currency or vice versa.

If you choose to convert U.S. dollars to a foreign currency, the program displays seven countries and their monetary denominations in parentheses (see Fig. 4). Select the country/currency of interest.

After you select the exchange, the program prompts you for

- 1. U.S. STANDARD→METRIC
 - 2. METRIC→U.S. STANDARD
 - 3. FOREIGN CURRENCY
- ENTER 1, 2 OR 3?

Figure 2. Conv.BA's main menu.

- 1. FAHRENHEIT TO CELSIUS
 - 2. INCHES TO CENTIMETERS
 - 3. FEET TO METERS
 - 4. MILES TO KILOMETERS
 - 5. OUNCES TO GRAMS
 - 6. POUNDS TO KILOGRAMS
 - 7. GALLONS TO LITERS
- ENTER NUMBER OF CONVERSION?

Figure 3. Menu to convert U.S. measurements to foreign measurements.

- 1. CANADA (DOLLAR)
 - 2. BRITAIN (POUND)
 - 3. FRANCE (FRANC)
 - 4. MEXICO (PESO)
 - 5. W. GERMANY (MARK)
 - 6. SPAIN (PESETA)
 - 7. JAPAN (YEN)
- ENTER NUMBER OF CURRENCY?

Figure 4. Currency conversion options.

the current currency exchange rate. For instance, if you wanted to convert dollars into French currency, the program asks you the exchange rate for one franc. You'll find exchange rates in the financial section of your local newspaper or *The Wall Street Journal* under the heading "U.S. \$ Equivalents."

When you enter the exchange rate, the program prompts for the number of dollars you want converted. When the answer appears, you can return to the main menu.

If you want to convert foreign currency to U.S. dollars, you would choose option 2 from the submenu. When you choose the currency to which you want your dollar figure converted, the program prompts, "What is the current exchange rate for one U.S. dollar?" Again, this information is found in your newspaper's financial section, under "Currency per U.S. \$." Enter the appropriate number, then enter the number of dollars you want converted and your answer appears on the display.

If for any reason you want to change the calculations for figuring out the currency, alter lines 1040 and 1100.

Bon Voyage

Have fun converting and don't leave home without your Model 100. Hopefully this program will help you the next time you buy gas by the liter at a German service station. ■

Program Listing 5. Conv.BA.

```

10 REM CONVERSION
20 CLS:PRINT"1. U.S. STANDARD
";:PRINTCHR$(154);:PRINT" METRIC"
30 PRINT:PRINT"2. METRIC ";:PRINTCHR$(
154);:PRINT" U.S. STANDARD"
40 PRINT:PRINT"3. FOREIGN CURRENCY"
50 PRINT:INPUT"ENTER 1,2 OR 3";N
60 IF N=1 GOTO90
70 IF N=2 GOTO 210
80 IF N=3 GOTO890 ELSE 20
90 CLS:PRINT"1. FARENHEIT TO CELSIUS"
100 PRINT"2. INCHES TO CENTIMETERS"
110 PRINT"3. FEET TO METERS"
120 PRINT"4. MILES TO KILOMETERS"
130 PRINT"5. OUNCES TO GRAMS"
140 PRINT"6. POUNDS TO KILOGRAMS"
150 PRINT"7. GALLONS TO LITERS"
160 INPUT"ENTER NUMBER OF CONVERSION";R
170 ON R GOSUB
330,370,410,450,490,530,570
180 PRINT:INPUT"DO YOU WANT ANOTHER
CONVERSION (Y/N)";A$
190 IF A$="Y" THEN 20
200 IF A$="N" THEN 1210 ELSE 180
210 CLS:PRINT"1. CELSIUS TO FARENHEIT"
220 PRINT"2. CENTIMETERS TO INCHES"
230 PRINT"3. METERS TO FEET"
240 PRINT"4. KILOMETERS TO MILES"
250 PRINT"5. GRAMS TO OUNCES"
260 PRINT"6. KILOGRAMS TO POUNDS"
270 PRINT"7. LITERS TO GALLONS"
280 INPUT"ENTER NUMBER OF CONVERSION";S
290 ON S GOSUB
610,650,690,730,770,810,850
300 PRINT:INPUT"DO YOU WANT ANOTHER
CONVERSION (Y/N)";A$

```

Listing 5 continued

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T	Menu choice	X	Degrees Celsius
N	Menu choice	W	Centimeters
R	Menu choice	E	Meters
S	Menu choice	K	Kilometers
V	Menu choice	G	Grams
D	Degrees Fahrenheit	B	Kilograms
I	Inches	L	Liters
F	Feet	C	Current exchange rate
M	Miles	U	How many units?
O	Ounces	A\$	Y/N Input
P	Pounds	B\$	Singular currency
Q	Gallons	C\$	Plural currency

Table 2. Conv.BA variable list.

Line	Description
10-80	Menu (Main)
90-200	Menu (U.S. Standard to Metric)
210-330	Menu (Metric to U.S. Standard)
340-600	Calculations (U.S. Standard to Metric)
610-880	Calculations (Metric to U.S. Standard)
890-910	Menu (Main-Foreign Currency)
920-1010	Menu (Choice of Currency)
1020-1070	U.S. \$ to Foreign Currency
1080-1130	Foreign Currency to U.S. \$
1140-1200	String Values
1210	End

Table 3. Conv.BA line descriptions.

Listing 5 continued

```

310 IF A$="Y" THEN 20
320 IF A$="N" THEN 1210 ELSE 300
330 REM F TO C
340 CLS:INPUT"DEGREES FARENHEIT";D
350 PRINT:PRINT D;"DEGREES FARENHEIT
=";5/9*(D-32); " DEGREES CELSIUS"
360 RETURN
370 REM INCHES TO CENTIMETERS
380 CLS:INPUT"HOW MANY INCHES";I
390 PRINT:PRINT I;"INCHES =";I*
2.54;"CENTIMETERS"
400 RETURN
410 REM FEET TO METERS
420 CLS:INPUT"HOW MANY FEET";F
430 PRINT:PRINTF;"FEET =";F*
.3048;"METERS"
440 RETURN
450 REM MILES TO KILOMETERS
460 CLS:INPUT"HOW MANY MILES";M
470 PRINT:PRINTM;"MILES =";M*
1.609;"KILOMETERS"
480 RETURN
490 REM OUNCES TO GRAMS
500 CLS:INPUT"HOW MANY OUNCES";O
510 PRINT:PRINTO;"OUNCES =";O*
28.35;"GRAMS"
520 RETURN
530 REM POUNDS TO KILOGRAMS
540 CLS:INPUT"HOW MANY POUNDS";P
550 PRINT:PRINTP;"POUNDS =";P*
.45;"KILOGRAMS"
560 RETURN
570 REM GALLONS TO LITERS
580 CLS:INPUT"HOW MANY GALLONS";Q
590 PRINT:PRINTQ;"GALLONS =";Q*
3.8;"LITERS"
600 RETURN
610 REM C TO F
620 CLS:INPUT"HOW MANY DEGREES
CELSIUS";X
630 PRINT:PRINTX;"DEGREES CELSIUS =";9*X
/5+32;"DEGREES FARENHEIT"
640 RETURN
650 REM CENTIMETERS TO INCHES
660 CLS:INPUT"HOW MANY CENTIMETERS";W
670 PRINT:PRINTW;"CENTIMETERS =";W*
.39;"INCHES"
680 RETURN
690 REM METERS TO FEET
700 CLS:INPUT"HOW MANY METERS";E
710 PRINT:PRINTE;"METERS =";E*
3.28;"FEET"
720 RETURN
730 REM KILOMETERS TO MILES
740 CLS:INPUT"HOW MANY KILOMETERS";K
750 PRINT:PRINTK;"KILOMETERS =";K*
.62;"MILES"
760 RETURN
770 REM GRAMS TO OUNCES
780 CLS:INPUT"HOW MANY GRAMS";G
790 PRINT:PRINTG;"GRAMS =";G*
.035;"OUNCES"
800 RETURN
810 REM KILOGRAMS TO POUNDS
820 CLS:INPUT"HOW MANY KILOGRAMS";B
830 PRINT:PRINTB;"KILOGRAMS =";B*
2.2;"POUNDS"
840 RETURN
850 REM LITERS TO GALLONS
860 CLS:INPUT"HOW MANY LITERS";L
870 PRINT:PRINTL;"LITERS =";L*
0.264;"GALLONS"
880 RETURN
890 CLS:PRINT"1. U.S.$ ";:PRINTCHR$(154)
;:PRINT" FOREIGN CURRENCY":PRINT" (
U.S.$ EQUIVALENT )"
900 PRINT:PRINT"2. FOREIGN CURRENCY
";:PRINTCHR$(154);:PRINT" U.S.$":PRINT"
( CURRENCY PER U.S.$ )"
910 PRINT:INPUT"ENTER 1 OR 2";T
920 CLS:PRINT"1. CANADA (DOLLAR)"
930 PRINT"2. BRITAIN (POUND)"
940 PRINT"3. FRANCE (FRANC)"
950 PRINT"4. MEXICO (PESO)"
960 PRINT"5. W.GERMANY (MARK)"
970 PRINT"6. SPAIN (PESETA)"
980 PRINT"7. JAPAN (YEN)"
990 INPUT"ENTER NUMBER OF CURRENCY";V
1000 ON V GOSUB
1140,1150,1160,1170,1180,1190,1200
1010 IF T=2 THEN 1080
1020 CLS:PRINT"WHAT IS THE CURRENT

```

Listing 5 continued

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Listing 5 continued

```

EXCHANGE RATE FOR 1
";:PRINTB$;:INPUT"";C
1030 PRINT:INPUT"HOW MANY U.S.$";U
1040 PRINT:PRINTU;"U.S.$="";:PRINT
USING"#####.##";U/C;:PRINT"";C$
1050 PRINT:INPUT"DO YOU WANT ANOTHER
CONVERSION (Y/N)";A$
1060 IF A$="Y" THEN20
1070 IF A$="N" THEN1210 ELSE 1050
1080 CLS:PRINT"* *";C$;" * *":INPUT"WHAT
IS THE CURRENT EXCHANGE RATE FOR 1
U.S.$";C
1090 PRINT:PRINT"HOW MANY
";:PRINTC$;:INPUT"";U
1100 PRINT:PRINTU;C$;"="";:PRINT USING
"#####.##";U/C;:PRINT"U.S.$"
1110 PRINT:INPUT"DO YOU WANT ANOTHER
CONVERSION (Y/N)";A$
1120 IF A$="Y" THEN 20
1130 IF A$="N" THEN1210 ELSE 1110
1140 B$="CANADIAN $":C$=B$:RETURN
1150 B$="POUND":C$="POUNDS":RETURN
1160 B$="FRANC":C$="FRANCS":RETURN
1170 B$="PESO":C$="PESOS":RETURN
1180 B$="MARK":C$="MARKS":RETURN
1190 B$="PESETA":C$="PESETAS":RETURN
1200 B$="YEN":C$=B$:RETURN
1210 CLS:END

```

Still Up in the Air

by Eric Grevstad
80 Micro News Editor

From the moment Radio Shack introduced the Model 100, people have considered the portable a suitable seat-mate for plane trips. After three months on the market, the 100 has logged a lot of flying time, but still hasn't earned its official license.

Hundreds of owners use their micros, with and without asking permission, on commercial flights. A few ask for permission and are turned down, though, as far as anyone knows, no planes have suffered instrumentation interference or near-disaster as a result of airborne computing. Past that, users waiting for an authoritative yes or no on the 100's airworthiness are still waiting.

As reported in *80 Micro* (July 1983, p. 169), Federal Administration Aviation rule 91-19 outlaws all electric devices except hearing aids, pacemakers, tape recorders, and shavers—unless an airline chooses to allow them. From Model 100 owners' chats on CompuServe, there's no doubt that many airlines are tolerating the 100.

The bulletin board contains dozens of messages like E. Brad Meyer's: "Took Northwest Flight 287 from Boston to Chicago today. Asked permission to use the 100, received it, and used the machine intermittently throughout the flight, including during the final approach. No problems reported."

InfoWorld gave two pages of its June 20 issue to a rather giddy article by Bob Loudon of Palo Alto, CA, who played with his new Model 100 from San Francisco to New York and back: "Years ago, a friend told me that you aren't a real success in this country until the stewardesses always stop by to say 'Hello,'" Loudon wrote. "You can achieve the same effect with a Model 100, at least until everybody else has one."

Besides impressing flight attendants, Loudon pointed

out an advantage of CMOS RAM over magnetic media: "The Model 100 has now been X-rayed twice by the airlines, with no loss of memory," he wrote.

On his way home, Loudon used the portable's Basic and sound routines to write a program that played five octaves of music in whole, half, quarter, and eighth notes—presumably trying the patience of people sitting nearby, but apparently causing no harm to the plane's communication and navigation equipment.

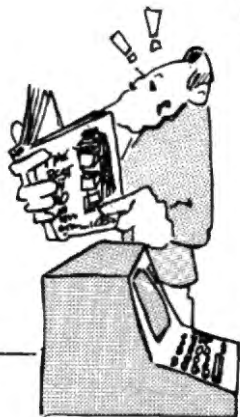
According to John Revelle of Rohnert Park, CA, the first rule of Model 100 air travel is to notify the flight crew of its use: "Although the rule is a federal one and the authority is supposed to be with the airline, the actual final word rests with the captain," wrote Revelle in a letter to *80 Micro*.

Meanwhile, Radio Shack is trying to end the uncertainty by collecting owners' reports and offering test 100s to airlines. Said director of computer merchandising Ed Juge, "I don't think there's been any official word yet. The only cases I've heard of someone not using the 100 or being stopped from using it were on USAir. There were a couple of incidents of the stewardess acting on her own, saying 'It's a rule that you can't have personal computers on the plane.'

"It doesn't look like there's a major problem at all," Juge said. "It's just a matter of history and of accumulating evidence to tell the airlines that people have used it, with the captain's permission, and there've been no problems.

"We're in contact with several airlines, all of whom have been offered units for testing; we've made some inroads with them and will possibly be contacting some more," Juge said of Radio Shack's requests for a definite all-clear. "We're trying to work within the existing law; we're not trying to go to the FAA and get a new law. And the existing law states that it's up to the airlines and the individual captains." ■

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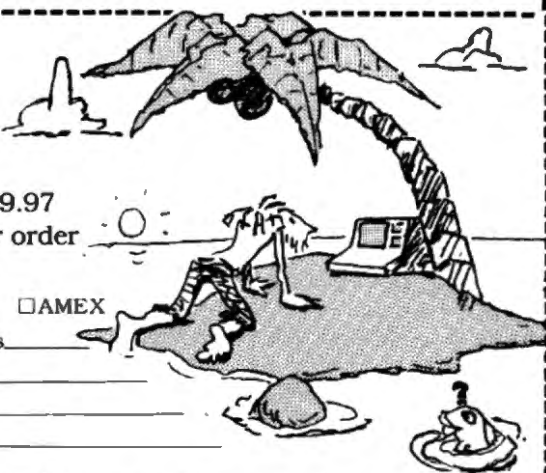
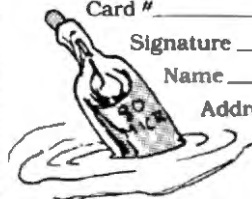
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NEWS THIS MONTH



The Shack's software future

Model 4 gets CP/M, but IBM gets the limelight.

Generalizations about the computer market have a half-life of approximately eight hours, but—in the absence of Peanut, Popcorn, Lisa, and McIntosh—the micro scene of mid-1983 made room for three definite hot properties.

One was the portable computer, with Radio Shack's Model 100 setting the pace; another was the inexpensive home micro, with more powerful machines like the Commodore 64 and the Coleco Adam replacing Timexes and VICs. The third was the IBM PC, attracting flocks of work-alike hardware and compatible software manufacturers.

The PC's success has overshadowed Tandy's Model 4. For years, the naysayers' view was that the TRS-80 was stuck with an orphan operating system, that TRSDOS was a software sideline compared to the 8-bit standard, CP/M. Now the Model 4 is getting, after half a year's postponement, the latest CP/M 3.0—just as software companies are rushing to 16-bit PC-DOS and MS-DOS products. The Model 4 may not be an orphan, but it seems IBM has the biggest family.

Has Radio Shack gone from a DOS dead-end to a hardware dead-end? Microsoft Corp., proud of its Model 100 software and Model 16 Xenix operating system, is maintaining a hands-off attitude toward the rest of the line: "The Model 4 is an 8-bit system, therefore Microsoft doesn't have anything to offer it in the way of an operating system," said public relations director Pam Edstrom.

Microsoft is enjoying immense success in the 16-bit world. The firm's MS-DOS is arguably the single-user stan-



Some of today's best sellers may come to the Model 4.

dard—even Digital Research Inc. has decided to offer its language products on MS-DOS as well as its own CP/M-86.

As for the multi-user Xenix system, which Microsoft licensed to Radio Shack for the Model 16, Edstrom says, "I guess I'd credit Radio Shack to some

extent for having Xenix take off and build some momentum. When Radio Shack, which is one of the major OEMs in the market—and this was the first time Radio Shack had gone outside for an operating system—picks a product, that reassures people it's going to be around for some time."

Radio Shack "went outside" for its alternate Model III operating system, LDOS; Tracy Licklider, vice president of operations for Software Arts of Cambridge, MA, saw LDOS—in Model III mode—playing a sizable role on the Model 4.

"I think that the Model 4 will do fairly well," Licklider said. "I think there's going to be a market for machines of that capability for some time. I think Radio Shack sees it as an upgrade of the Model I/III, analogous to Apple's beefing up the II into the IIe.

"In terms of software, I think it will help somewhat that they have CP/M on the 4, but I think enough of the mainstream applications will be under LDOS in Model III mode or TRSDOS 6.0. I think it'll have the main spread of applications."

Licklider praised the Model 4 as "a very well-priced machine," saying its 64K, two-drive model (\$1,999) compares favorably with the Apple IIe—"There're no color graphics, but for lots of applications such as VisiCalc or word processing you don't need graphics." His one reservation concerned a missing language:

"I think it's sad there's no Logo on it, even a black-and-white one. I understand the Model III has been very popular as a school machine, and Logo would seem a natural thing to have, but I guess the low-resolution graphics prohibited that."

Licklider admitted that the 4 isn't likely to attract state-of-the-art programs: "As for new major innovative software under TRSDOS, I think not; that'll probably be 16-bit or MS-DOS material. But the 4 represents a reasonable market. We have done VisiCalc under TRSDOS 6.0, and, though I can't yet say anything definitely, there's lots of interest in it as a TK!Solver machine."

Bill Hogue, president of Big Five Software, was more pessimistic about Tandy's prospects. Big Five, the company behind such classic TRS-80 games as *Galaxy Invasion* and *Cosmic Fighter*, makes its new bestseller, *Miner 2049er*, exclusively for Atari micros.

"I'm pretty worried about the TRS-80 market," Hogue said. "We have officially left it, though we're still selling some of our older games. If we hadn't come out with our Atari game at the time we did, we probably would have gone out of business. If we'd come

out with a TRS-80 game at the time, we would have gone out of business.

"I've talked to other people and they've told me that nobody's buying TRS-80 software, that sales are down. A lot of stores in my area that used to sell it, as well as Apple and Atari programs, have discontinued it.

"I don't think Radio Shack is going to go bankrupt or anything like that," Hogue said. "But I think they're a little bit behind in technology. I never did like their Color Computer. I heard they were coming out with a new one, and I just saw that toy [the MC-10] they made, and I hope that isn't it."

As a game designer, Hogue prefers Atari's ROMpack capability: "Cartridge is the only place to be. We can put our games on that and piracy's almost eliminated." Asked whether the Model 4's CP/M will boost Radio Shack sales, he said, "No way. The way you make your money is mostly in the games market; that's the home market. Ask the average person who's bought a computer and he doesn't know what CP/M is."

Outside of games, though, CP/M should increase the Model 4 software library. George Tate, president of Ashton-Tate, said "The TRSDOS market is something we haven't been involved with, so I haven't paid much attention to it." Asked whether his firm's dBase II would appear on Model 4 CP/M, however, Tate replied, "Oh, yeah, absolutely. There isn't question one about that."

Can Tandy stay competitive with IBM? "Tandy certainly has their own market. They have a lot of retail stores, and they can be competitive with anyone they choose," Tate said. "And they've shown an ability to do some surprising things, like come out with the Model 100, which I think is a great machine.

"If you look at the market of Radio Shack over time, it's a market that's been almost immune to outside compe-

tion," Tate pointed out. "Most everything that's been sold for them has been sold through Radio Shack stores. I don't think it's a dead end at all."

The consensus that CP/M will mean access to many current, if not brand-new, programs, while new software will come primarily from Radio Shack, was accepted by Ed Juge, Tandy's director of computer merchandising.

"I think there's a lot of CP/M stuff out there," Juge told *80 Micro*. "Now whether we're going to spark a whole rush of new software for the 4, I doubt it. I don't think anybody goes into using the CP/M system with the idea that anybody's going to come out with a lot of new material. You do it to use existing software.

"We don't have any intention of bringing out software under the CP/M system. It's there for the people that want to use CP/M, or the people who want to support it. We believe TRSDOS is pretty locked in now. We've got 50 to 60 people on the phone using it and answering questions, and I don't want to have to hire another 50 or 60 people."

