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A WAYNE GREEN PUBLICATION

the magazine for TRS-80 users*

How You Can Join The Network Nation

Assembling The Complete Data System

80micro

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80 Contents

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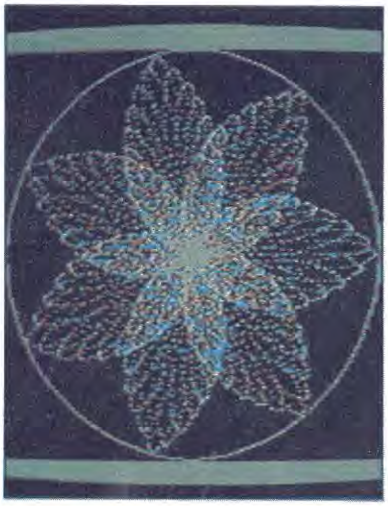

DEPARTMENTS

***on Load 80 tape**

80 REMARKS

by Wayne Green

"The Model 16 looks as if it is going to be a good system."

The Model 16. . . A Debacle

The coming "dump" of the Model II at $3,000 may unsettle Shackies a bit. It certainly will hammer home the idea that