There will, Juge confirmed, be new TRSDOS 6.0 software from Radio Shack. "Probably the first things will be Scripsit and SuperScripsit in 80-column format. There'll be a new Cobol accounting package. That's overdue now, as is CP/M—we thought we'd have CP/M from DRI [Digital Research Inc.] around February or March, and now it looks like the first of September. If there's anything we can do to speed that up, we'll certainly do it, because we think that's an important product."

As for other new software or systems, Juge might have endorsed Tate's comment on Radio Shack:

"They certainly don't do everything right, but they do enough right to survive. My opinion is that Radio Shack will survive and do well and astound us many times." ■

As this issue went to press in late June, Radio Shack confirmed that Jon Shirley, vice president of computer merchandising, was leaving the firm to become president of Microsoft Corp., effective August 1st. Shirley told *80 Micro* that his replacement, while "almost 100 percent likely to be someone from within" Radio Shack, had not been decided upon.

For a full story on Radio Shack and Microsoft, see next month's news section.

HARDWARE

Growing pains for stringy floppy

Delayed success leaves pioneers behind.

Since its introduction at the 1978 West Coast Computer Faire, the Exatron Stringy Floppy (ESF) has attracted a small but loyal following of TRS-80 Model I owners, but has never caught on with the mass market. That's changing now, as new low-end computers launch a stringy floppy boom—which, ironically, leaves Exatron and its current customers out in the cold.

Earlier this year, Texas Instruments licensed the tape-cartridge drive's technology from Entrepo Corp. (Exatron's new name) for its CC-40 Compact Computer (see *80 Micro*, June 1983, p. 318). At June's Consumer Electronics Show in Chicago, stringy floppies appeared in several products, from Atari's Graduate upgrade for the VCS to Unintronics' 48K, \$200 Sonic home micro.

And, giving perhaps the biggest boost to the stringy floppy, Coleco included a non-Entrepo unit in its 80K CP/M-compatible Adam, for which company spokesmen expected sales of half a million units by Christmas.

Meanwhile, current and potential Exatron end-users are stymied by the Sunnyvale, CA firm's reorganization. Wayne King, chairman of Exatron's New York City workshop (a combined user's group and sales force), said he'd heard the company would no longer sell drives or software, just blank wafers, the stringy floppy's storage medium.

It appeared, King told *80 Micro*, that Entrepo was abandoning the retail market for OEM sales, though official information was hard to come by: "Entrepo hasn't notified workshop chairmen, which they could do for the cost of a mailing. The management they have seem to me to be a little bit nutty. They can't decide in which direction they're pulling."

Robert Howell Sr., Exatron's founder, confirmed King's hunch about Entrepo's market direction, though he admitted that the situation was "very confused": "Entrepo is the new name of the company. I started this thing in

my garage several years ago, and about a year ago we brought in new financing and outside management, and they elected to change the focus of the business from the end-user to OEMs. What's going to happen to the end-user business is too confusing to guess. I think it'll get picked up by somebody and carry on as a separate business.

"The [Entrepo] board of directors doesn't know what the hell they want to do yet," Howell said on June 7. "I'm [Exatron's] chairman of the board, founder, major stockholder, and currently I don't have a thing to say about anything. If we got this thing reorganized, I'd hope to restart the end-user business."

Asked to summarize his view of the stringy floppy's prospects, Howell was optimistic but candid: "My opinion is that the stringy floppy is going to be the standard mass storage technology for the under-\$500 computer and be produced in the tens of millions each year. But I've been believing that for a long time and it hasn't happened yet.

"It is a superb machine—small, fast, inexpensive, easy to use. I don't think there's anything that can touch it. But there's only so much you can do without money. I've been running this out of my garage for a long time."

King agreed, saying that the ESF's low profile had obscured its merits as a high-speed, low-cost compromise between cassette and disk systems. "The machine is a great little device, and it'll do a lot that's never really been tapped," he said. "I'd like the situation to be that when you buy a computer and start out with bulk I/O, before you have disk drives, you have something like a stringy floppy.

"But they never did support software very well, which I thought was a big failing, because the stringy floppy would support a lot of things that it never had software for."

According to King, Exatron had had to rely on hobbyists rather than offer its own line of programs: "The way it was,



The stringy floppy is staging a comeback.

if someone wrote a nice patch to convert a disk program and sent it to them, they'd buy it, but that was about it. So mostly you were left with cassette-based software, and the advantage of that is it loads very quickly, but other than that you might as well have a cassette." The only major commercial program offered for the ESF was Electric Pencil 2.0.

Of the new Entrepo management, King said "They've changed a whole lot from what they used to be. They used to be very reliable, very interested in the end user, and very willing to help out. Obviously, they've got their eyes on the big money, they're going to be the big OEM manufacturer. Which is all right, but if they'd supported the stringy floppy they could have already started a market. There'd be a big base of people using stringy floppies, so other companies would support it."

Robert McDonald, president of Entrepo, shared Howell's optimism while answering King's complaints. "We're winding down the mail-order part of the business," McDonald confirmed. "We have decided to end it. It's going to be ended as far as Entrepo is concerned, it's going to be sold off to somebody. It's a small business, and less strategic, and in a way distracting from the OEM side. . . . Entrepo is really concentrating on selling OEMs to the large computer manufacturers."

However, McDonald said, the re-

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Ahhh, instant relief! At last there is a permanent cure for contact oxidation on Model I edge connectors. Many TRS-80 users are familiar with the symptoms: untimely resets, spontaneous reboots, or the inability to get the computer started at all without a frustrating session with a pink eraser.

The Gold Plug 80 is a well made device consisting of an edge-card plug with gold plated contacts, available with either 34 or 40 contacts. The rear of the plug has ter-

minal tabs which fit exactly over the existing foil fingers on the TRS-80's connectors. After installation, the original plugs have been extended about a half inch, meaning that the plastic door covers no longer fit. This did not trouble me, but you should take it into consideration. E.A.P.'s advertising leaflet, by the way, cautions you about the doors, which is refreshing. They also have the excellent policy of permitting you to return any plugs ordered for a refund if after seeing them you are un-

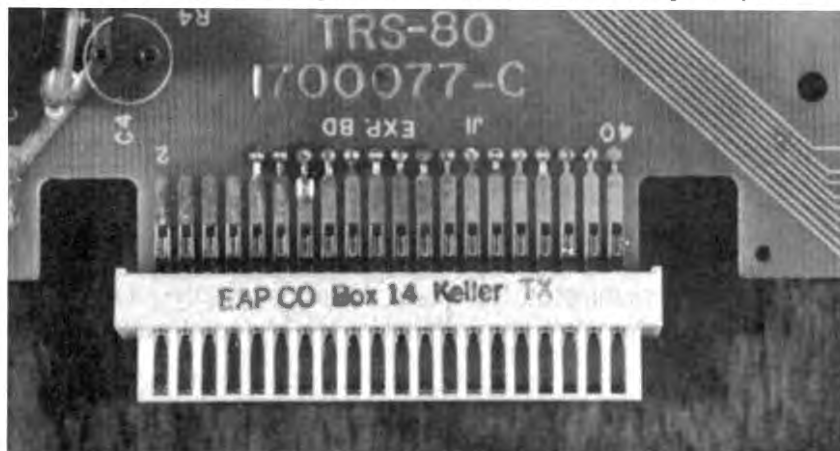
willing to undertake the installation.

An excellent set of instructions accompany the plugs, and they are shipped promptly. I ordered mine by mail on a Monday and received my set of plugs by first class mail on Tuesday of the next week.

Installation

Installation requires a soldering iron (I use a 40-watt Weller), Rosin-core solder, a Phillips screwdriver, and your last Pink Pearl. The keyboard and Expansion Interface have to be disassembled to get at the connectors, which are then cleaned—the eraser's last fling. The Gold Plug 80 is fitted over the existing plug with the contacts centered, and then soldered to the board. I have some soldering experience, but it proved to be an easy, safe job. The contact is heated, a very small amount of solder applied, and then you go on to the next contact. It took about an hour to do all six plugs.

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80 Micro, September 1983 • 295

vised company would not forget today's 5,000-10,000 ESF owners: "It's going to be supported," he said of the ESF. "We did confuse people, by the way; as we ship new units we're sending a letter explaining the change. The product will probably be supported by another company that will emerge, probably not under the Exatron name. When there is an end-user thing that re-emerges, we will advertise and promote that far and wide and alert people to it."

As for the OEM market, McDonald described the new wafer-equipped computers as only the tip of the iceberg. "Texas Instruments has a license for the whole technology, to manufacture it for their own requirements. So they can do what they want with it, except sell it to other people. Coleco has gone to another technology, primarily because we are not ready to gear up at the speed they wanted. We expect to be in high-volume production by mid-September."

At the Chicago CES, McDonald said, "We had interest from virtually everybody in the low-end computer market," mentioning Milton Bradley as well as Atari and Sonic. "We have discussions and contract negotiations going on with other companies."

What about software? "One of our reasons for working with OEMs is to have them supply the software. We won't be doing that ourselves, though we'll be supplying duplicating services for the manufacturers."

"What we're doing initially is letting the OEMs use all their pull and power to get the software authors, the publishing houses, in with them with the media."

"I think downstream we may get back into it. We won't have the hobbyists write or convert software and send it in—some of those people may participate; some of them are very talented folks. But we'll try to do it more professionally."

In an echo of King's and Howell's opinions of the stringy floppy's future, McDonald predicted, "I think it's finally going to get its due in the marketplace. We're very, very bullish. We're so bullish that we think we have a chance to become the media standard. Execution is the problem now, not market acceptance. We're really planning on this being a large industry."

"We never did handle the end-user business very professionally," McDonald said of the Exatron/Entrepo switch.

"We did not handle the phase-out very professionally, either, so I guess I owe an apology to the end-user."

As this issue went to press in late June, Howell reported raised hopes for confused owners: "It looks like we're well on our way to reorganizing our end-user business. It looks as if the ESF

owners' association is going to take over support of the product and distribute both hardware and software.

"There is a group of people actively involved in putting together a support system. If it happens, we'll send an announcement in the mail to our customers." ■

GAMES

Whatever happened to Tandyvision?

Plunging prices end Mattel/RS venture.

First there was Atari, with a monopoly on both home video games and VCS software; then came Mattel Electronics' Intellivision, with George Plimpton hawking better graphics. Then came ColecoVision and the improved Atari 5200, and hundreds of game cartridges from dozens of companies. The video game industry has always been chaotic; by early this summer, with consumers abandoning game systems for competitively priced home computers, it appeared the bottom had dropped out of the market.

Radio Shack is a computer, not a video game, company; the Color Computer is priced and positioned above both game machines and low-end micros, and the Models I/III/4 have unashamedly bad graphics. But the Fort Worth firm did make a stab at the Space Invaders market last year with Tandyvision—a relabeled Intellivision, made by Mattel and sold in Radio Shack stores.

Tandyvision was introduced in November 1982, just in time for the Christmas buying rush. Within six months, it had sunk without a trace. Gail Lacourse, manager of Displayed Video's RS dealership in Ypsilanti, MI, told *80 Micro*, "Radio Shack has discontinued those, I believe around March. They were SOWG's, Sold Out When Gone. They don't even sell cartridges anymore. We couldn't order them if we

tried."

What happened? From all indications, Tandyvision was torpedoed by the unsettled game market generally and by Intellivision price cuts specifically: Radio Shack bought units from Mattel and, adding a margin for profit, sold them to consumers—until Mattel offered price reductions and rebates for its version, leaving Tandy in the position of someone who buys something the day before a sale.

When Tandyvision debuted in the November 1982 catalog, it was competitively priced at \$249.95. Within weeks, however, Plimpton was on TV plugging a \$50 Mattel rebate. By spring, discount stores were offering Atari VCS systems for under \$100, and Intellivision and ColecoVision prices had fallen to \$180, with sale prices as low as \$150.

"From what we understand, what happened to Radio Shack was the same thing that happened with the TDP-100 versus the Color Computer," said Jack Torres of Computer Plus in Littleton, MA. "When Radio Shack took on the line, Mattel reduced the price, and you could get an Intellivision for less than a Tandyvision."

Added Displayed Video's Lacourse, "The reason [Tandyvision was discontinued] is the simple fact that Mattel, while selling the product to Radio Shack, did not inform Radio Shack that they were going to continue to lower prices and offer \$50 rebate programs. So the dealers were complaining, be-



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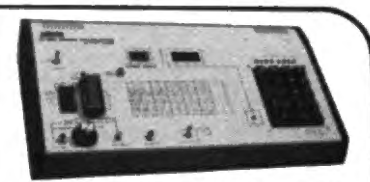
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cause people could buy them in the store for less than they [dealers] were paying for them."

For its part, Mattel isn't talking. Kathy Kennedy, Mattel Electronics' press agent, told *80 Micro*, "Our company has a policy of not commenting on someone else's business."

While the unit was a Mattel item, she said, "Tandyvision was really their brand name. They marketed it and that was their product. You'd have to talk to Radio Shack about that."

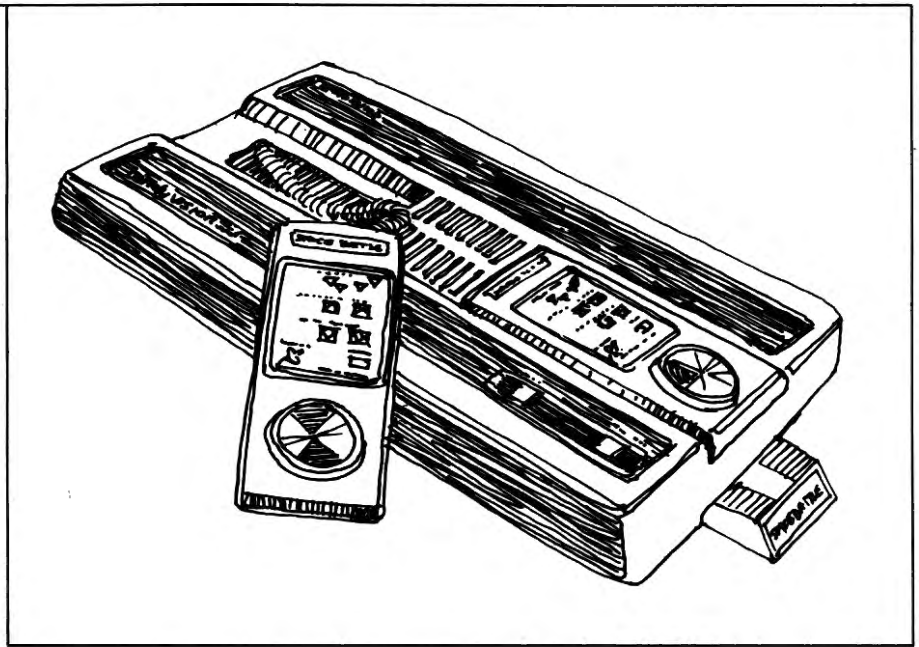
Kennedy did acknowledge Mattel's aggressive rebate policy: "There were like three rebates at different times. There was one in October; I believe there was a \$25 rebate as well, leading up to Christmas." Also, there were Plimpton's \$50 rebate commercials of early 1983, with the spokesman first refusing to participate in a circus ad and later agreeing after being put in a lion's cage. "There have been several rebates," Kennedy concluded, "to help the retailers sell the product and increase our installed base."

Leon Lutz, Tandy/Radio Shack's video game buyer, confirmed that the remaining Tandyvisions will be the last: "Oh, we're selling them out. We've got them on sale at \$159.95 and cartridges at half price. . . . We haven't bought any more units from [Mattel]. They dropped Intellivision and came out with Intellivision II, which we don't sell."

The product will, he said, be supported: "We service them ourselves, if it's a Tandyvision. The cartridges are Intellivision cartridges; if there's a problem with them you send it to Mattel. We have quite a large number of cartridges left, and we're selling them off."

Did Mattel's price reductions stab Tandy in the back? "I can't say they stabbed us in the back. I mean, the market went to pot when Texas Instruments introduced their \$100 computer. Everybody and his uncle got into the act with computers and video games. And Mattel responded to the market with a \$50 rebate."

Rather than be too critical of Mattel—"Well, the rebate kind of kicked it in the butt a little bit, but again, that was the market"—Lutz thought that some dealers might have cleared Intellivision inventories to make way for Atari. "You can find them at a lot of different prices around the country. I would assume some people are try-



Tandyvision: The TDP-100 of video games.

ing to unload some units because of Atari's wanting an exclusive marketing agreement.

"There are some Mattel distributors and dealers out there who are selling units at a very good price simply because of that arrangement; if you want to sell Atari, you can't sell any other unit. But that's just speculation on my part."

(Bruce Entin, Atari's vice president for public relations, rebutted Lutz's idea of Atari's marketing policy: "That is not true. We use exclusive distributors, but you can't tell a retailer what to sell or what not to sell. You can see the different machines in stores all over the place.")

Ultimately, Lutz said of the Tandyvision venture, "We want to be competi-

tive in the marketplace, and we could not be competitive at the gross margin the company operates on. We tend to want to make money on our product line."

Has the Tandyvision incident soured relations between Mattel and Radio Shack? "We're still good friends, in fact I met them at the CES show in Chicago." Might the two work together again? "It's not impossible. There's nothing planned at the moment, but it's not unthinkable.

"I think they're a good company, a very good company, and it was just their having to respond to the marketplace, not a problem with us. There's no bad feelings in the company.

"The video game market is kind of unstable, in my opinion." ■

Game Over?

From recent reports, it looks as if losing the video game business was no hardship for Radio Shack.

In London, where Intellivision prices have fallen from \$218 to \$157, the head of Mattel's British unit told the *Wall Street Journal*, "Our forecast for 1983 and 1984 is just about static. The market is under attack by the home computer sector."

Looking at U.S. companies, *Fortune's* Bro Uttal was more severe: "The

entire video game market could collapse because the line between game consoles and home computers is blurring. If the line vanishes, the computer is likely to replace the game console because it can do more than just play games."

At this rate, the whole industry might repeat the marketing shift from games to programming that Tandy made with the Color Computer. And Mattel—whose Aquarius computer has barely scratched the market—may be the worse off.

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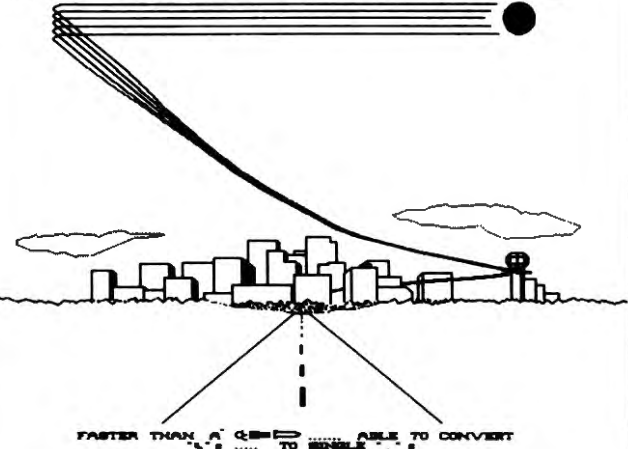
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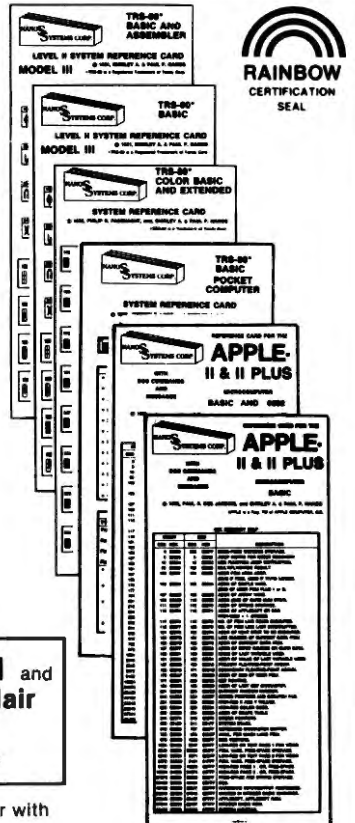
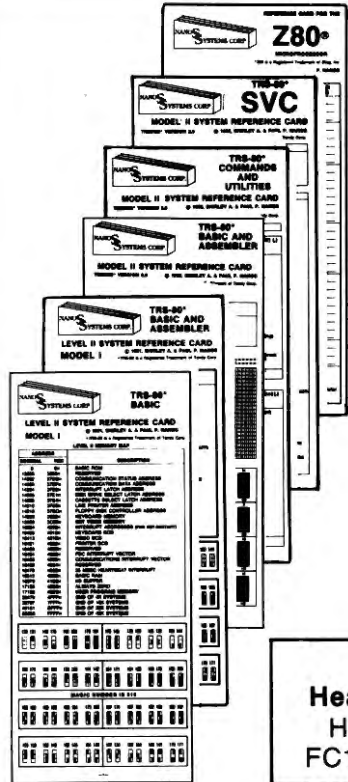
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PULSE TRAIN

10-megabyte floppy disk



A breakthrough that will keep the familiar floppy disk competitive with

hard units can be summarized in a crude analogy: More cigars can be packed into a box standing on end than lying flat.

Eastman Kodak Co.'s Isomax floppy disk, introduced at the National Computer Conference in Anaheim, CA, uses isotropic cobalt-enhanced magnetic particles to store up to 10 times the information of a normal disk. (Isotropic means "having properties with the same values along axes in all directions.")

Today's floppies use cigar-shaped particles aligned horizontally, parallel to the disk's surface; Kodak's egg-shaped particles can store data vertically, squeezing up to 10 megabytes in a 5 1/4-inch space.

The dense-pack disks were created by Kodak's research labs in France and the U.S., and are being produced by the company's Spin Physics division in San Diego, CA. William Kroon, the division's director of marketing, told *Computerworld* that Isomax disks hold data horizontally as well as vertically, or at any angle in between, but that the vertical format gives the greatest capacity for the money. The floppies cost between \$10 and \$20 per disk in quantities of 1,000.

The disks will be commercially available late this year and carry a two-year (five-

million-pass) guarantee, but you can't pop one into your TRS-80: Kodak is now selling them to about 10 major disk drive manufacturers, who are producing drives that meet Isomax's requirements (a 20- instead of 50-micron gap between recording head and media).

Horizontal recording, however, isn't dead yet. This September, Amlyn Corp. of San Jose, CA will start shipping a half-height drive that uses a mylar scale and precise head control to put 170 tracks per inch on a 5 1/4-inch floppy, providing 3.3 megabytes unformatted or 2.13 megabytes formatted storage.

A home away from home



If a bed, a bath, sanitized glasses, and Magic Fingers aren't enough, you might want

a room with a micro. Two companies are now supplying in-room smart terminals to upper-bracket hotels, allowing travelers to play games or send electronic mail as easily as scan the room service menu.

Travelhost Inc. of Dallas, TX, the nation's largest hotel supply company, has agreed to purchase as many as 500,000 videotext terminals from Quazon Corp. over the next two and a half years. The membrane-keyboard, Z8-equipped terminals link with the rooms' TV sets and United Telecom Inc.'s Uninet



SuiteTalk: Making hotel life more electronic.

communications network to offer airline schedules, news and stock information, and e-mail (using ITT Dialcom).

The company anticipates adding games, restaurant menus and reviews, and on-line shopping to the service, which costs \$20 per hour in prime time and \$7 per hour at night. Member hotels, such as the Midland in Chicago (the first to offer Travelhost's terminals), receive \$1 every time a guest goes on line.

A similar service is provided by SuiteTalk, the creation of HotelTech International. The Belvedere, CA firm charges hotels \$1,000 a month to lease a Concierge source micro, designed in cooperation with Sony, and \$30 a month for each in-room SuiteTalk unit—a device that looks like a slightly modified Color Computer, though HotelTech cofounder Susan Martel says "It's something we're going to be making

ourselves."

SuiteTalk users have free access to menus describing hotel services, local shopping and transportation guides, and CBS and NBC information services. Guests connect with a home or office computer for the cost of the phone call, and \$20 an hour (\$9 at night) provides access to games, news, word processing, e-mail, and airline information. The hotel management can put local businesses' ads on SuiteTalk, too.

Both HotelTech and Travelhost stress their terminals' ease of use and convenience for data-hungry travelers. As the price of technology comes down and micros become standard equipment in more hotels, Martel says, even computer novices will get hooked: "I think it's going to be a terrific way to sell more personal computers. People who use them in the hotel will want one of their own."

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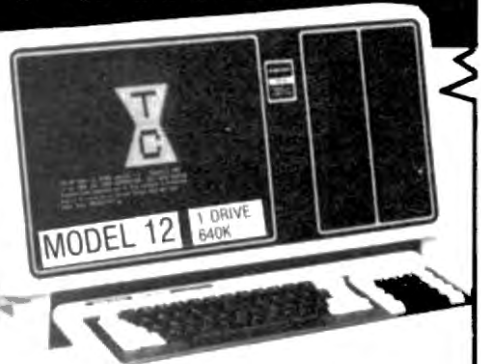
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PULSE TRAIN

Remembering the Model I



It's an insult if an IBM PC owner calls your TRS-80 a "museum piece," but it's

all right if the Smithsonian Institution does. The National Museum of American History in Washington, DC owns over 100 computers; of the fewer than 12 micros in the collection, one is a vintage Model I.

According to *InfoWorld* reporter Kathy Chin, the Smithsonian's panel "chooses items that it judges to be historical firsts or that represent the state of the art in microcomputing." The Model I, "one of the early popular computers," shares exhibit space with an Imsai 8080 ("one of the well-known homemade models") and the price-breaking Timex-Sinclair 1000.

Other classic-computer organizations seem to be following the museum's lead,



Is your Model I a valuable antique?

pioneering in a field where machines from 1978 have almost antique status. The Blacksburg Group of Blacksburg, VA, which preserves older micros as a sideline to producing computer books, has a Model I in its collection. And Jamie Parker, exhibit coordinator of The Computer Museum of Marlborough, MA, says her institution is

looking for a Model I donor.

InfoWorld's Paul Freiberger and John C. Dvorak, lumping early Tandy micros with Exidy Sorcerers and Sol-20s in an article titled "Obsolete Computers," say "Many tight-fisted users consider the TRS-80 Model I to be a workhorse. They have found ways to upgrade to double-density disks and add

uppercase and lowercase, and they manage to keep the machines running. . . . With about 250,000 old Model I's out there, it will be a while before they are truly obsolete.

"The big plus for the old Model I," Freiberger and Dvorak claim, "was the detachable keyboard, which was ahead of its time. It allows users to sit back in their easy chairs and type away, without having to worry about the back strain that comes from hunching over an immobile terminal keyboard. Many TRS-80 fanatics still wonder why Radio Shack puts an old-fashioned immobile keyboard on its newer machines."

Radio Shack's vice president for computer merchandising, Jon Shirley, gave one answer to that question at a Boston Computer Society meeting in May (see *80 Micro*, August 1983, p. 280). The TRS-80, Shirley reminded the audience, is extremely popular with schools; teachers and administrators prefer the one-piece design, he said, as it means fewer pieces to lose and cables to tangle. ■

Breakdowns and shakeups

● Enter Date (MM/DD/YY): **MASSACHUSETTS'** new auto emission and safety inspection campaign stopped abruptly on June 1. While service stations' 1,205 Hamilton Test Systems computers worked without a hitch during their first two months on the job, the machines' chips refused to accept "June" in their programs.

Repair crews hurried to fix the June bugs; some computers were temporarily reprogrammed and told it was December.

END
BYTES

Meanwhile, the state considered extending the monthly inspection period, and motorists, like uninspected cars, fumed.

● With heavy competition in the video game market, the model 400 and 800 computers showing their age, and the 1200XL crushed by the less expensive Commodore 64, **ATARI** has regrouped. Warner Communications has merged its troubled subsidiary's computer and game divisions, dropped the three unsuccessful micros, and introduced four new models: the 600XL, 800XL, 1400XL, and disk-equipped 1450XLD. The firm has also hired Alan Alda to do commercials.

Atari watchers expected the consolidation to mean a loss of several hundred jobs at the firm's Sunnyvale, CA headquarters. A possible upturn might come in early 1984, when Warner's Ataritel line begins shipment of computer telephone devices.

● While Atari's slipping, IBM is in the **CHIPS**. In fact, so many Big Blue imitators want Intel 8088s and 8086s for their PC clones that there's a five-month-plus waiting list. One supplier is said to have turned down a spring order for 400,000 of the 16-bit CPUs because it had already sold its entire 1983 production.

Dave House, vice president of Intel's microprocessor division, told the *Wall Street Journal*, "The market's going crazy with buying. It's not healthy and it cannot last. What's scary is that there are at least 30 customers out there who each are buying microprocessors as if they intend to capture 30 percent of IBM's market."

● Electronic Arts, a San Mateo, CA publisher of Apple, Atari, and Commodore programs, is leading the way in **CELEBRITY** software. Cartoonist Gahan Wilson is designing graphic games for the firm, and NBA stars Larry Bird and Julius Erving have donated their strategies and images to a basketball game.

● "Desktop **USE** is not keeping pace with desktop purchases," says the Yankee Group, a Boston-based market survey firm. In two surveys, the group found that more than two-thirds of corporate managers used their micros less than half an hour per day.

To keep desktops from gathering dust, the surveyors call for integrated, easy-to-use software, machines designed for managers rather than professionals, and more emphasis on communications (data base access, file compatibility, and electronic mail). "Function, rather than price, will fuel market growth," they conclude.

● Next month, for a change, End Bytes will not mention new computer **MAGAZINES**. This month's crop includes

Personal and Professional, for DEC desktop users; *Micro-kids*, a bimonthly for 10- to 16-year-old beepers from Warner Software; *Teaching, Learning, Computing*, a computer resource for educators; and *Personal Robotics News*, a monthly newsletter for the infant home-android industry.

● A new toll-free number lets users express their opinions or ask questions about the health effects of **CRT TERMINALS** (see *80 Micro*, July 1983, p. 338). The number, 800-521-VDTS (in Ohio, 800-522-VDTS), was created by 9 to 5, a national association of clerical workers, in the wake of the Massachusetts legislature's introduction of a bill to regulate CRT installation.

The Massachusetts bill would require six months' advance notice of CRT installation, employer-paid annual eye exams, "ergonomically correct" or adjustable equipment, and regular work breaks for CRT operators.

● Last month, this column mentioned Epson's sponsorship of the Miss World pageant in the U.K. Here in the States, the firm projects a more serious image. The latest product from Epson America Inc. is a \$150,000 **LIMOUSINE**.

As reported in *Computerworld*, Epson commissioned a Beverly Hills, CA remodeler to add 52 inches to an already lengthy Mercedes 450 SEL, outfitting the interior with QX-10 and HX-20 computers and a printer—as well as TV, video cassette recorder, telephone, bar, electric clothes steamer, manicure set, nail dryer, and shaver. It seems the average corporate executive wastes about 40 hours a month traveling by car, out of reach of office messages and stock reports; Epson's auto keeps the wheels of business turning. ■

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Caimans and condos

What was that?" I asked, veering to avoid some sort of animal in our path.

"I don't know, but they're all over the place." Mad Max peered fearfully out the window. "Reptiles. Lizards."

"Stop a minute," Mercedes ordered. I did so, thinking she meant to wait while the things crossed the road. Instead, she popped out the door and came back with one.

"It's a crocodile!" shrieked Max, climbing onto the PMC for safety.

"No, it's an alligator," I reassured him. Max stayed perched.

"It's a caiman," Mercedes said, stroking the thing. "Lots of them here in Florida. Isn't it cute?"

"Cute?" We were more shocked at Mercedes' use of the word than its application to the toothy creature.

"Yeah. I think he likes me," she beamed, oblivious to Max's protests of being allergic to amphibians.

"Speaking of Alien Defense, what do you think of this?" I asked, trying to steer the conversation back to our alleged topic at hand. I handed Max a letter from Ken Corless of Pomona, NY, in which he claimed an astronomical score of 13,485,500.

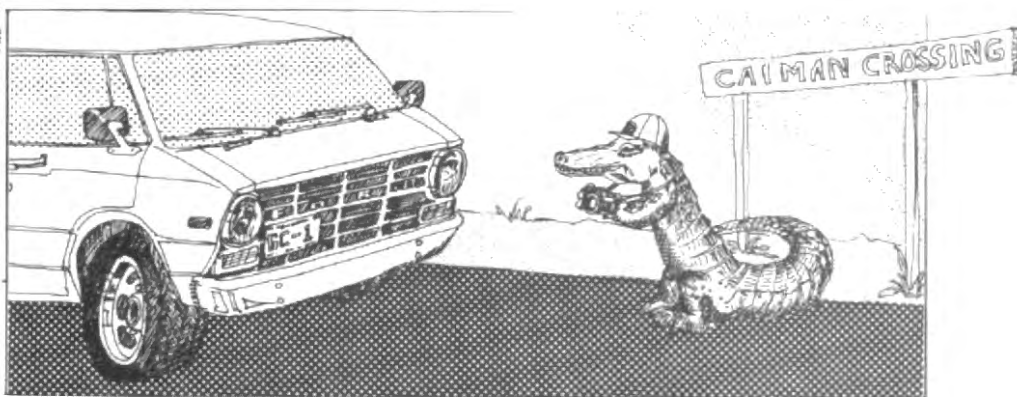
"My God!" Max screamed.

"The man's obviously made a deal with the underworld," said Mercedes. "The Devil and Ken Corless."

"But wait," said Max. "Listen to this: 'It seems that if your last humanoid is being picked up and you shoot him, the program does not recognize that you should go to deep space. Instead, it thinks you have 256 humanoids left that cannot be picked up. As a result, each completed wave awards 25,600 bonus points.'"

"Geez," said Mercedes, reading over Max's shoulder. "He played for 16 hours, and had over 100 ships and bombs left!"

"He says he got 1,111,100 the legitimate way," Max continued. "There's a trick to that, too. You go into deep



space, shoot open a pod, and hyperspace. Then you accelerate slowly until you see swarms right on your tail. Next, you shoot another pod and hyperspace again. Now you've got two pods' worth of swarms half a screen behind. Any other pods you shoot will not release swarms."

"Nothing's sacred anymore," Mercedes said. "Next thing you know, people'll be getting 10 million in Lunar Lander."

After two more hours on Route 95, we finally found a restaurant on our side of the road. Two salesmen selling time-sharing vacations joined us.

"To be frank, honest, and candid, some of these scores are getting ridiculous," I said as I wolfed down my smoked swordfish. "What do you say we kick a few of these games off the Big Board?"

"Let's talk condos," Ed, one of the salesmen, said.

"What do you suppose caiman meat tastes like?" Max asked into his Boffo Burger Platter.

"That's disgusting," said Mercedes.

"It probably tastes like chicken," Fred, the other salesman, said.

"Everything tastes like chicken to you," Ed replied. "How about a little bungalow on Sanibel Island?"

"Take Galaxy Invasion, for instance," I continued. "It's no longer a game—it's an endurance test, a marathon. I'd just as soon go sit on a flagpole for three weeks."

"Get your fingers out of my fries," Max growled at Fred.

"Fred doesn't eat much these days," said Ed. "You know, I've got some nice, clean mobile homes in Clearwater."

"And Bounceoids," I went on. "We've got people who have to stop playing because they can't see the screen through all the extra ships."

"We already have a mobile home,"

Mercedes said sourly.

"Where's Sanibel Island?" Max asked.

"Hey, you said we could go to the Epcot Center!" Mercedes said.

"Life is short, kid," said Ed. "You gotta think of the future."

"So then it's decided," I said. "Galaxy Invasion and Bounceoids are off the board. And Alien Defense. And Armored Patrol. And Liberator, and Skyscraper."

"Don't call me 'kid,'" Mercedes retorted, "unless you want this sundae down your shirt."

"Feisty, isn't she?" Fred said.

"She has her days," I sighed.

"Now, this is science," I said as we drove toward the gleaming sphere that marked the Epcot Center. "This'll be educational."

"I can't wait to see what they've done with epiphytes," said Mercedes from under a seat, where she was playing with the caiman.

"I'm going on all the rides, too," Max said agreeably.

As we approached the entrance, a dozen or so more time-sharing salesmen emerged from the bushes. They walked stiffly toward us, pale, gaunt, arms ghoulishly outstretched. I turned my eyes at the horrible sight.

"When there's no more room in hell," Max intoned, "the salesmen shall walk the earth."

I downshifted through the horde, and prepared to enter the Experimental Prototype Community of Tomorrow.

"Where's Max?" asked Mercedes as we left the Kraft exhibition. "I kept looking for him while you were up on stage dancing with the animated food."

"I don't know," I said with my souvenir hat pulled over my eyes, embarrassed at having mistaken the show for a flashback. "He must have found an

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We soon caught up with him—he couldn't go very fast with the luggage and the gas grill under his arm.

"Hey, guess what?" he asked, dropping a 35mm camera and a VIC-20. "I just bought vacations for all of us forever!"

"Huh?"

"Time-sharing! Don't you know anything? That's what Florida's all about!" he explained, sweeping an arm and nearly knocking over another sales rep. "We've got a beachfront cabana for one week a year till 2040!"

"My God," I gasped. "They got him. Look at his eyes."

"But don't they require a down payment?" asked Mercedes.

"No," he said, producing a sheaf of 14 or 15 signed contracts. "They'll bill me."

"Max," I interrupted in terror. "You have no money."

"I thought of that," he reasoned. "So I signed your old friend Winthrop's name to everything."

"Let's get some of these new high scores out of the way," I said as we ate supper. We seemed to be doing a lot of eating lately, which suited Max fine.

"Well, Kyle Hoyt, who lives right around here, sent a score for Dig Out," Mercedes said. "And he sent in high scores for Gauntlet, Missile Attack, and Outhouse."

"Thinks he's hot stuff, doesn't he?" Max grumbled.

"Now, now," Mercedes said. "You've still got the high score in Bable Terror."

Then there was Kevin Josephson of Chilliwack, B.C., who reported six high scores—in Rear Guard, Panik, Space Castle, Frogger, Crazy Painter, and Stellar Escort. Max was suspicious of all those nice round numbers, but we like to give people the benefit of the doubt.

"I'm tired," said Mercedes. "Let's get out of this place."

"Where to?" I asked.

"Well..." said Max, as he rummaged through his various contracts. "If we hustle down to Ft. Meyers, we can still catch a couple of days in our ca-

bana. Soak in some rays, do some shell-ing, set up the Cafe..."

"OK," I said. "But then we've got to head north. It's too humid down here for anything but caimans."

The salesmen were still milling about when we left. They'd overturned one car, and had an elderly couple in a Winnebago under siege.

"Don't look, Mercedes," I said. "This isn't something someone your age should see."

Naturally, she ignored my advice, and ogled the horrifying carnage.

"So what?" she gulped. "Doesn't bother me."

But she was strangely silent after that, and woke up with nightmares in the wee hours of the next morning.

"I wish she hadn't seen that," I said to Max later.

"The minions of reality stalk the borders of every fantasy land," Max said philosophically. "She's going to grow up sooner or later."

Still, the incident bothered me. I hope she never has to buy a used car. ■

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Frogger	100,000	Kevin Josephson, Chilliwack, B.C.
Galaxy Invasion Plus	1,113,600	Geordon Portice, Twining, MI
Gauntlet	52,570	Kyle Hoyt, Titusville, FL
Ghost Hunter	41,190	John Kane, Nelson N.Z.
Insect Frenzy	520,610	Darrien Ewaniuk, Vegreville, Alta.
Jovian	133,320	Mark Brinkman, Emporia, KS
Laserball	72,530	Neil Matson, Panama City, FL
Laser Defense	1,000,000	David Cameron, Prince George, B.C.
Leaper	35,410	Tommy Seniuk, Vegreville, Alta.
Lunar Lander	9,600	Nelson Kruger, Duarte, CA
Mad Mines	10,220	Gorman Miller, Titusville, FL
Martian Patrol	17,740	Kyle Hoyt, Titusville, FL
Meteor Mission 2	119,750	Bob Brown, Dallas, TX
Missile Attack	42,730	Kyle Hoyt, Titusville, FL

Monster Invaders	32,620	Troy Scrapchansky, Uncasville, CT
Olympic Decathlon	9,598	Matt Dossey, Ocala, FL
Outhouse	1,000,000	Kyle Hoyt, Titusville, FL
Paddle Pinball	3,980,310	Brian Gehrich, Quincy, IL
Panik	48,000	Kevin Josephson, Chilliwack, B.C.
Penetrator	345,510	George Heineman, Framingham, MA
Planetoids	56,450	Carl Pflanzler, Gillette, NJ
Rear Guard	73,290	Kevin Josephson, Chilliwack, B.C.
Robot Attack	143,250	Mark Fertig, Northville, MI
Scarfman	679,490	David Heyman, Conway, PA
Sea Dragon	552,890*	John Hope, Kingston, Ont.
Space Castle	52,700	Kevin Josephson, Chilliwack, B.C.
Space Intruders	14,030	Ron Johnston, Emporia, KS
Space Warp (Level 8)	261	Jer McLanahan, New Canaan, CT
Stellar Escort	625,000	Kevin Josephson, Chilliwack, B.C.
Strike Force	433,900	C. Athanas & N. Kincaid, Topsham, ME
Super Nova	2,138,710	Mark Fertig, Northville, MI
Swamp Wars	59,130	Farhad Abrishami, Silver Spring, MD
Temple of Apschai	390	Carl Pflanzler, Gillette, NJ
Time Runner	89,479	Mad Max
Venture	29,440	Farhad Abrishami, Silver Spring, MD
Voyager 1	833	Farhad Abrishami, Silver Spring, MD
Weerd	17,120	Chris Athanas, Topsham, ME
Wild West	15,400	Gorman Miller, Titusville, FL

* Expert mode: 339,080 (David Smith, Kingwood, TX).

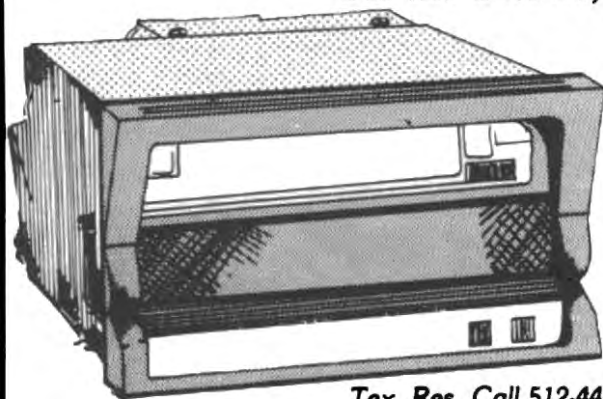
Gamer's Cafe readers are invited to submit their high scores, preferably with screen photos, for these and other Model I/III/4 games. Sorry, but we are no longer accepting entries for Color Computer games and, due to known bugs or ridiculously high scores, the following: Alien Defense, Armored Patrol, Bounceoids, Galaxy Invasion, Liberator, and Skyscraper.

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429

Send any questions or problems dealing with any area of TRS-80 microcomputing to Feedback Loop, 80 Micro, 80 Pine St., Peterborough, NH 03458.



As the author of the Weather Forecast program (January 1983, p. 400), let me state that contrary to the "discovered error" in the May Debug (p. 26), the program works correctly. The error was in how Rea Plowman used the program.

First, some pertinent information about the program: It is important that the user input the barometric pressure value obtained at or near the location of the forecast, and that it is measured by a barometer adjusted to indicate the barometric pressure at sea level. Using a non-adjusted barometer, regardless of how expensive or accurate, results in inaccurate forecasts.

To properly determine the correct values to enter in the program follow these steps:

- Lightly tap the barometer and copy down the value indicated.
- Repeat this step an hour later.
- Compare the readings. If they differ by .05 or more the change is considered rapid. Less is considered slow and no change should be recorded.
- Wind direction should be recorded at the time of the second barometer reading, and is always counted as the direction the wind is coming from, not the direction it is blowing toward.
- Enter these values into the program and record the resulting forecast.

As you can see, the short, simple, and user-friendly program isn't really that simple. Use of this program by those uninformed in the fundamentals of using a barometer and determining wind direction can result in incorrect forecasts.

A.P.
Kenosha, WI

Thanks for the update; I appreciate your taking the time to clarify the proper use of your program.

I have answers for two readers' ques-

tions posed in the April 1983 issue.

First, for D.F. in Columbus (p. 380), here's how to use SuperScriptit with NEWDOS80 2.0:

● Load SuperZap and select the DFS function.

● Answer the file prompt with SCRIP-SIT/CMD.

● Type in F,CD,90,52.

● After the cursor finds this byte sequence, modify it to 00,00,00.

● SuperScriptit now works with NEW-DOS80 2.0, except for the display directory function. This isn't a problem since you can now access MINIDOS.

Second, B.H. in Brazil (p. 396), can be assured that the CP-500 is almost an exact duplicate of the Model III. The only differences I can find are: The main circuit board is mounted horizontally without any RFI shielding, the power supply is sturdier and incorporates a cooling fan, and there's a resident machine-language monitor in ROM that is invoked via the break and reset keys. I've been using Radio Shack software extensively on this computer for the last six months and have had no problems.

D.C.L.
Sao Paulo, Brazil

Thanks for the information.

The correct answer to D.R.'s question (March 1983, p. 414) is this: Find the start, end, and execution addresses for machine-language programs, CLOADM the program, but don't execute it. After it's loaded, type

```
PRINT 256*PEEK(487)+PEEK(488)
```

to get the start address. Then type

```
PRINT 256*PEEK(126)+PEEK(127)-1
```

to get the end address. And finally, type

```
PRINT 256*PEEK(157)+PEEK(158)
```

for the execution address. Now you can type

```
CSAVEM"NAME",START,END,  
EXEC.
```

M.R.
Englishtown, NJ

B.B.
Smithtown, NY

Boy, am I embarrassed about missing that one.

I'm responding to your question to those who've used EDTASM 1.0 and 1.1 (April 1983, p. 394). I first used EDTASM 1.0, but it only saves 200 lines of source code, as I discovered when I typed in a 400-line program.

I exchanged it for version 1.1 and have had no problems using it for the last 10 months except for an occasional bad load due to the use of uncertified tapes.

W.B.
Osceola, PA

I've encountered problems with EDTASM on my Model I. Everything works fine until it's time to reload the object code back into the EDTASM buffer to edit the program.

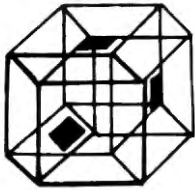
A service center told me my problem was that the code recorded after assembling wasn't object code, but was instead Assembly code. The Write command is used to store object code on tape.

J.S.
Thornton, CO

I have tried to use EDTASM 1.0 on my Model III, but it won't write system tapes. Any attempt to do so bombs the program. The manager of Radio Shack refunded my money and sent the program back to Fort Worth. To say the least, I'm furious with Radio Shack for their lack of interest in the needs of their computer owners.

R.B.
Nepean, Ontario

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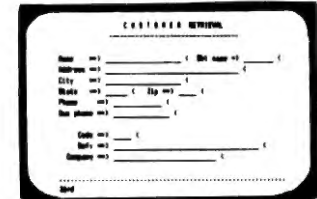
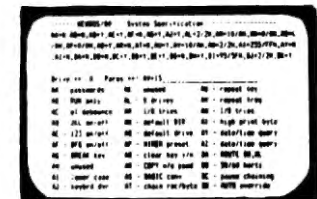
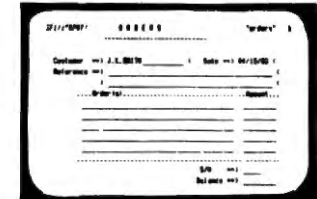
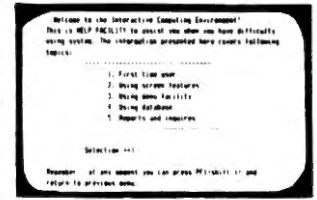
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FEEDBACK LOOP

I believe I know the source of A.L.'s problem (April 1983, p. 394), although in my case the problem usually occurred only when I had a long object code file to write to tape.

When writing the header record to tape and writing the first data record, EDTASM goes off and does some sort of calculation that takes almost two seconds. The result is a long inter-record gap between the first two records. This probably doesn't bother most TRS-80s, but in my old Model I on the CTR-80 the inter-record gap causes a problem. It appears that when the next pulse comes along after the gap, a circuit starts ringing. The result is that the first byte of the new record is garbled so that the computer doesn't recognize the record and hangs up.

I solved the problem two ways. First, I wrote a short loader program that ignores, but reports, errors in the first byte of a data record, which should be 3CH. I've found that many once unreadable tapes are now OK. The second solution was to move up to disk drives.

J.V.
McLean, VA

It seems that there are several problems with EDTASM 1.0 and 1.1. First, version 1.0 can't write more than 200 lines of source code to tape, and second, there are problems with object and source code files. The only solution for the first problem is to get version 2.0. The second problem is more difficult.

Make sure you're using EDTASM properly. There are two ways to save a file to tape. One is as a source code program, the other is as an object code program. A source code program uses the Write command and stores on tape a duplicate of your file in memory with all labels, line numbers, comments, and so forth exactly as stored in memory. If you want to add or edit the program you have to reload the source file. The source code can't be loaded into Basic with the System command. Source code is only to be used for creating object code and editing.

The object code file is the actual machine-code instructions of your program. This file is stored on tape after you issue the Assemble command. If any errors are discovered during assembly, you can still save the file to tape, but it bombs if you try to use it. EDTASM does not load object code programs into memory; it can only load

source code files. If you discover a bug in your object code program, you must use the source code file to make any changes to the program, and then reassemble and save the new object code program.

Finally, the overlong inter-record gap is a problem which I don't know how to solve, except to do as J.V. did and write your own loader program. For convenience, you may want to write a program that loads and then resaves the program without the overlong gap between records. Does anyone have a suggestion on how to handle this problem?

I recently upgraded my Model I to disk drives, but I bought two new slim-line TEAK 40-track drives. After several months of searching before buying the drives, I decided to start with TRSDOS. The Radio Shack stores were willing to sell me a disk and manual for \$35 (\$15 for the disk, \$20 for the manual), but I found a source, Total Access (P.O. Box 3002, Richardson, TX 75080, 214-458-1966), that was willing to sell both for only \$20. When I called them, they wanted to know what drives I had so they could patch TRSDOS accordingly. So, at no extra charge, I received a 40-track version of TRSDOS 2.3!

I'm just beginning to learn disk operations, but I haven't had any problems with their patched version of TRSDOS 2.3.

J.M.
Kettering, OH

What a coincidence! I was just finishing a program to patch TRSDOS 2.3 for 40-track operation when I read the letter from K.S. of Pittsburgh (May 1983, p. 381). I'm calling it VCT3540 and selling it for \$32.50. Anyone interested in converting from 35-track to 40-track operation can order it from Mysoft Computer Software, P.O. Box 417, Arroyo Grande, CA 93420, 805-481-3992.

L.P.
Arroyo Grande, CA

In response to K.S.'s question (May 1983, p. 381) about converting TRSDOS 2.3 to 40-track operation, Percom (211 N. Kirby, Garland, TX 75042) sells a program called Patchpak #4 which does this, but it also makes some patches to the operating system that makes it incompatible with your drives.

I converted TRSDOS 2.3 without making the additional changes to the operating system. Unless all the changes made by Patchpak are suitable and you have a two-drive system available for the conversion process, I suggest you contact me for a copy of my 40-track TRSDOS.

M.B.
Munhall, PA

I have a patch so that you can operate TRSDOS 2.3 with 40-track drives. If you'll forward my name and address to K.S., I'll be happy to provide him with the patch.

W.F.
Ft. Knox, KY

W.F., it's done! And thanks to everyone else kind enough to help K.S. out of his bind.

I own a Model I with the two-chip ROM set. With the following program:

```
10 A$ = INKEY$: IFA$ = "" THEN I0ELSE  
PRINT ASC(A$): GOTO 10
```

it is possible to print out the ASCII codes for every key pressed except the shift-down arrow keys. Why doesn't the shift-down arrow return a value?

C.G.
Munich, West Germany

The Model I uses the shift-down arrow as a control key combination, since it doesn't have a separate control key. A control key doesn't have an ASCII value.

When you press the shift-down arrow keys, ROM interprets this as meaning that you want to type a control key (ASCII value from 1 to 26, keyed by pressing the appropriate letter of the alphabet, ASCII value 65-91). Thus, it waits for the alphabetic keystroke and subtracts 64 from it to get the control code value. In other words, if you press the shift-down arrow keys followed by the M key, the ROM returns the value 13 to your program.

I have a Model I Level II with an LNW Expansion Interface (EI) and two disk drives. I've had three problems: the CPU to EI cable, the terminating resistors, or an easily corrected problem with the FD1771B chip.

I solved the cable problem by using

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an 18-inch cable connected from my TC-8. The cable grips the connectors so tightly that it almost can't be removed.

The terminating resistors are a real problem. The resistors are needed if edge connector J3 isn't used, but should be removed if J3 is connected to anything else. Moving the CPU-EI cable to J3 means that J4 is available to pick up static; this is no solution. I'm in the process of building a PC board with the resistors and a short cable so that I can put the resistors where needed.

The FD1771B problem: if the disks aren't present, the system hangs up. I installed a switch to take the chip out of service (described on p. 76 of the September 1981 issue of 80 Micro).

E.H.C.
Pioneer, CA

Thanks for writing.

In the February 1983 issue R.K. of Fallston, MD asked about formatting track zero on both single- and double-density disks (p. 410). Not long after reading that, I came up with the solution: use a forced interrupt command during format.

To format track zero, sector zero in single-density: Format track zero in double-density, issue the format in single-density command, and issue an immediate interrupt command after the data for sector one has been written to disk. Sector one is then in single-density mode and sector two in double-density.

You can format single-double-single-double, or any other combination, using a slightly different approach: Format the track in the density of the last sector; format tracks up to the next to last sector in the other density; and repeat, alternating the density and stopping the format (via interrupts) one sector less than the previous format until you reach sector zero.

N.M.
Stoney Creek, Ontario

An ingenious solution! Thanks!

I have an early Model I with an Exatron Stringy Floppy. My problem is with Basic: When I use Data and Read, the computer won't read past the first value. I've tried everything I can think of with no luck. Are my ROMs bad?

Can they be replaced? Do I have to use Model III ROMs?

G.M.
Kirkland, WA

It sounds like a problem that occurred with the earlier versions of the Model I ROMs. When Level II was introduced, it had a few bugs. Radio Shack went through several revisions before settling on the current two-chip ROM set. One of the versions, primarily associated with the revision G CPU board, had a flaw in the Read Data sequence. To correct this flaw, you have to issue the command POKE 16553, 255 before attempting to use the Read and Data statements.

Try doing this first. If it solves the problem, you don't have to worry about replacing the ROMs. If it doesn't, get a memory test program from your local computer repair center and have it check out the ROMs. The checksums given by the program should match the checksums listed for your ROM chips. If they don't match, you have to replace the ROMs.

The Model III ROM won't work in a Model I, so you needn't worry about that. However, I don't know how compatible the two-chip ROM set is with the Exatron Stringy Floppy. So call Exatron and ask them if it turns out that your ROMs need to be replaced.

I've been trying to contact The Bottom Shelf in Decatur, GA, but receive no response to my letters and phone calls. What's up?

G.P.
Glendale, WI

TBS went out of business over a year ago. I can't find any leads on the people who ran it. Sorry!

I'm writing in response to J.M.'s letter in the May 1983 issue (p. 384), and to anyone else having trouble loading the Checkers 80 program. After failing to get a successful load, I listened to the recording for faded tape, static, or hiss. What I found was a recording at a noticeably different frequency from other loadable tapes.

My solution is to physically alter the CTR-80 recorder to play at a different speed, which results in a successful load. To alter your tape recorder you'll need a small (30-watt) soldering iron, a

Phillips screwdriver, a voltmeter, two feet of insulated small gauge wire (#22 to #30) and a 50-ohm rheostat. You may also need a 6-volt lantern battery.

First, listen to the tape and compare it with another loadable tape. Determine if the recording is either too high or low a frequency. If it's too low you'll need the lantern battery.

Second, unplug all plugs and remove the batteries.

Third, remove the back of the tape recorder (two screws up front and one in the battery compartment), being careful not to break the battery compartment wires.

Next, find the cable leading from the motor (mine was brown) and follow it to where it's soldered to the circuit board. You should see one insulated wire and one uninsulated braided wire coming from the cable.

Now put the batteries in and press the play button. Use the voltmeter to find the positive end of the motor, press stop, and remove the batteries.

Remove the positive wire from the motor, and solder an 8-inch length of wire to the motor. Solder another 8-inch wire to the circuit board at the end of the negative lead and solder the center terminal of the rheostat to the positive wire.

If the frequency is too high, solder the other wire to either of the other two rheostat terminals, and skip the following instructions. If the frequency is too low, solder a short piece of wire to one of the other two rheostat terminals and attach the other to the positive terminal of the recorder. Connect the wire you soldered to the circuit board to the negative terminal of the battery. The motor should start turning. If it doesn't, double check your wiring. Remove the wire from the battery.

Wrap tape around the soldered wires and put the tape recorder back together, but don't put the screws back (reattach the wire to the lantern battery if you used it).

Put the cassette in the recorder and adjust the rheostat until it sounds right. When it does, rewind the tape and try to load it into the computer. Keep trying until it loads.

If you have a machine-language monitor, load and use it to load Checkers 80. With Checkers 80 in memory use the monitor to find the start, end, and execution addresses of the program, and then save it (after removing

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your modifications) to a new tape. The new tape should load correctly every time.

P.S.
Oregon, WI

Sounds like an awful lot of work. Rather than do all that, try what the next fellow did. If this doesn't work, then try P.S.'s solution.

I also had a problem loading Checkers 80, as well as Invasion Force, on my Model III. It seems, after listening to the tapes, that these programs were recorded at a slightly different speed than the other Radio Shack tapes. On the Model I it doesn't matter, but the Model III is more finicky and refuses to load the tapes.

My solution was to connect a wire-wound potentiometer across the remote jack on the recorder to slow the motor speed enough to read the program. I used a 5,000-ohm control with a patch cord ending in a mini-plug. Just wire one of the patch cord leads to the center and the other to one of the end terminals of the potentiometer. A few attempts may be necessary.

B.P.
Borden, Ontario

Your suggestion should work quite well for those people with tapes recorded at too high a frequency. Thanks.

M.G. of Parma Heights (May 1983, p. 388) wants to connect a Sperry-Remington 101 to a Model I. The 101 is an IBM Selectric in disguise, and the only way to use it is to add solenoids and circuitry. Escon makes a special version of their kit to convert the SR101. Since the kit costs about \$500, most people would be better off with an Epson or DMP printer.

For an off-the-cuff conversion of hexadecimal numbers, Basic is convenient. Just enter

A = 10: B = 11: C = 12: D = 13: E = 14: F = 15

Then, to convert 6E, type ?6*16 + E. Of course, after doing this many times you'll eventually memorize hexadecimal notation and won't need the table. In the meantime, however, it's useful.

D.B.
Gainesville, FL

Thanks for the help.

This concerns the printer functions of the Radio Shack Inventory Control System (February 1983, p. 408). Although your method may work, Radio Shack published an article concerning that problem. It's the result of the design of their earlier line printers, and how a form feed was handled. On all current copies of TRSDOS, Radio Shack includes a utility called LPC/CMD which corrects this error. If you don't have LPC/CMD, you can get it from Radio Shack Computer Centers free of charge.

Even though this article was published in the Tandy Newsletter in 1981, they should include a note about this problem in their software packages sold today.

D.G.
Junction City, KS

You're right, LPC/CMD does correct the problem for people with older, or non-Radio Shack printers.

I have a Model I Level II 16K computer. I wanted to buy an Expansion Interface, but I now learn that they aren't available. Do you know where I can get one, or if someone else makes one that works on the Model I?

H.R.
Elkhart, IN

Rider Radio (Peterborough, NH 03458, 603-924-3911) still has a few units left. They are new 32K units with RS-232 boards, and are fully covered by Radio Shack's warranty. They cost \$550, shipping included.

LNW sells an expansion interface kit for the Model I. You assemble it yourself, putting on the components for the features you want, when you want them. Holmes Engineering also sells an expansion interface, as does Micro-Design. All three companies advertise in 80 Micro, so check their advertisements for features and prices.

I'm having serious problems with my Model III. It starts up with a high-pitched squeal from inside, similar to the sound a TV makes. After a few moments the image on the screen flickers and moves as if a strong mag-

netic field is present. What's happening, and how can I fix it myself?

B.G.P.
Aston, PA

Your squealing problem is in the picture tube, just like a TV. The insulation on the high voltage line to the tube is breaking down, causing the squealing noise. After a period of time a static charge builds up on the tube and generates a magnetic field that distorts the picture. This is a potentially dangerous situation. What you need to do is to get some "high voltage dope" from a TV repair shop and spread it on the high voltage line to your picture tube. The dope reinsulates the line, eliminates the leakage, and fixes your problem. If the repair shop gives you static about the dope, just explain the problem.

If the dope doesn't cure your problem, you'll have to take it to a repair shop. Since the problem is with the picture tube, just about any TV repair shop can do the job for you, and probably cheaper than Radio Shack.

I want to add disk drives to my Model III, and want to know what's the best configuration, 40- or 80-track? single- or dual-headed? single- or double-density?

Second, in what format are most disk programs sold (what track count, single- or double-density, etc.)?

Third, what's the best DOS?

Fourth, what brand of drive should I buy? And from whom should I get it? Also, who has the best disks?

Next, what are the differences between Level II and Disk Basic?

My friend and I have been exchanging programs we write. He has a single-density drive. If I get a double-density drive, will we still be able to exchange programs?

And finally, what's a locked disk? Is it one you can't copy?

P.H.
APO San Francisco, CA

I like short, simple questions like yours.

First, for drive zero you should get a double-density 40-track unit. This keeps you compatible with most disk-based Model III software, which is sold in that format. Many game programs are self-loading and won't boot in a drive other



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than a 40-track double-density drive. As third and fourth drives, 80-track drives are fine but you'll have difficulties using them efficiently as drives zero and 1.

Whether the drive is single- or double-sided is a personal choice you'll have to make. From a software point of view, it doesn't matter. The primary advantage is that one double-sided drive is cheaper than two single-sided drives, and takes up less room. The disadvantage is that a double-sided drive costs more than a single-sided drive.

TRSDOS is the simplest DOS to use, but is unreliable as compared with the other DOSes on the market. I prefer MULTIDOS because it reads the disks of almost any other DOS. Very handy. It also has a super Basic for program writers, and maintains the most compatibility, in command syntax, with TRSDOS 2.3. In addition, it is one of the easiest systems to learn. My next choice is DOSPLUS, which has a lot of bells and whistles added, making it very versatile and fairly easy to use. NEWDOS80 and LDOS are designed

for professionals, and require hard study before you can begin to use them effectively.

Since you have a Model III, you'll need a drive-zero kit. The drive-zero kit contains the disk controller circuitry, mounting hardware, and power supply for the drives. You must have it before you can use drives. Your next drive, drive 1, won't need a case since it mounts inside the Model III case. You also should not need a power supply, since most drive-zero kit power supplies can power two drives. All you'll need is a bare drive. Which company you buy from is up to you. Your criteria should cover price, motor speed, stepping speed (the faster the better), and your proximity to a repair center. If you get a non-Tandy drive and there isn't a computer repair center close by you, you'll have real problems if your drive needs work in the future. You may end up having to remove it from your computer and sending it to the drive manufacturer. In that case, buying a Tandy drive makes more sense since you can just

take it to any Radio Shack store and have them send it to their repair center for you.

The primary differences between Disk and non-Disk Basic are in the disk I/O commands and in a few miscellaneous commands. The real power of Disk Basic depends on which DOS you get, since they all offer different features.

Exchanging programs with your friend will depend on your DOS. LDOS, NEWDOS80, MULTIDOS, and DOSPLUS are all capable of reading Model I disks in a Model III, especially if the disk was formatted by their Model I versions. Most of them, if the Model I has a double-density board, read Model III disks in Model I systems, but they require that both computers use the same operating system (Model I MULTIDOS reads Model III MULTIDOS disks, but only if the Model I has a double-density board). For more information on their transfer capabilities, call or write the manufacturers.

Finally, there are software techniques

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that let you lock the data on a disk and prevent it from being backed up or copied. I consider locked disks to be a *caveat emptor*, buyer beware! Some software is worth having, even if you can't make back-up copies. You have to decide whether it's worth it.

I have a Model I with one disk drive. I need a disk directory program and would appreciate some advice. I have mostly TRSDOS disks, but also a few NEWDOS. Do any of the directory programs let you change the disk's name?

L.S.
Worcester, MA

I can't adequately answer your question since I don't use directory programs myself. I do know, however, that there are several that allow you to read non-TRSDOS disks and also let you change the disk name. You should check the advertisements in *80 Micro*. They'll give you more information about the directory programs. If you

have any back issues of *80 Micro*, check the review section. You may find a review that answers your question.

I plan to transfer some applications programs I've written in Basic on my Model III to an IBM PC. The IBM uses Microsoft Basic, as does the Model III. Both can save programs as ASCII files. The only differences I can see in the dialects are that IBM's Basic has a few enhancements that I don't need for my programs and the IBM doesn't have a PRINT@ command.

My programs don't use any machine-language routines, and use only three or four PEEKs and POKES. Can I save my programs in ASCII format on the Model III and transfer them to the IBM PC via the RS-232 port? If so, what software do I need?

M.W.
Edison, NJ

Yes, you can make the transfer. For the Model III you'll need a terminal

program such as Omniterm (\$95 from Lindbergh Systems, 41 Fairhill Road, Holden, MA 01520, 617-852-0233). Since I don't have an IBM (yet), I can't recommend terminal software, but here are three to start you off: Westico (25 Van Zant St., Norwalk, CT 06855, 203-853-6880, \$175), Microcom (1400A Providence Hwy., Norwood, MA 02062, under \$100), and Saturn Consulting Group (147 West 26th St., New York, NY 10001, 212-675-7753, no price given). Others are listed in *PC World* (555 De Haro St., San Francisco, CA 94107).

You shouldn't have any trouble transferring the programs as long as they're in ASCII format. I've had no trouble doing this from my Model I to other computers such as the Apple, Col- or Computer, Model III, and so on.

I recently purchased a new DMP-500. It has many improvements over my LP V, and I had hoped the correspondence type font would allow me to write

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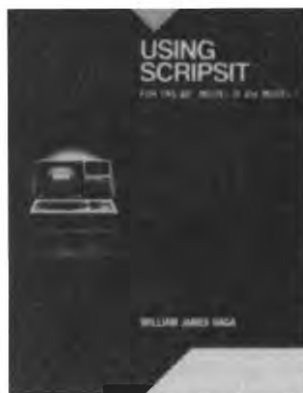
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office notes without having to use the DWII printer in another office. I didn't expect letter quality, but I was shocked to discover that the lowercase Y in the correspondence mode ruins the entire type font. The Y is offset vertically from the other letters in the font. It almost looks like a capital letter if you use it in words like "you" or "your."

Since I need to print letters with non-slashed zeros (which is available only in the correspondence type font), neither DMP-500 type font is acceptable for business purposes. If you have any suggestions for correcting this problem, please let me know. I gather that the character-generator chip would have to be reprogrammed to correct this problem.

C.H.
Newport, RI

You're right; it does mess up the type font. I find it incredible that Radio Shack would let such a mistake go uncorrected. Can anyone help C.H. with a new character-generator chip?

I'm writing to let you know that Tandy has released three new boards for the Color Computer: an MC board, a TDP board, and a board without any ID at all. I have the last one.

The board layout is different from the C, D, and E boards. My machine is a factory-installed 32K model with 64K chips. Is this normal? All four Berg jumpers say 16K/64K. Also, the technical manual (#26-3193) doesn't apply to my board. Is there a new one?

L.C.
Folsom, CA

Yes, it's normal for 32K machines to use 64K chips. You have the latest Color Computer board, designed to convert to 64K operation with the proper software. Radio Shack is currently working on a new Extended Basic ROM chip to let you access the full 64K RAM while in Basic. I've been told that the ROM will respond to the prompt PRINTMEM with 60,383. The remaining 4K is reserved for page-zero variables, text screen, and

high memory port addresses (RS-232, SAM chip, and so on). When we'll see this new software is guesswork.

By the way, high-level management at Radio Shack vehemently denies that the Color Computer is going to be dropped. The new MC-10, according to an internal memo sent to store managers, is not a replacement unit but a new low-end computer designed to compete with the Timex-Sinclair Spectrum.

My Radio Shack technician tells me that the only manual available is the one you listed. Even though he has a new 64K board in his shop, he doesn't have any technical information on it yet. When the updates are available you'll be able to get them through National Parts (900 East Northside Drive, Fort Worth, TX 76102, 817-870-5662).

I'm confused about the numerous anti-glare screens on the market today. Will the plastic screens stop X-ray emission and eliminate eye fatigue? Do slow- or medium-decay monitors work

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well with fast-action games? How do replacement monitors compare with anti-glare screens?

B.G.P.
Aston, PA

The only thing that stops X-rays is lead. Plastic puts up as much resistance to X-rays as glass does, which is to say none at all.

Eye fatigue is the result of staring at the blue-white phosphor of a monitor for several hours, and the inability to move in relation to that screen. For example, if you could move the keyboard back and forth from the monitor and tilt the monitor's screen up, down, left, and right as you can with some other computers, you would eliminate most eye-fatigue problems.

Phosphor-induced eye fatigue is a different problem. Your eyes are not designed for constant use with these particular light frequencies. They prefer instead frequencies closer to the middle of the visible light spectrum. That's why

many people hate fluorescent lights: The white light is slightly painful to them. But white phosphor is used because it's easy and cheap to apply.

Glare also enters the picture, since anything that makes the screen harder to read makes you strain your eyes.

The primary advantage to slow- and medium-decay monitors is reduced eye fatigue, which means longer periods of work without having to rest your eyes, greater productivity, and happier workers. The disadvantage is that you have to replace your current monitor with a more expensive one.

Green screens reduce eye fatigue by changing the monitor's blue-white light to green. They help, but replacing the monitor with a green or amber screen is better. The primary advantage to plastic green screens is that they're cheap by comparison with replacing a monitor. If you get a green screen, get one made of hard plastic, not molded plastic. The soft plastic is hard to clean without tearing it.

If you decide to get a replacement

monitor, get one with a built-in anti-glare screen; it'll cost a few dollars more, but as long as you're getting a new monitor you might as well do it right the first time.

Also, note that plastic green screen covers with built-in anti-glare are not made. Placing the two together means that you have to turn the video intensity of your monitor quite high, which eventually will burn out the phosphor in your monitor. The amber/green monitors are designed to prevent this.

Finally, using games with the slow- and medium-decay green/amber monitors isn't a problem. You will notice a slight tail (as the phosphor decays) behind rapidly moving graphics objects, but you quickly get used to it. And besides, the reduced eye fatigue more than makes up for this disadvantage. ■

Terry Kepner is a freelance writer and programmer, and the vice president of Interpro. He's been writing about microcomputers since 1979.

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Reviewed in March '82 "80 Microcomputing"

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Byte Magazine, May and June 1980

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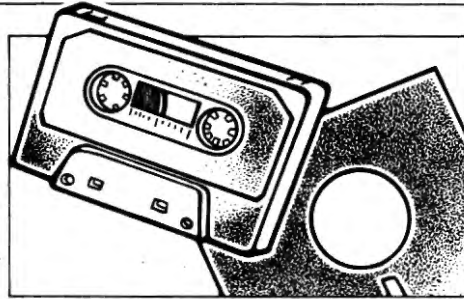
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Lots of you write urging me to include more business programs on Load 80. This month, I did just that. This issue's theme is business, and Load 80 offers some intriguing applications.

The magic of successfully automating your company lies in finding a program that satisfies your requirement. Some of this month's programs may be just what you need; some may not. How do you decide?

You should begin by defining what you need the computer to do. Consider what you currently do manually. Do you send out large mailings? A data-management system can create and sort your mailing lists. Do you want the computer to print your mailing labels?

Analyze your business needs

You must select software compatible with your printer.

How do you keep track of your inventory? The right program can predict your needs and encourage low overhead by reducing your on-hand merchandise.

Do you need special reports on a regular basis? Do you handle a lot of correspondence? A good word processor is a must.

Additionally, you must examine your business's projected growth over the next year, five years, and even 10 years. The software you choose must keep up with your growth.

The computer's role in business management is handling information. A well-chosen system provides up-to-date reports faster than you can generate by hand, increases productivity, and improves your use of capital thanks to more efficient information-handling. In other words, the computer helps you coordinate information.

The small-business computer system consists of three parts: the computer (hardware), programs (software), and support (liveware). As a TRS-80 owner, you've already made your hardware choice.

Your software choice should take into consideration your company's needs as well as the people who will work with the program. If you're going to run the computer yourself, you should realize that data entry could take a lot of time that might be more profitably spent. If you plan to train an employee to run the computer, the program must be well documented and easy to use.

You should also analyze the software to see if it needs modifications for your particular business and whether you can make those modifications yourself. Commercial business applications do standardized jobs; if your company handles those jobs in an unconventional way, you need to customize the program.

Not all the programs we've included this month will help you. But they give you a chance to see what a computer can do for your business. Think carefully about whether you need each program in your business before you incorporate it.

Index	Page	Article	File Spec	Comments
Side A				
1	74	The Business of Planning	MONTE/BAS	none
2	128	Project Assessment Technique	PAT/BAS	none
3	184	Spacemap	SPACEMP1/SRC	Ed/Asm
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4	230	Talk to the Big Guys	UT1/SRC	EDTASM*
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	230	Talk to the Big Guys	UT6/SRC	EDTASM

*EDTASM is a Radio Shack product.

September 1983 disk Load 80 directory.

Index	Page	Article	File Spec	Comments
Side A				
A		Copyright	COPYRGHT/BAS	none
B	74	The Business of Planning	MONTE/BAS	none
C	128	Project Assessment Technique	PAT/BAS	none
Side B				
UT1	230	Talk to the Big Guys	UT1/CMD	system*
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UT6	230	Talk to the Big Guys	UT6/CMD	system*
DEA	184	Spacemap	SPACEMP1/SRC	Ed/Asm

*These six programs are already assembled. Load them as System files to a disk. Read the instructions in the article to create the executable command file.—Eds.

September 1983 cassette Load 80 directory.

Load 80 Subscription Notice

Load 80 circulation is handled here in Peterborough. If you have a problem with your Load 80 subscription, please notify Lori Eaton at 80 Pine St., Peterborough, NH 03458. Some people contact 80 Micro's fulfillment company in Farmingdale, NY, with their Load 80 problems; this delays our reply by about

four weeks. And that's a drag for all of us.

Load 80 Complaints and Questions

If you have technical problems with any Load 80 program, please write or call me. If I don't have the answer, I'll find it. Keep those cards and letters coming! ■

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Color Load 80 directory.

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Letters and Numbers

by Richard Ramella

```

100 REM * REPEAT * TRS-80 LEVEL II AND COLOR BASIC 4K
110 REM * FUN HOUSE / SEPT. '83 /R.RAMELLA
120 CLS
130 A$=A$+INKEY$
140 IF LEN(A$)>1 THEN A$=RIGHT$(A$,1)
150 IF A$<>" THEN PRINT A$ " ";
160 GOTO 130
170 END
  
```

Repeat

```

100 REM * LETTER FIND * TRS-80 LEVEL II AND COLOR BASIC
110 REM * FUN HOUSE / SEPT. '83 /R.RAMELLA
120 CLS
130 CLEAR 400
140 A$="ABCDEFGHIJKLMNPOQRSTUVWXYZ"
150 B$=A$
160 A=RND(26)
170 Z$=CHR$(64+A)
180 B$=LEFT$(B$,A-1)+" "+RIGHT$(B$,LEN(B$)-A)
190 PRINT @ 0,B$;
200 PRINT
210 PRINT
220 D$=INKEY$
230 IF D$="" THEN 220
240 IF D$<>Z$ THEN PRINT "NO -- "; ELSE PRINT "YES -- ";
250 PRINT Z$
260 FOR T=1 TO 750
270 NEXT
280 CLS
290 GOTO 150
300 END
  
```

Letter Find

```

100 REM * ABC * TRS-80 4K LEVEL II AND COLOR BASIC
110 REM * FUN HOUSE / SEPT. '83 /R.RAMELLA
120 CLS
130 N=100
140 Z=0
150 A=65
160 A$=INKEY$
170 PRINT @ 448,"SCORE: ";N;
180 IF A$<>" AND A$<>CHR$(A) THEN N=N-1: B=B+1
190 IF B=3 THEN B=0: PRINT @ 360,CHR$(A);: FOR T=1 TO 500: NEXT
T: PRINT @ 360," ";
200 IF A$<>CHR$(A) THEN 160 ELSE PRINT @ 2,CHR$(A);: A=A+1: Z=Z+
1
210 IF A=91 THEN PRINT: PRINT: PRINT "YOU DID IT!": END
220 GOTO 160
230 END
  
```

ABC

September is back-to-school month. I go back to Clown-Around University to work on my degree in Funhouseology, and you go back to the next higher grade.

This is kind of a sad time for some people who get left behind—the little brothers and sisters of the world. It will be lonely for them.

Before I burst into tears, let me say that I've done something about this situation. I have some programs you can take home for the kids who haven't started school yet.

All these programs have a few goals: learning the alphabet and numbers one to nine, adding numbers up to five, and learning the keyboard for typing. The programs are short.

Some work in both Level II and Color Basic. Others have separate Level II and Color Basic listings. In all programs, line 100 indicates for which sys-

The Key Box

Model I and III
Color Computer
4K RAM
Level II Basic
Color Basic

tems the listings are meant. Look closely to be sure you're typing in a program that fits your machine.

Now, I'm not an educator; I'm just a poor old fun house attendant. But I do know a few things about little kids and learning and computers.

First, the programs here leave out some important aspects of

learning: hearing, saying, and writing down. Little kids need crayons, pencils, and paper to play with the ideas in these programs.

Printing numbers and letters gives them small muscle coordination that helps when they go to school and learn what to do with a pencil. Sesame Street and you can help the kids

hear and say their numbers and letters.

Second, make sure the kids don't think the computer is magic. Let them know it's just a machine.

Third, small children are often smeared from head to toe with peanut butter and jelly, so wash them off before you let them near the computer. Don't tell them I said that.

Before you open the Early Childhood Learning Surprise Packet, I want you to know that I'm willing to help anyone who has trouble keying in Fun House programs. My address is: Richard Ramella, 1493 Mountain View Ave., Chico, CA 95926. A self-addressed, stamped envelope gets you a quick answer.

```

100 REM * TYPE * TRS-80 LEVEL II AND COLOR BASIC 4K
110 REM * FUN HOUSE / SEPT. '83 /R. RAMELLA
120 CLS
130 DATA DOG,CAT,MOM,DAD,STOP,GO,BED,RED,BIG,SMALL,DOOR,APPLE
140 DATA HI,MY,I,ME,YOU,WE,PULL,PUSH,OPEN,CLOSE,HOP,MOP,FLOOR
150 DATA CAR,BIKE,RUN,APPLE,STAR,MOON,DAY,SLEEP,PEEP,EYE,NOSE
160 DATA FOOT,HAND,BOY,GIRL,HELLO,EGG,BREAD,SOUP,WATER,HIGH
170 DATA LOW,BIRD,QUICK,BROWN,FOX,OVER,LAZY,THE
180 CLEAR 500
190 DIM A$(54)
200 FOR A=1 TO 54
210 READ A$(A)
220 NEXT A
230 CLS
240 C$=""
250 B$=A$(RND(54))
260 PRINT B$
270 C$=C$+INKEY$
280 IF RIGHT$(C$,1)=CHR$(32) THEN C$="": PRINT @ 192," ";
290 PRINT @ 192,C$;
300 IF C$<>B$ THEN 270
310 FOR T=1 TO 6
320 PRINT @ 256,"GOOD"
330 FOR G=1 TO 50
340 NEXT G
350 PRINT @ 256," ";
360 FOR G=1 TO 50
370 NEXT G
380 NEXT T
390 GOTO 230
400 END

```

Type

Number Tap—Level II

```

100 REM * NUMBER TAP * TRS-80 LEVEL II
110 REM * FUN HOUSE / SEPT. '83 /R. RAMELLA
120 CLS
130 ES(1)="(0)+"+STRING$(6," ")+"(0)"
140 ES(2)="-X-"+STRING$(6," ")+"-X-"
150 S$=CHR$(191)+CHR$(191)
160 C=0
170 N=0
180 Z=224
190 A=RND(9)
200 PRINT @ 160,A;
210 A$=INKEY$
220 IF A$="" THEN N=N+1
230 IF A$=CHR$(32) GOSUB 840
240 IF C=9 THEN N=200
250 IF N=200 THEN 270
260 GOTO 210
270 IF C<>A THEN 630
280 PRINT @ 8,"YES";
290 Y=3
300 FOR X=0 TO 40
310 SET(X,Y)
320 SET(X,Y+20)
330 NEXT X
340 X=0

```

Listing continued



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* TRS-80 is a trademark of Tandy Corp

✓477

Listing continued

```
350 FOR Y=3 TO 23
360 SET(X,Y)
370 SET(X+40,Y)
380 NEXT Y
390 PRINT @ 196,E$(1);
400 PRINT @ 264,CHR$(186)+S$+CHR$(181);
410 Z=20
420 X=30
430 FOR Y=15 TO 20
440 SET(X,Y)
450 SET(X-Z,Y)
460 Z=Z-2
470 X=X-1
480 NEXT Y
490 Y=Y-1
500 FOR X=16 TO 25
510 SET(X,Y)
520 NEXT X
530 FOR T=1 TO 15
540 FOR K=1 TO 2
550 PRINT @ 196,E$(K);
560 FOR L=1 TO 20
570 NEXT L
580 NEXT K
590 NEXT T
600 FOR T=1 TO 100
610 NEXT T
620 GOTO 120
630 PRINT @ 10,"NO";
640 FOR T=1 TO 500
650 NEXT T
660 FOR B=253 TO 224 STEP -1
670 PRINT @ B," ";
680 FOR T=1 TO 10
690 NEXT T
700 NEXT B
710 FOR T=1 TO 500
720 NEXT T
730 H=1
740 FOR B=224 TO 224+(A*3)-3 STEP 3
750 PRINT @ B,S$
760 PRINT @ B+128,H
770 H=H+1
780 FOR T=1 TO 100
790 NEXT T
800 NEXT B
810 FOR T=1 TO 500
820 NEXT T
830 GOTO 120
840 PRINT @ Z,S$
850 C=C+1
860 Z=Z+3
870 RETURN
880 END
```

Repeat

This short program is for Level II and Color Basic. Type RUN and tap the enter key. Then let the little one take over. Any key tapped endlessly repeats a character on the screen. When the child taps another key, it starts repeating.

This is fun for very small children. It shows that something happens on the screen when you tap keys.

Letter Find

This listing works in Color Basic and Level II. The program prints the entire alphabet except for one letter that it leaves blank. The player figures out which letter is missing and taps that letter on the keyboard.

The program indicates whether the choice is right or wrong and prints the mystery letter. It repeats endlessly. This exercise helps the youngster learn the alphabet and the keyboard.

ABC

Again, this listing supports



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Level II and Color Basic. The player starts with a score of 100, but the screen is blank. The object is to type in the alphabet in order from A to Z.

Nothing happens if the player types a letter out of order. If he makes three wrong choices in a row, the right letter briefly appears on the screen. The game ends when the player correctly types the entire alphabet.

Type

Level II and Color Basic are in the same listing. In lines 130-170, I have written 54 words that are useful to know. The program shows the word, then the player tries to type that word. If he makes a mistake, the player taps the space bar, the mistake disappears, and he starts typing over from the beginning of the word.

You can put other words in data lines 130-170, but you must replace these words on a one-to-one basis so you always have 54 words. If you change

```

100 REM * NUMBER TAP * TRS-80 COLOR BASIC 4K
110 REM * FUN HOUSE / SEPT. '83 /R.RAMELLA
120 CLS(0)
130 C=0
140 N=0
150 Z=224
160 A=RND(9)
170 PRINT @ 160,A;
180 A$=INKEY$
190 IF A$="" THEN N=N+1
200 IF A$=CHR$(32) GOSUB 560
210 IF C=9 THEN N=200
220 IF N=200 THEN 240
230 GOTO 180
240 IF C<>A THEN 330
250 PRINT @ 96,"YES";
260 FOR H=1 TO 5
270 SOUND 204,2
280 SOUND 193,1
290 SOUND 185,2
300 SOUND 176,2
310 NEXT
320 GOTO 120
330 PRINT @ 96,"NO";
340 FOR H=1 TO 2
350 SOUND 193,3
360 SOUND 176,3
370 SOUND 170,3
380 SOUND 159,5
390 NEXT H
400 FOR B=253 TO 224 STEP -1
410 PRINT @ B,CHR$(128);
420 SOUND B-20,1
430 NEXT B
440 FOR T=1 TO 500
450 NEXT T
460 FOR B=224 TO 224+(A*3)-3 STEP 3
470 B$=CHR$(143+RND(7)*16)
480 PRINT @ B,B$+B$;
490 SOUND B-50,5
500 FOR T=1 TO 50
510 NEXT T
520 NEXT B
530 FOR T=1 TO 750
540 NEXT T
550 GOTO 120
560 SOUND RND(5)*13+150,1
570 C=C+1
580 X$=CHR$(143+RND(7)*16)
590 PRINT @ Z,X$+X$;
600 Z=Z+3
610 RETURN
620 END

```

Number Tap—Color Basic

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From the January 1981 issue of the CSRA Computer Club newsletter

There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical information on the TRS-80 color computer™. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

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the number of words, count the total words in lines 130-170. Replace the number 54 with your new total in lines 190, 200,

and 250.

If you put in hundreds and hundreds of words, you must change line 180 CLEAR 500 to

a higher number, perhaps CLEAR 1000. Above all, remember that you can't use the left-arrow key to erase.

Number Tap

This program has separate Level II and Color Basic listings. In both versions, a number from one to nine appears on the screen. The player taps the space bar as many times as the number indicates. If a three appears, the player taps the space bar three times.

Each tap produces a new rectangle of light on the screen. The player must act quickly because if nothing happens within five or six seconds, the computer assumes a wrong answer.

In Level II Number Tap, if the answer is right, the word "YES" appears along with a smiling face. If the answer is wrong, a "NO" appears and the computer counts out the right answer.

In Color Number Tap, a right answer gets a happy song, and a wrong answer gets a sad

```

100 REM * HOW MANY? * TRS-80 LEVEL II
110 REM * FUN HOUSE / SEPT. '83 / R.RAMELLA
120 CLS
130 CLEAR 500
140 FOR A=1 TO 32
150 D$=D$+"YES "
160 E$=E$+"NO "
170 NEXT A
180 A=RND(5)
190 B=RND(5)
200 IF A+B=10 THEN 180
210 A$=CHR$(191)
220 PRINT @ 13,A$+"B"= ";
230 FOR C=78 TO 78+128*(A-1) STEP 128
240 PRINT @ C,A$
250 NEXT
260 FOR C=82 TO 82+128*(B-1) STEP 128
270 PRINT @ C,A$;
280 NEXT
290 PRINT @ 21,"";
300 C$=INKEY$
310 IF C$<>" " AND VAL(C$)>0 AND VAL(C$)<10 THEN PRINT @ 22,C$; ELS
E 300
320 C=VAL(C$)
330 IF C=A+B THEN X$=D$: GOSUB 370 ELSE X$=E$: GOSUB 370
340 FOR T=1 TO 2000
350 NEXT
360 GOTO 120
370 FOR F=704 TO 832 STEP 64
380 PRINT @ F,X$;
390 NEXT F
400 IF C<>A+B GOSUB 420
410 RETURN
420 FOR G=1 TO 10
430 PRINT @ 21,A+B;
440 FOR T=1 TO 20
450 NEXT T
460 PRINT @ 22," ";
470 FOR T=1 TO 15
480 NEXT T
490 NEXT G
500 PRINT @ 21,A+B;
510 RETURN
520 END

```

How Many?—Level II

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How Many?

This program presents endless addition problems with answers less than or equal to nine. It plays an adding game that lets the player add up the answer in a way that teaches both counting and addition.

Say the problem is $2 + 3 = ?$. Beneath the 2 are two light blocks; beneath the 3 are three blocks of light. The player taps an answer between one and nine.

The separate Level II and Color Basic versions are slightly different. In Level II How Many?, a wrong answer gets a few rows of "NO" and a right answer gets rows of the word "YES." If the answer is wrong, the right answer flashes over the wrong answer.

In Color How Many?, a sad song signals no, and a happy song signals yes. The program corrects wrong answers.

Next month I'll have some activities that will help people

```

100 REM * HOW MANY? * TRS-80 COLOR BASIC 4K
110 REM * FUN HOUSE / SEPT. '83 / R.RAMELLA
120 CLS(0)
130 A=RND(5)
140 B=RND(5)
150 IF A+B=10 THEN 130
160 A$=CHR$(143+RND(7)*16)
170 B$=CHR$(143+RND(7)*16)
180 IF B$=A$ THEN 170
190 PRINT @ 9,A,"+B=" ";
200 FOR C=74 TO 74+(64*(A-1)) STEP 64
210 PRINT @ C,A$;
220 NEXT
230 FOR C=78 TO 78+(64*(B-1)) STEP 64
240 PRINT @ C,B$;
250 NEXT
260 PRINT @ 17,"";
270 C$=INKEY$
280 IF C$<>" " AND VAL(C$)>0 AND VAL(C$)<10 THEN PRINT @ 18,C$ "
; ELSE 270
290 C=VAL(C$)
300 IF C=A+B GOSUB 340 ELSE GOSUB 410
310 FOR T=1 TO 1500
320 NEXT
330 GOTO 120
340 FOR F=1 TO 3
350 SOUND 204,2
360 SOUND 193,2
370 SOUND 176,2
380 NEXT
390 SOUND 218,6
400 RETURN
410 FOR F=1 TO 2
420 SOUND 147,4
430 SOUND 117,4
440 SOUND 89,5
450 NEXT
460 FOR F=1 TO 10
470 PRINT @ 17,A+B;
480 SOUND RND(10)*20,1
490 PRINT @ 18,CHR$(143+RND(7)*16);
500 FOR T=1 TO 20
510 NEXT T
520 NEXT F
530 PRINT @ 17,A+B;
540 RETURN
550 END
  
```

How Many?—Color Basic

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Rules

1. Final entries must be in by November 1, 1983.
2. All entries must be submitted in a 10x13" envelope and must include: typewritten, double-spaced documentation; a printed copy of the program listing; a magnetic disk or cassette containing the program listing, the documentation, and any figures or tables; and a completed entry blank.
3. Documentation should consist of an explanation of the program, its purpose, how to use it, and the necessary software and hardware needed to use it (including memory re-

quirements). Good documentation also points out the interesting algorithms and program techniques used without giving a line-by-line account.

4. Entries must be original and unpublished.
5. All winning programs become the property of **80 Micro**.
6. The category in which you will be judged will be determined by your age as of November 1, 1983. You must not have turned 19 by that date.
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TAKE II



This column features Model II, 12, and 16 conversions of earlier programs. Readers who have converted programs for their own use are encouraged to submit them.

"Mail List" first appeared in *80 Programs for the TRS-80 1001001 Inc.*, Peterborough NH, 1979, pp. 54-56). This Model II conversion was done by Byron Lott of 913 Inverness Way, Sunnyvale, CA 94087.

"Mail List" offers 12 program options including search; list by name, city, state; and so on. The program lets you add and save data, or make changes to existing data. Your list, once compiled, either appears on the screen or is sent to the printer. You take care of only the postage. ■

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Program Listing

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1 REM 14-APR-82 *BDL*
2 CLS
3 PRINTTAB(22) "RUNNING PROGRAM -MAIL/BAS-":PRINT:PRINT
4 PORT=1TO500:NEXTT
5 CLEAR12000:CLS:DIM N1$(101),N2$(101),A$(101),C1$(101),C2$(101),C3$(101),PH$(1
6) ,OS(101),B$(101)
7 NPS="POSTMAN":ONERRORGOTO2410
8 QS="":Z1S="":Z2S="":QPS="":PRINT@188,"MAILING LIST MENU"
9 PRINT:PRINT
10 PRINT*1 CREATE NEW LIST"
11 PRINT*2 SEARCH FOR ONE NAME"
12 PRINT*3 LIST ALL NAMES IN ONE CITY"
13 PRINT*4 LIST ALL NAMES WITH THE SAME OPTION LINE"
14 PRINT*5 LIST ALL NAMES WITH THE SAME CITY AND OPTION"
15 PRINT*6 LIST ALL NAMES WITH THE SAME ZIP CODE"
16 PRINT*7 LIST ALL NAMES IN LIST"
17 PRINT*8 ADD NEW NAMES TO THE LIST"
18 PRINT*9 MAKE CORRECTIONS TO LIST"
19 PRINT*10 SAVE CURRENT FILE ON DISK"
20 PRINT*11 INPUT A FILE FROM DISK"
21 PRINT*12 PRINT TOTAL NUMBER OF NAMES IN LIST"
22 PRINT*13 SORT CURRENT FILE"
23 PRINT*14 LIST DISK-FILES"
24 PRINT*15 EXIT PROGRAM"
25 PRINT:INPUT"ENTER SELECTION";A:CLS:ON A GOTO 160,280,455,650,800,970,1130,13
26,1470,1690,1760,1830,2050,2400,1985
27 PRINT*NOTE: ENTER '*' FOR 'LAST NAME' AFTER FINAL DATA ENTRY TO INDICATE -E
28 OF-
29 165 PRINT
30 FOR R=1 TO 100
31 PRINT*";R
32 INPUT"ENTER LAST NAME";N1$(R)
33 IF N1$(R)="*"THEN CLS:GOTO 20
34 PRINT
35 INPUT"ENTER FIRST NAME AND MIDDLE INITIAL";N2$(R)
36 PRINT
37 INPUT"ENTER STREET ADDRESS";A$(R)
38 PRINT
39 INPUT"ENTER CITY, STATE, ZIP CODE (C...C, SS, ZZZZZ)";C1$(R),C2$(R),C3$(R)
40 PRINT
41 INPUT"ENTER PHONE NUMBER";PH$(R)
42 NEXT R
43 PRINT"ENTER NAME TO BE SEARCHED"
44 PRINT
45 PRINTTAB(5)"LAST NAME";
46 INPUT N1$
47 PRINT
48 PRINTTAB(5)"FIRST NAME";
49 INPUT N2$
50 PRINT
51 INPUT"RESULTS ON VIDEO OR PRINTER (V OR P)";QS:PRINT:PRINT
52 FOR R=1 TO 100:IF (N1$=N1$(R))AND(LEFT$(N2$,4)=LEFT$(N2$(R),4)) THEN 375
53 NEXT R
54 CLS:PRINT"NAME REQUESTED NOT FOUND IN LIST"
55 GOTO20
56 IFQS="P"THENGOSUB1920:GOSUB1925:GOTO440
57 PRINTN2$(R); " ";N1$(R)
58 PRINTA$(R):PRINTC1$(R); " ";C2$(R); " ";C3$(R)
59 PRINT
60 INPUT"DO YOU WANT THE PHONE NUMBER (Y OR N)";Z1$
61 IFZ1$="Y"THENPRINTPH$(R)
62 PRINT
63 INPUT"DO YOU WANT THE OPTION CODE";Z2$
64 IFZ2$="Y"THENPRINTQS(R)
65 PRINT
66 INPUT"DEPRESS <ENTER> TO RETURN TO MENU";Z3$
67 CLS:GOTO20
68 INPUT"WHAT IS THE CITY NAME";C1$:PRINT
69 C=0:INPUT"DO YOU WANT THE LIST WITH OPTION CODE(Y OR N)";Z1$
70 PRINT
71 INPUT"DO YOU WANT THE LIST ON VIDEO OR PRINTER (V OR P)";QS:IFQS="P"THEN472E
```

Listing continued

Listing continued

```

LSEGOTO475
472 PRINT:INPUT"PRINT INDIVIDUALLY OR COMPLETE LIST (I OR C)";QPS
473 GOSUB1920:GOTO500
475 PRINT
490 PORT=1T05:PRINT:NEXTT
500 FORR=1T0100
510 IFCL$=C1$(R)THEN540
520 IFN1$(R)="***"THEN615
530 GOTO610
540 IFQS="P"THENIFQPS="C"THENGOSUB1925:GOTO610ELSELPRINT:GOSUB1925:PRINT:INPUT"W
HEN READY TO PRINT DEPRESS <ENTER>";QS:GOTO610
545 PRINT
550 PRINTN2$(R);" ";N1$(R)
560 PRINTAS(R)
570 PRINTC1$(R);" ";C2$(R);" ";C3$(R)
580 IFZ1$="Y"THENPRINTOS(R)
590 PRINT
600 PRINT:PRINT
605 C=C+1:IFC=3THENC=0:INPUTZZ$
610 NEXTR
615 PORT=1T05:PRINT:NEXTT
630 INPUT"DEPRESS <ENTER> TO RETURN TO MENU";Z3$
640 CLS:GOTO20
650 INPUT"WHAT IS THE KEYWORD(OPTION CODE)";K$
655 PRINT
660 C=0:INPUT"DO YOU WANT THE LIST ON VIDEO OR PRINTER (V OR P)";QS:IFQS="P"THEN
662ELSEGOTO665
662 PRINT:INPUT"PRINT INDIVIDUALLY OR COMPLETE LIST (I OR C)";QPS
663 GOSUB1920:GOTO670
665 PORT=1T05:PRINT:NEXTT
670 FORR=1T0100
680 IFOS(R)=K$THEN710
690 IFN1$(R)="***"THEN765
700 GOTO760
710 IFQS="P"THENIFQPS="C"THENGOSUB1925:GOTO760ELSELPRINT:GOSUB1925:PRINT:INPUT"W
HEN READY TO PRINT DEPRESS <ENTER>";QS:GOTO760
715 PRINT
720 PRINTN2$(R);" ";N1$(R)
730 PRINTAS(R)
740 PRINTC1$(R);" ";C2$(R);" ";C3$(R)
750 PRINT:PRINT:PRINT
755 C=C+1:IFC=3THENC=0:INPUTZZ$
760 NEXTR
765 PORT=1T05:PRINT:NEXTT
780 INPUT"DEPRESS <ENTER> TO RETURN TO MENU";Z3$
790 CLS:GOTO20
800 C=0:INPUT"ENTER CITY NAME";C1$
805 PRINT
810 INPUT"ENTER KEYWORD(OPTION CODE) ";K$
815 PRINT
820 INPUT"DO YOU WANT THE LIST ON VIDEO OR PRINTER (V OR P)";QS:IFQS="P"THEN825E
LSEGOTO830
825 PRINT:INPUT"PRINT INDIVIDUALLY OR COMPLETE LIST (I OR C)";QPS
827 GOSUB1920:GOTO840
830 PORT=1T05:PRINT:NEXTT
840 FORR=1T0100
850 IFN1$(R)="***"THEN940
860 IFKS=OS(R)THEN880
870 GOTO930
880 IFCL$<>C1$(R)THEN930
890 IFQS="P"THENIFQPS="C"THENGOSUB1925:GOTO930ELSELPRINT:GOSUB1925:PRINT:INPUT"W
HEN READY TO PRINT DEPRESS <ENTER>";QS:GOTO930
895 PRINT
900 PRINTN2$(R);" ";N1$(R)
910 PRINTAS(R)
920 PRINTC1$(R);" ";C2$(R);" ";C3$(R)
925 PRINT:PRINT
928 C=C+1:IFC=3THENC=0:INPUTZZ$
930 NEXTR
940 PORT=1T05:PRINT:NEXTT
950 INPUT"DEPRESS <ENTER> TO RETURN TO MENU";Z3$
960 CLS:GOTO20
970 C=0:INPUT"ENTER THE ZIP CODE";C3$
975 PRINT
980 INPUT"DO YOU WANT THE LIST ON VIDEO OR PRINTER (V OR P)";QS:IFQS="P"THEN985E
LSEGOTO1000
985 PRINT:INPUT"PRINT INDIVIDUALLY OR COMPLETE LIST (I OR C)";QPS
987 GOSUB1920:GOTO1005
990 PRINT
1000 PORT=1T05:PRINT:NEXTT
1005 FORR=1T0100
1010 IFC3$=C3$(R)THEN1040
1020 IFN1$(R)="***"THEN1095
1030 GOTO1090
1040 IFQS="P"THENIFQPS="C"THENGOSUB1925:GOTO1090ELSELPRINT:GOSUB1925:PRINT:INPUT
"WHEN READY TO PRINT DEPRESS <ENTER>";QS:GOTO1090
1045 PRINT
1050 PRINTN2$(R);" ";N1$(R)
1060 PRINTAS(R)
1070 PRINTC1$(R);" ";C2$(R);" ";C3$(R)
1080 PRINT:PRINT:PRINT
1085 C=C+1:IFC=3THENC=0:INPUTZZ$
1090 NEXTR
1095 PORT=1T05:PRINT:NEXTT
1110 INPUT"DEPRESS <ENTER> TO RETURN TO MENU";Z3$
1120 CLS:GOTO20
1130 C=0:INPUT"WANT LIST WITH OPTION CODE(Y OR N)";Z1$
1135 PRINT
1140 INPUT"WANT LIST WITH PHONE NUMBER (Y OR N)";Z2$
1145 PRINT
1150 INPUT"DO YOU WANT THE LIST ON VIDEO OR PRINTER (V OR P)";QS:IFQS="P"THEN115
5ELSEGOTO1160
1155 PRINT:INPUT"PRINT INDIVIDUALLY OR COMPLETE LIST (I OR C)";QPS
    
```

Listing continued

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TAKE II

Listing continued

```

1157 GOSUB1920:GOTO1190
1160 FORR=1TO5:PRINT:NEXTT
1190 FORR=1TO100
1200 IFN1$(R)="*"THEN1290
1210 IFQ5="P"THENIFQ5="C"THENGOSUB1925:GOTO1280ELSELPRINT:GOSUB1925:PRINT:INPUT
"WHEN READY TO PRINT DEPRESS <ENTER>";Q5:GOTO1280
1220 PRINTN2$(R);";";N1$(R)
1230 PRINTA$(R)
1240 PRINTC1$(R);";";C2$(R);";";C3$(R)
1250 IFZ1$="Y"THENPRINTO$(R)
1260 IFZ2$="Y"THENPRINTPH$(R)
1270 PRINT:PRINT
1275 C=C+1:IPC=3THENC=0:INPUTZZ5
1280 NEXTR
1290 FORR=1TO5:PRINT:NEXTT
1315 INPUT"DEPRESS <ENTER> TO RETURN TO MENU";Z35
1320 CLS:GOTO20
1330 A=0:IFN1$(1)="*"THEN1465ELSEFORE=1TO100:IFN1$(E)="*"THEN1337
1335 A=A+1:NEXTE
1337 PRINT:PRINT"HERE ARE ";A;" NAMES IN THE CURRENT LIST"
1340 PRINT:PRINT:PRINT"NOTE: ENTER '*' AFTER THE LAST DATA ENTRY TO INDICATE -E
OF-"
1350 PRINT
1360 FORR=(A+1)TO100
1370 PRINT:PRINT"R";R
1380 INPUT"ENTER LAST NAME";N1$(R)
1385 PRINT
1390 IFN1$(R)="*"THEN CLS:GOTO20
1400 INPUT"ENTER FIRST NAME AND MIDDLE INITIAL";N2$(R)
1405 PRINT
1410 INPUT"ENTER ADDRESS";A$(R)
1415 PRINT
1420 INPUT"ENTER CITY, STATE, ZIP CODE (C...C, SS, ZZZZZ)";C1$(R),C2$(R),C3$(R)
1425 PRINT
1430 INPUT"ENTER OPTION CODE";O$(R)
1435 PRINT
1440 INPUT"ENTER PHONE NUMBER";PH$(R)
1450 NEXTR
1460 CLS:GOTO20
1465 CLS:PRINT"LIST NOT OPEN";GOTO20
1470 INPUT"ENTER LAST NAME";N1$
1475 PRINT
1480 INPUT"ENTER FIRST NAME AND MIDDLE INITIAL";N2$
1490 FORR=1TO100
1500 IFN1$(R)="*"THEN1530
1510 IF(N1$=N1$(R))AND(LEFT$(N2$,4)=LEFT$(N2$(R),4))THEN1555
1520 NEXTR
1530 CLS:PRINT"SORRY, NAME REQUESTED NOT FOUND IN LIST"
1540 PRINT
1550 GOTO20
1555 Q5="":PRINT:PRINT"NOTE: IF NO CHANGE TO DATA, DEPRESS <ENTER> TO CONTINUE";
PRINT
1558 PRINT"CURRENT LAST NAME= ";N1$(R)
1560 INPUT"ENTER NEW LAST NAME";N1$(R)
1565 PRINT
1568 PRINT"CURRENT FIRST NAME AND MIDDLE INITIAL= ";N2$(R)
1570 INPUT"ENTER NEW FIRST NAME AND MIDDLE INITIAL";N2$(R)
1575 PRINT
1578 PRINT"CURRENT ADDRESS= ";A$(R)
1580 INPUT"ENTER NEW ADDRESS";A$(R)
1595 PRINT
1598 PRINT"CURRENT CITY, STATE, ZIP CODE= ";C1$(R);";";C2$(R);";";C3$(R)
1600 INPUT"ENTER NEW CITY, STATE, ZIP CODE (C...C, SS, ZZZZZ)";C1$(R),C2$(R),C3$
(R)
1615 PRINT
1618 PRINT"CURRENT OPTION CODE= ";O$(R)
1620 INPUT"ENTER NEW OPTION CODE";O$(R)
1635 PRINT
1638 PRINT"CURRENT PHONE NUMBER= ";PH$(R)
1640 INPUT"ENTER NEW PHONE NUMBER";PH$(R)
1655 PRINT
1660 PRINT"CORRECTION COMPLETE"
1670 PRINT
1675 PRINT:INPUT"DEPRESS <ENTER> TO RETURN TO MENU";Z35
1680 CLS:GOTO20
1690 YY=R:INPUT"ENTER NAME OF FILE TO SAVE";NFS
1695 PRINT:PRINTTAB(2)"*** WRITING LIST TO FILE ***"
1710 OPEN"O",1,NFS
1715 PRINT#1,YY
1720 FORR=1TOYY
1730 PRINT#1,R;N1$(R);";";N2$(R);";";A$(R);";";C1$(R);";";C2$(R);";";C3$(R);";";O$(R);";";PH$
(R)
1740 NEXTR
1745 CLOSE
1750 CLS:PRINT"LIST SAVED":GOTO20
1760 INPUT"ENTER NAME OF FILE TO LOAD";NFS
1775 OPEN "I",1,NFS
1780 PRINTTAB(3)"*** LOADING LIST FROM FILE ***"
1785 INPUT#1,YY
1790 FORR=1TOYY
1800 INPUT#1,R;N1$(R),N2$(R),A$(R),C1$(R),C2$(R),C3$(R),O$(R),PH$(R)
1810 NEXTR
1815 N1$(YY+1)="*"
1820 CLS:PRINT:PRINT"LOADING COMPLETE":CLOSE:GOTO20
1830 PRINT
1840 R=0:IFN1$(1)="*"THEN1890
1850 FORE=1TO100
1860 IFN1$(E)="*"THEN1890
1870 R=R+1
1880 NEXTE
1890 PRINT"HERE ARE ";R;" NAMES IN THE LIST"
1900 GOTO20
1920 CLS:INPUT"IF PRINTER READY DEPRESS <ENTER>";Q55:PRINT:INPUT"TOP OF PAGE (Y
OR N)";Q55
1922 IFQ55="Y"THENSYSM"FORMS T"

```

Listing continued

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TAKE II

Listing continued

```

1924 PRINT:INPUT"WHEN READY TO PRINT DEPRESS <ENTER>";Q6$:RETURN
1925 LPRINTNFS;" ITEM NO.,"R
1930 LPRINTN2$(R);" ";N1$(R)
1940 LPRINTA$(R)
1950 LPRINTC1$(R);" ";C2$(R);" ";C3$(R)
1960 IFZ1$="Y"THENLPRINTO$(R)
1970 IFZ2$="Y"THENLPRINTPH$(R)
1980 LPRINT" ":RETURN
1985 PRINTTAB(28)**** CAUTION ****
1987 PRINT:PRINT
1990 INPUT"CURRENT LIST SAVED IN DISK FILE (Y OR N)";Q9$
1995 IF Q9$="Y"THEN 2010
2000 IF Q9$="N"THEN CLS:PRINT"RETURNING TO MENU!";PRINT:PRINT:GOTO20
2010 PRINT:PRINT:PRINT"PROCESSING COMPLETE";PRINT:END
2050 PRINT"SORTING CURRENT FILE"
2052 R=0:FOR=1TO100:IFN1$(E)="*"THEN2058
2054 R=R+1:NEXTE
2058 PRINT:PRINT"HERE ARE ";R;" NAMES IN THE LIST"
2060 FORI=1TOR
2070 B$(I)=N1$(I)+" "+N2$(I)
2080 NEXTI
2090 D=1
2100 D=2*D
2110 IFD<=RTHEN2100
2120 D=INT((D-1)/2)
2130 IFD=0THEN2370
2140 FORI=1TOR-D
2150 FORJ=ITOLSTEP-D
2160 L=J+D
2170 IPB$(J)<=B$(L)THEN2340
2180 X$=N1$(J)
2182 N1$(J)=N1$(L)
2184 N1$(L)=X$
2186 X$=N2$(J)
2188 N2$(J)=N2$(L)
2190 N2$(L)=X$
2200 X$=A$(J)
2202 A$(J)=A$(L)
2204 A$(L)=X$
2206 X$=C1$(J)
2208 C1$(J)=C1$(L)
2210 C1$(L)=X$
2212 X$=C2$(J)
2214 C2$(J)=C2$(L)
2216 C2$(L)=X$
2218 X$=C3$(J)
2220 C3$(J)=C3$(L)
2222 C3$(L)=X$
2224 X$=PH$(J)
2226 PH$(J)=PH$(L)
2228 PH$(L)=X$
2230 X$=O$(J)
2232 O$(J)=O$(L)
2234 O$(L)=X$
2300 X$=B$(J)
2310 B$(J)=B$(L)
2320 B$(L)=X$
2330 NEXTJ
2340 NEXTI
2350 GOTO2120
2370 CLS:PRINT"FILE SORT COMPLETE":GOTO20
2400 SYSTEM"DIR":INPUT"WHEN READY TO RETURN TO MENU, DEPRESS <ENTER>";Q$:CLS:GOT
020
2410 IFERR=53THENCLS:PRINT"FILE REQUESTED NOT ON DISK":RESUME20
2415 IFERR=56THENCLS:PRINT"PRINTER NOT READY (ACTIVE/RIBBON)";RESUME20
2420 IFERR<>56THENCLS:PRINT"UNSPECIFIED ERROR":RESUME20
    
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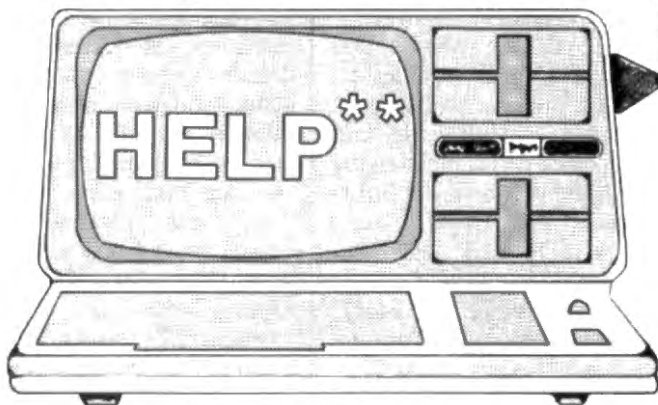
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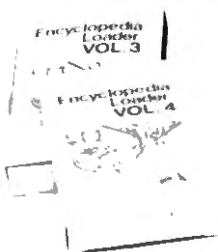
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339B8E

Multi-Color Plotters

The Strobe 200 drum-type plotter features an easy-to-use control panel, an efficient paper-loading system, and a holder that accepts a wide variety of pens for graphics and lettering. It plots areas of up to 8 by 10 inches, with a step size of .002 inches along the X or Y axis.

The plotter costs \$845, including a TRS-80 parallel interface card. An RS-232C serial interface for CP/M microcomputers provides four foreign-language character sets and costs \$195.

★★★★★

Strobe's Model 260 graphics plotter is an automatic six-pen version of the Model 200. It lets you plot graphs and charts using up to six different colors with automatic pen changes. Software options let you preselect colors before using the plot and to generate high-resolution bar charts, pie charts, and line graphs (at 500 steps per inch along both the X and Y axes). Alphanumerics are also included for

labeling charts and creating pages of text.

The Strobe Model 260 costs \$995 and includes an RS-232 interface. The pens are held in a cartridge, and each color pen is individually replaceable. For more information on these two plotters, contact Strobe Inc., 897 Independence Ave., Building 5A, Mountain View, CA 94043, 415-969-5130.

Reader Service ✓551

Watch Out for Falling Planets!

You are space-wrecked on a civilized alien planet that is apparently deserted. You and your robot companion, Floyd, have up to 10 days to solve riddles, stop the planet from plummeting into the sun, and save the planet's plague-stricken population. Nothing too difficult for the seasoned gamer... or is it?

Planetfall, written by Steven Meretzky, is the third in a series of science fiction games from Infocom Inc. The game heightens realism by increasing the interaction between

the player and Floyd, and by allowing players to find food, eat, sleep, get sick, and even dream. Depending on your actions, different moves take different amounts of time, a serious consideration since you are competing against time to win. All game commands are in English, with a vocabulary of over 600 words to draw from.

Planetfall's packaging is different from most other games. Inside a folder-like package you find a Stellar Patrol ID Card, a space diary, futuristic postcards, and other elements that complement the story. Planetfall costs \$49.95, is available for both the Models I and III, and can be purchased from either Infocom Inc. (55 Wheeler St., Cambridge, MA 02138, 617-492-1031) or any major computer store.

Reader Service ✓555

Wild Irish... Disks?

A new flexible disk, produced using a special binding method, that cleans disks as they spin is being made by Irish Magnetic Industries Inc. (270-78 Newton Road, Plainview, NY 11803, 516-293-5582). The 5¼- and 8-inch disks are produced from high-quality, mylar-based, magnetically coated materials with unique surface lubricants that minimize head and disk friction and ensure data integrity.

All disks are individually

jacketed and are packaged 10 to a box. The 5¼-inch, 48-tracks-per-inch disks have a suggested list price of from \$32.90 to \$49.80 for single-to double-sided format, and single to double densities. The 8-inch disk costs range between \$49.80 and \$69.80 for single and double densities.

Reader Service ✓558

Model 4 Upgrade

Now you can convert your 16K cassette Model 4 computer to a 64K or 128K disk-drive system with Micro-Design's new upgrade kit. This kit includes the new MDX-6 disk controller board, drive mounting towers, two disk drives, a power supply, sound board, an RS-232 serial board, and memory. An illustrated user's manual provides instructions on kit installation.

The MDX-6 disk controller board is redesigned to run with the Model 4 at its 4 MHz speed. It controls up to four installed or add-on disk drives. The drives may be either 5¼- or 8-inch capacity, single- or double-sided, or any combination. The MDX-6 also has gold-plated edge connectors to ensure trouble-free operation.

This upgrade kit costs \$399 and is available from Micro-Design, 6301 Manchaca Road, Suite B, Austin, TX 78745, 800-531-5002.

Reader Service ✓573



The Strobe 200 multi-color plotter.

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

Ammicro introduces the first letter quality printer for \$680 that can also be used as a typewriter.



The **MICROWRITER™** Daisy wheel printer.

There was a need for a low cost letter quality machine that would be suitable for use as an office typewriter, and as a computer printer. Ammicro met that need by combining the Microwriter parallel interface and the traditional Olivetti craftsmanship that was available in their Praxis machine.

With the Microwriter you can have the best of both worlds a letter quality printer, and a high quality office typewriter all in one machine, that sells for less than the cost of a good dot matrix printer!

It's not just printer or a typewriter that comes complete with a deluxe carrying case, but a feature-packed, lightweight machine that doubles as an office typewriter. This printer is a simple, low cost, reliable unit which can be utilized with word processing systems, microcomputers, personal computers, and small business systems. The Microwriter's low noise level and slim modern styling allow it to blend with any decor.

The Microwriter's print quality is identical to the finest office typewriters on the market. This machine is not only perfect for letters and manuscripts, but with its 165 character, 12 inch print width, the machine is perfect for letter quality budget spread sheets, price lists, data sheets, and forms.

The Microwriter can tab, rule single lines both vertical and horizontally, underline and print at 10, 12, or 15 characters per inch (switch selectable)! Its ten character memory for automatic error correction, lift off correction ribbon, and fixed or programmable page formats are a few of the many features that make it a perfect office typewriter. Microwriter not only handles letter and legal size sheet paper in widths up to 12 inches wide, but also handles fanfold paper.

There's a wide selection of 21 interchangeable daisy wheels available. And ribbon cassettes that just drop in.

Its operation as a computer printer is simple. Just load it up with paper and you are ready to go. Centronics compatible parallel output cables are currently available from stock for the following computers: IBM PERSONAL COMPUTER™, OSBORNE 1™, ZENITH Z-100™, BURROUGHS B-20™, Convergent Technologies models IWS & AWST™, TRS-80 MODEL I, II, III™, APPLE II™. . . custom cables also available by special order.

This machine creates a new standard by which all current low cost letter quality printers will follow. Ammicro's Microwriter is truly designed for the lifestyles of the 80's and for decades to come.

Why settle for just any printer when you can have a MICROWRITER. . . a fine letter quality typewriter for you and your computer.

The Microwriter is the only daisy wheel printer on the market for \$680. For more information, see your local computer dealer or contact Ammicro directly.

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The ComRiter CR-II, a letter-quality printer, provides personal computer users with word processing features previously available only in more expensive printers. These features include superscript, subscript, backspace, underline, boldface, double-strike, and proportional spacing. It has a 5K buffer that lets you reproduce original and multiple copies of documents stored in memory. The buffer saves up to three pages of data and text.

The printer measures 19½ by 6 by 13 inches, weighs 20 pounds, and has an average print speed of 12 characters per second. The unit features bidirectional printing and logic-seeking. The print wheel comprises the standard 96 ASCII characters, and the ribbon is the standard cassette-type.

Optional features include tractor feed, color ribbons, a cut-sheet feeder, and interchangeable print wheels compatible with the Comrex CR-I

ComRiter daisy-wheel printer. The Centronics parallel version of ComRiter CR-II costs \$629; the RS-232C serial version \$699. It is manufactured by Comrex International Inc., 3701 Skypark Drive, Torrance, CA 90505, 213-373-0280.

Reader Service ✓576

Z80 Applications

With James W. Coffron's new book, *Z80 Applications*, you'll learn the necessary programming and interfacing techniques for connecting the Z80 microprocessor to common microcomputer expansion units. You will also learn how to use the Z80 with ROM, static and dynamic RAM, and how to use basic and advanced I/O techniques, such as interrupts.

This 288-page instructive text contains diagrams and thorough examples that explain everything you need to know to implement useful Z80 applications. It costs \$14.95 plus \$1.50 shipping when ordered from Sybex



The ComRiter CR-II offers letter-quality printing and other word processing features.

DOES STRING COMPRESSION HAVE YOU TIED UP IN KNOTS?

LET TRASHMAN CLEAN UP THE MESS!

THIS PROGRAM IS A MUST FOR EVERYONE WHO USES "BASIC" ON A TRS-80. Why? Because it can reduce BASIC's string compression time delays by 95% or more.



WHAT'S STRING COMPRESSION?

When a BASIC program changes a string (words, names, descriptions), it moves it to a new place in memory, and leaves a hole in the old place. Eventually, all available memory gets used up and BASIC has to push the strings together to free up some space. This takes time. Lots of time. The computer stops running for seconds or minutes, and you may even think it's "crashed".

Yes! String compression is what's been causing all those intolerable delays. The keyboard won't work, and until all the strings have been collected, you just have to sit and wait. Then things run for a while, until string compression is needed again. And again.

If you're using your computer for business, that wastes your money. If you're using it personally, it wastes your time.

WHAT'S THE SOLUTION?

As soon as you start using TRASHMAN, those delays will almost disappear. The program is **very easy to use**, so you don't have to be a computer programmer to take advantage of it. It's written in "machine language" and uses only 578 bytes of memory for itself, plus two bytes for each "string" in your program. It works with other machine language programs and all the major operating systems.

HOW WELL DOES IT WORK?

If you use it with a BASIC program that has only a few strings, very little time is wasted in string compression, and TRASHMAN will be only slightly helpful. But, in programs that use hundreds or thousands of strings, including large string arrays, TRASHMAN is just what you need. If you have any remaining doubts, just look at the chart, and then get yourself a copy as fast as possible.

TRASHMAN is available on disk for just \$39.95.

ATTENTION SOFTWARE PUBLISHERS:

Trashman may be licensed for use with your packages. Call for details.

# STRINGS	SECONDS DELAY NORMAL	SECONDS DELAY TRASHMAN	PERCENT IMPROVEMENT
250	11.8	0.7	94
500	45.8	1.6	96.5
1000	179.6	3.5	98
2000	713.2	7.8	98.9

(All timings done on TRS Model I. Model III 15% faster, but pct improvements identical. Listing of timing program available on request.)

SAVE TIME WITH FASTER



"FASTER" speeds up most TRS-80 BASIC programs by 20-50%. It's helped hundreds of satisfied people and it can help you. Detailed instructions make it easy to use. FASTER analyses your BASIC programs while they run, then displays a simple change, usually one line, that sequences program variables so the ROM will find them faster.

You can use FASTER to speed up programs you've bought, as well as programs of your own. Since it isn't a compiler, your BASIC programs can be read and changed afterwards. FASTER works on business programs, models, and games. The more complex your program, the better the results.

Does FASTER really work? Yes! Just check the reviews in *Personal Computing*, May, 1981, p. 116: "FASTER is effective and easy to use"; *80 U.S. Journal*, April, 1982, p. 106: "I recommend FASTER to everyone"; and *80 MICRO* (April, 1982, p. 40): "If you...would like a significant increase in the run-time speed, then buy FASTER."

FASTER runs on the TRS-80 Models I and III, 16-48K tape or disk, and all major operating systems. **\$29.95**

"QUICK COMPRESS" takes only 276 bytes of memory, and removes the blanks and remarks from even the largest BASIC program in less than 3 seconds. It produces smaller, faster programs without altering their logic. **\$19.95**

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Incorrect or erratic speed is a common cause of unexplained disk errors and loss of data. RPM's documentation explains how to detect and correct these problems quickly and easily. As *80 MICRO* (April, 1982, page 41) said: "If your drives have problems I recommend RPM before paying to get it repaired."

RPM is supplied on diskette for the TRS-80 Models I and III. We suggest you order a copy before you need it.

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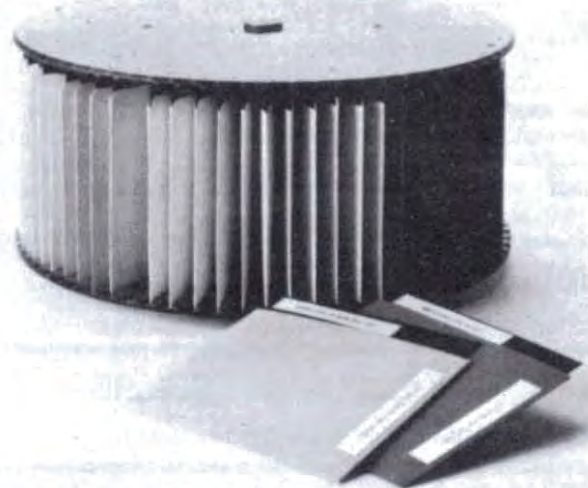
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Inland's Diskette Carousel.

Inc., 2344 Sixth St., Berkeley, CA 94710, 415-848-8233.
Reader Service ✓584

A Good Combination

Applied Creative Technology Inc. (2723 Ave. E East, Suite 717, Arlington, TX 76011, 800-433-5373 or 817-261-6905), makes an adapter, called Type & Print, that connects the Olivetti Praxis 30 and 35 to any Centronics parallel-interface computer.

This unit essentially provides you with a letter-quality printer for under \$500. The Type & Print costs \$179 and requires no soldering or hardware modifications for hook-up. The Olivetti Electronic Typewriter is readily available from most office supply stores at prices comparable to the lowest-priced dot-matrix printers.

Reader Service ✓566

Disk Carousel

Now you can protect and store up to 72 5 1/4-inch floppies in Diskette Carousel, a high-impact, smoked plastic rotating file. Disks are stored in colorful envelopes that brighten the room and help you color-code your disks. The rotary base stores disks

vertically so that the envelopes don't touch the magnetic coating. This minimizes static electricity and provides fast disk access.

The Diskette Carousel is compact. It measures 6 by 13 inches and can be stacked on other carousels. It is sold by Inland for \$29.95 (32051 Howard Ave., Madison Heights, MI 48071, 313-585-2330 or 800-521-8428).

Reader Service ✓564

Programmable Menu

A CP/M version of Custom Software Services' Programmable Menu is now available. Written in machine language, the Programmable Menu reads and displays menu selections created by the operator using any text editor.

Up to nine selections can be created for each menu, with multiple menus supported. Sub-menus return to the master menu by pressing the break key.

Designed to run under Pickles & Trout's implementation of CP/M 2.2 for Models II/12/16, the program costs \$29.95 and is sold by Custom Software Services, P.O. Box 150, Porterville, CA 93258, 209-784-7966.

Reader Service ✓572

Back to School

VisiCalc neophytes can rest at ease. An audio cassette how-to book from FlipTrack Learning Systems "talks" you through the development of a complex VisiCalc model. *How to Use VisiCalc* begins with the basics like setting up a spreadsheet with labels, values, and formulas, and progresses to more advanced concepts, such as replicate, choose, lookup, and net present value functions. The result is an effortless introduction to every VisiCalc command and function.

The course is presented in a friendly, conversational manner on four cassettes, accompanied by a fully indexed lesson summary. By flipping over the tape at key points in each lesson, you can receive additional information on special-interest topics. *How to Use VisiCalc* costs \$65 and is available from FlipTrack Learning Systems, P.O. Box 711, Glen Ellyn, IL 60137, 312-790-1117.

Reader Service ✓569

The CP/M Workshop is a simple-to-use program that shows first-time users of CP/M-based microcomputers how to get started. The program is entirely self-paced and comes complete with diagrams, exercises, reviews, demonstrations, hints, and evaluation sessions. Within a very short time you can begin to run programs, control information on floppy disks, copy files, and print documents using rapid, interactive, and graphics formats.

CP/M Workshop comes complete with a user's manual, and both a working and back-up disk for 8-inch drives. It costs \$115. For more information, contact Datascan Inc., 2716 Ocean Park Blvd., Santa Monica, CA 90405, 213-452-9114.

Reader Service ✓553



How to Use VisiCalc: Starts with the basics.

Save Your Data!

Inmac's Datasaver protects computer systems by taking over the computer's power requirements within 12 milliseconds of a detected brownout or total power failure. It supplies back-up power for two to five minutes at full rated power output, and for 15 to 30 minutes at half rated output load. A front panel LED and a buzzer alert you to the shortage, giving you time to shut down the system before ac power loss occurs.

Datasaver consists of a rechargeable battery with an automatic charger, a solid-state power inverter, an ac line-voltage monitor, and a cut-out switch. It is available for both the Models I and III and costs \$485 from Inmac (2465 Augustine Drive, Santa Clara, CA 95051, 408-727-1970).

Reader Service ✓550

Misosys' Version III

Version III of Misosys' labeling disassembler is now available. It disassembles Z80 object code files directly from disk or from memory. Output is directed to a paged display, a printer listing, or a source-disk file. The line-numbered output file is automatically partitioned into multiple files whose size the user defines.

Version III screens text

TRS-80 COMPUTERS

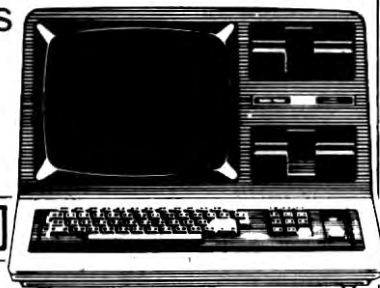
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Bi-Tech's bar code reader for the Model 100.

data to direct the disassembler to output selected address fields as byte, word, or literal data. These output formats are double-byte and double-word statements compatible with the EDAS assembler.

Two Version III packages are available: DSMBLR is supported under TRSDOS and LDOS on the Model I/III, and PRO-DUCE supports LDOS 6.0 and TRSDOS 6.0. Each costs \$40 and is sold by Misosys, P.O. Box 4848, Alexandria, VA 22303, 703-960-2998.

Reader Service ✓577

Wipe Away Your Problems

The Statkleer Cloth is impregnated with a dry chemical treatment that removes CRT static and built-up dust with a single wipe. Because it's made of flannel and uses no liquid cleaner, no streaking, film residue, or scratches affect your CRT screen.

It comes with a secure-seal pouch for storage, and, used daily, retains its chemical potency for up to six months. Each 12-by-12-inch cloth costs \$2.95 from Evans Specialty Co. Inc., 14 East 15th St., P.O. Box 24189, Richmond, VA 23224, 804-232-8946.

Reader Service ✓574

Model 100 Bar Code Readers

The Scanhandler MS190 is a lightweight (15-ounce) laser bar code scanner that is plug-compatible with the Model 100. With 5-volt wand emulator signal levels, the Scanhandler is a cost-effective alternative to wand readers and more expensive scanning systems.

All the optics and electronics required for non-contact scanning are contained in this Class I unit. The laser operates at 150 scans per second, has a near-100 percent first read rate, a 10-inch maximum depth of field, and delivers both audible and visual indications of successful reads.

This is the first laser bar code scanner to include scanning, decoding, and communications capabilities in a single unit. It costs \$1,800 (special OEM discounts available) and is available from Metrologic Instruments Inc., 143 Harding Ave., Bellmawr, NJ 08031, 609-933-0100.

Reader Service ✓559

★★★★★

Bi-Tech Enterprises Inc. (10B Carlough Road, Bohemia, NY 11716, 516-567-8155) now makes a bar code reader for the Model 100. It features a push-to-read switch that minimizes battery use, a

scanning rate up to 76 cm/sec, solid-state reliability, digital output, and a low-friction tip. When held at an angle between zero and 30 degrees, it reads bar code lines as small as 0.3 mm.

The reader is completely self-contained, allowing you to read bar codes in a totally portable environment. Each unit comes with software to read bar code and sample interface routines. It costs \$279.95 and comes with a 90-day warranty on parts and labor.

Reader Service ✓585

Compact Disk Carrier

Diskaddy is an anti-static vinyl disk carrier that stores up to 22 disks (both 5¼- and 8-inch) in accordion-style pockets. Each pocket holds

two disks, comes with two indexes for filing, and has an inner pocket to store disk directories. Adjustable pocket flaps have visible index tabs for disk labels and an elastic closure to secure the unit.

Diskaddy is used to carry valuable disks from place to place, to file disks in an accessible unit where every disk is readily seen, and to store disks in a protective, compact unit.

It is available from Four-dee Products Co. Inc., 9380 Activity Road, Suite J, San Diego, CA 92126, 619-693-1105. Retail prices start at \$5.99.

Reader Service ✓567

Go Ape Over Bananas!

Banana is an 80-column dot-matrix printer from Lead-



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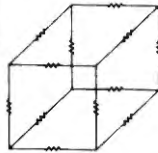
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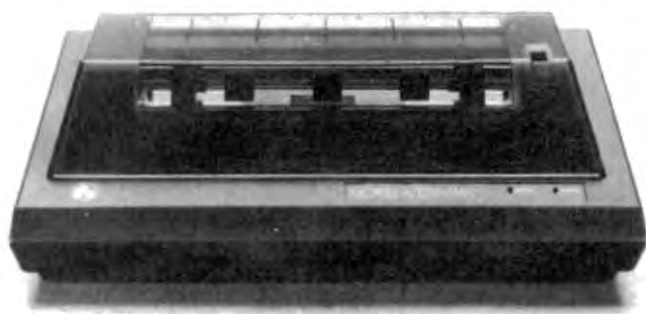
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The Gorilla/Banana dot-matrix printer.

ing Edge's new Gorilla line. It prints alphanumeric or graphics characters on fan-fold forms from 4½ to 10 inches wide, and prints 50 characters per second. The characters are printed in a clear 5-by-7 matrix similar to that of CRT terminals.

Although the Banana has the standard character spacing of 10 characters per inch, you can select double-width characters under software command. The printer also features both a character- and dot-addressable graphics mode, with a density of 63 by 60 dots per inch. Line spacing in the graphics mode is reduced from six to nine lines per inch.

Banana is compact (16 by 5 by 8 inches) and weighs 12 pounds. It has a Centronics-type parallel interface that allows direct hookup to the Models I, II, and III. The Gorilla Banana is available for \$249.95 from Leading Edge Products Inc., 225 Turnpike St., Canton, MA 02021, 800-343-6833.

Reader Service ✓560

A Sex Change

A self-contained, pocket-sized gender changer that re-configures cable-ends whose genders conflict is now available from Inmac (2465 Augustine Drive, Santa Clara, CA 95051, 408-727-1970).

The Gender Changer is an inexpensive alternative to replacing or modifying EIA

232 cables. The unit consists of two EIA 232 25-pin connectors placed back to back. Both male-to-male and female-to-female connectors are available, with all 25 pins connected. Each changer costs \$30 and comes with a one-year guarantee.

Reader Service ✓580

A Clean Hit

Copysource Anti-Stat Clean Kit is a quick and easy system for eliminating static dust on CRT screens for up to two months per treatment. Each kit contains 50 pads impregnated with a non-streak, non-stat cleaning solution and a lint-free buffing cloth.

This compact kit is conveniently affixed to your computer with self-adhesive mounting tape. Single kits cost \$12.95; three kits run \$32.85; 10 kits (a case) cost \$89.50. To order, contact Chope-Stevens Paper Co., Dept. 111, 1800 18th St., Detroit, MI 48216, 313-237-0300.

Reader Service ✓579

Model 16 Spreadsheet

Horizon Spreadsheet is a new and versatile spreadsheet designed for the UNIX operating system. It does, however, operate on any UNIX-like system, including Xenix for the Model 16.

The program offers the largest electronic spreadsheet available, a grid 256 cells

square (VisiCalc offers 64 by 256 cells). Unlike other systems, the Horizon Spreadsheet employs virtual memory for full use of all cells in the system.

It can be integrated to Horizon Word Processing, has a multi-line Help menu, and features powerful built-in functions including date arithmetic, and science and financial calculations. In addition, it permits both consolidation and extraction of multiple and subordinate spreadsheets.

Priced at \$245, the Horizon Spreadsheet is available from Horizon Software Systems Inc., 185 Berry St., Suite 4821, San Francisco, CA 94107, 415-543-1199.

Reader Service ✓552

No More Printer Fights!

Microbuffer In-Line is a printer buffer expandable to 256K. It provides memory buffer for a variety of output devices including serial or parallel printers, modems, typesetting equipment, word processors, plotters, and remote data entry.

Its Copy feature lets you print up to 255 hard copies

without tying up the computer. A touch-sensitive button on the front panel lets you specify the number of copies required. You can pause and continue the copying process as if no interruption had occurred. New data is sent to the buffer at any time during the copy process.

The buffer accepts incoming data from the computer at high speed and transmits it to the output device at the appropriate speed. You can specify nine different data transfer rates, ranging from 75 to 19,200 baud.

The Microbuffer In-Line System requires no software modifications, is available with a serial or parallel interface, and sells for \$299 (32K) and \$349 (64K). Additional memory costs \$179 per 64K. It is manufactured by Practical Peripherals Inc. (31245 La Baya Drive, Westlake Village, CA 91362, 213-991-8200) and comes with a full two-year warranty.

Reader Service ✓588

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NEW PRODUCTS

are available for CP/M, 8-bit computers. FirstDraft costs \$195 and includes a user's manual and a book on computer-assisted writing; DocuMentor costs \$295; purchased together they cost \$395. For further information, contact PromptDoc Inc., 833 West Colorado Ave., Colorado Springs, CO 80905, 303-471-9875.

Reader Service ✓554

Hard Disk

VR Data has added Hard Disk III to its line of Winchester disk drives. The Hard Disk III Subsystem is available as a formatted 5 megabyte fixed and/or removable disk. It comes fully assembled and includes case, power supply, cables, and mounting hardware.

Other configurations available for the disk drive subsystem are 10-, 15-, 20-, and 30-megabyte capacities. Adapters for the Model I and III start at \$150, and the prices for the Hard Disk III start at \$995. Both are available from VR Data, 777 Henderson Blvd., Folcroft, PA 19032, 800-345-8102.

Reader Service ✓561

Power Console

The Model 038 from PMC Industries Inc. (9353 Activity Road, San Diego, CA 92126, 619-695-3520) is a new power

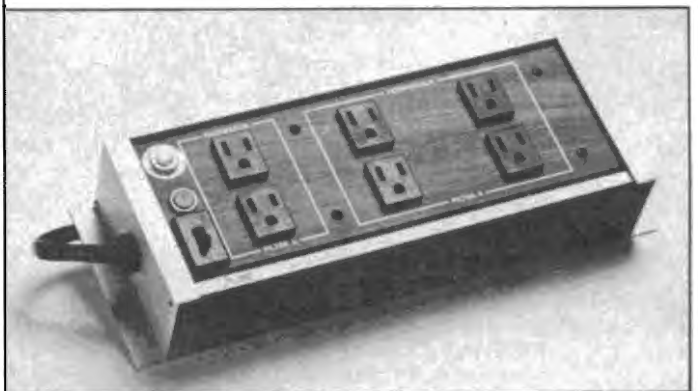
console specifically designed for use with personal and small business computers. It protects computers and data from power line noise, transients, and high-voltage surges. It eliminates RFI/EMI noise up to 55 decibels, and high-voltage and high-energy spikes up to 70 joules.

The unit comes with a 6-foot, three-wire shielded ac line, a 15-amp resettable circuit breaker, a main on/off switch, and a power indicator light. It can be wall, floor, or bench mounted, and comes in an aluminum and steel case that measures 13 by 4½ by 2 5/8 inches and weighs four pounds. All parts are UL listed. The unit is designed for 120-volt, 15-amp use, and costs \$125.

Reader Service ✓565

The Extender

You can now simplify Basic programming on the Models I and III with Solecronics' new software package. The Extender is a machine-language patch into the Basic interpreter that lets you use labels instead of line numbers to identify a line of the program in GOTO, GOSUB, ON...GOTO, ON...GOSUB, ON ERROR GOTO, or IF...THEN, and lets you use the first 40 characters of a variable name instead of only the first two characters.



Power Console for processors and peripherals.

This applies to simple variable names, array names, and function names of all types.

All currently running Basic programs and all Basic commands may be used with The Extender without modification. The program loads into the top 1000 bytes of memory and costs \$29.95 for both the Model I and III versions. To order, contact Solelectronics, 400 Ashbury Ave., Evanston, IL 60202, 312-866-8737.

Reader Service ✓575

Let's Get Digital

Datalock is a high-quality digital tape assembled in a premium cassette shell with an oversized pad to ensure accurate alignment. Its specifications are superior to audio tape for digital recording: less distortion, cleaner high-end response, higher output ratio, and longer wear.

Datalock costs \$3.75 for a single cassette, \$5.95 for a two-pack, and \$29.95 for a 12-pack in a smoke-plastic case. For further information, contact National Distribution Center, 117 West 23rd St., Independence, MO 64055, 816-254-0400.

Reader Service ✓583

Helpful Wallcharts

Ever forget a VisiCalc or SuperScripts command and were too lazy or busy to look it up? Crest Software (2132 Crestview Drive, Durango, CO 81301, 303-247-9518) has

found the answer: wallcharts of the systems' commands. Each 18-by-25-inch two-color chart graphically depicts all commands in large, readable type.

In addition to the commands, the chart depicts the keystroke combinations and provides explanations. In smaller print are the remaining operations and math functions. The result is a one-stop, all-inclusive reference center for anyone's use.

Both the VisiCalc and SuperScripts charts cost \$4 each plus \$2 for handling and shipping. The SuperScripts chart is designed for the Model III; the VisiCalc chart is for universal computer application.

Reader Service ✓582

Model I/III Goes Color!

Computer Shack has done the impossible! You can finally copy and use your Color Computer disks on any Model I or III. CIII (pronounced C-three) lets you copy programs and data files from machine to machine without conversions or re-typing.

It acts much like a variable file utility: insert CIII and the Color Disk of your choice into the disk drives and select the files you want to transfer. You'll be able to copy from a Model I/III to or from your Color Computer disk in a

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Datalock digital cassettes.

matter of seconds.

CIII is available from major computer stores or directly from Computer Shack (1691 Eason, Pontiac, MI 48054, 313-673-8700) for \$24.95.

Reader Service ✓581

Disk Back-up

Beta-DTS lets Models I and III users back up one megabyte of disk images on a standard 60-minute cassette tape. Retrieval of a disk from cassette is automatic and includes formatting.

Beta-DTS requires a cassette recorder with cable, one disk drive, and 32K of memory. It comes complete with a self-boot operating system disk, a user's manual, and necessary hardware to do the job.

Available from Beta Enterprises Inc. (14049 Settlement Acres Drive, Cleveland, OH 44142, 216-362-6191), Beta-DTS costs \$149.95 plus \$5 for handling and shipping.

Reader Service ✓570

Printer Utility

The Printer Utility Package from MicroSmith Computer Technology (P.O. Box 1473, Elkhart, IN 46515) consists of eight programs to enhance your Model I's and

III's printing capabilities with the Epson MX-80. There are programs that allow direct printer initialization for bold, compress, and italic modes; print block, enlarged, normal, and small characters on lines left/right justified or centered; generate banners printed at 90 degrees to the normal lettering and run down the length of the paper; and print multiple copies of the same label on single- and double-wide label stock.

All these programs are supplied as Basic source files, and are written with special attention to the Epson MX-80 command codes. The package is available for either a 48K CP/M 2.0 system on a standard 8-inch single-sided, single-density disk or for the Models I and III with 48K. The price for either is \$35.

Reader Service ✓562

Bar Code Fever

The Bar Code Reader (Model BCR 232) from Digitronics is a compact handheld unit that reads, verifies, and transmits bar codes into a computer via the RS-232 port.

The unit has a ruby wand for scanning a bar code, and a microprocessor-based unit for translating the bar code

into digital data, verifying the code's readability, and then transmitting the data to a computer.

It costs \$595 and is manufactured by Digitronics, a division of Comtec Information Systems Inc. (53 John St., Cumberland, RI 02864, 401-724-8500).

Reader Service ✓557

Network Analysis

AC Network Analysis Program (ACNAP) analyzes electronic circuits with up to 70 components. It is optimized for speed and is capable of analyzing a five-node, 10-component circuit in less than one second. ACNAP works with component tolerances to provide worst case, Monte Carlo, and Sensitivity analysis.

Both linear and logarithmic frequency increments can be specified for all operations. Automatic noise equivalent bandwidth calculations are provided, as is the generation of a Spectral Data file.

ACNAP is menu-driven and allows simple entry and editing of circuits by component name. Models I and III versions cost \$39.95 and are available from BV Engineering, P.O. Box 3351, Riverside, CA 92519, 714-781-0252.

Reader Service ✓556

Blown Away

70 PSI is an aerosol dust and lint remover that removes microscopic dust from instruments, magnetic tape heads, and computer disks and drives. As the name implies, it delivers 70 pounds of pressurized, non-toxic inert gas triple-filtered for maximum purity. The gas leaves no residue and is moisture-free.

Each 14-ounce container has a three-way adjustable valve for precise spray control and an extension tube for

difficult-to-reach areas.

The product is available from Chemtronics Inc. (681 Old Willets Path, Hauppauge, NY 11788, 800-645-5244 or 516-582-3322) and costs \$3.75.

Reader Service ✓571

Printer Switch

The new Centronics-compatible Printer Switch from Intra Computer routes hard copy to a letter-quality daisy-wheel or high-speed dot-matrix printer. It measures 3¼ by 6 by 6¼ inches, and is both code and speed transparent.

The Printer Sharing Switch, also Centronics-compatible, lets two computers share one printer. The interface cable from a single parallel port of each computer is plugged into a connector on the Printer Sharing Switch. A built-in 6-foot cable is attached to the printer.

Both products cost \$165, come with a one-year warranty, and are available from Intra Computer, 101 West 31 St., New York, NY 10001, 212-947-5533.

Reader Service ✓563

Model 100 Software

Typing Teacher, originally compatible with the Models I and III, is now available from Instant Software Inc. (Route 101 and Elm St., Peterborough, NH 03458, 603-924-9471) for the Model 100.

The program comprises a seven-part package that familiarizes you with key location, goes through words and phrases, and ends with complete mastery of the board. Screen diagrams show correct finger placement and related proper techniques.

Completely documented and fully guaranteed, Typing Teacher costs \$17.95 and requires 8K of memory.

Reader Service ✓578



Bar Code Reader for the RS-232 Port

If you guessed that a Practical Peripherals Microbuffer™ printer buffer saves time, you're right. For the way it works, this inexpensive product is the most practical addition to your microcomputer system ever.

With Microbuffer, you don't have to wait for your printer to finish before you resume using your computer. Data is received and stored at fast speeds, then released from Microbuffer's memory to your printer. This is called buffering. The more you print, the more productive it makes your workflow.

Depending on the version of Microbuffer, these buffering capacities range from a useful 8K of random access memory — big enough for 8,000 characters of storage — up to a very large 256K — enough for 256,000 characters of storage.

Practical Peripherals makes stand-alone Microbuffers for any computer and printer combi-

nation, including add-on units especially for Apple II computer and/or Epson printers. Each has different features like graphics dumps and text formatting besides its buffering capabilities. You can choose one that's just right for your system.

Best of all, they're built to last and work exactly like they're supposed to.

If you're still guessing whether you can afford to have one, talk with any computer dealer. That's the best way to find out how practical a Practical Peripherals Microbuffer is.

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✓ 11

GUESS WHO HAS MICROBUFFER.™



That's what you get with the LNW80 Model 2—undoubtedly the most versatile, powerful and fully equipped microcomputer in its class today. A machine so superior in concept and design, that it will define the standards of microcomputer performance for years to come.

VERSATILITY

The LNW80 2 performs wonders with the most complete library of software available to any microcomputer on the market today. Every LNW80 2 comes complete with this outstanding library of Business Software. **LNW SMALL BUSINESS AND PROFESSIONAL ACCOUNTING SERIES™** General Ledger, Accounts Receivable, Accounts Payable, Payroll; **ELECTRIC SPREADSHEET™**; **ELECTRIC PENCIL™** **WORDPROCESSOR**; **MICROTERM™** **MODEM PROGRAM**; **CHART EX™** **HIGH RESOLUTION BUSINESS GRAPHICS CHARTING PROGRAM**; **CP/M 2.2™**; **DOSPLUS™**; **LNW-BASIC™**; **MICROSOFT BASIC™**. In addition to a comprehensive line of LNW80 2 Software, it is also fully compatible with software from TRS80® (Models 1, 3, 4), CP/M® and Cromemco® worlds—a capability which gives you access to the most extensive and mature libraries of business, scientific, engineering and entertainment software applications. So no matter how far you expand into user applications, the LNW80 2 will expand right along with you.

POWER

The LNW80 2 performs miracles with the computing power of 96K RAM (standard) of user memory matched with a mass storage capability which handles 5¼" floppy disks and 5¼" hard disk drives. And while the unit comes with built-in

controllers for 5¼" and 8" floppy disks (single/double sided, single/double density, up to 4.5 Megabytes capacity), the LNW80 2 also gives you the unique ability to read and write diskettes from a greater variety of other popular computers than does any other microcomputer. So regardless of how big you grow, you will never end up with thumb-twiddling down time while you expand to a more powerful system. The LNW80 2 will always have enough muscle to handle your biggest and toughest jobs.

FULLY EQUIPPED

The LNW80 2 was developed to anticipate the needs of both expansion and compatibility. So the computer was designed with enough built-in features to keep you from having to spend a small fortune as you move down the road to higher levels of user sophistication. Standard features include high and low resolution graphics in both color and black-and-white, an asynchronous serial communication channel, and a wide variety of tape, printer, monitor and hardware expansion ports. In addition, the LNW80 2 contains an array of quality construction features that fully justify its remarkable one-year limited warranty.

So if you're looking for a microcomputer that will satisfy your performance needs as you grow and develop, take a long, hard look at the LNW80 2. It's the one microcomputer built to meet the challenges of tomorrow—for a long time to come. For more information and the name of the dealer nearest you, write or telephone:

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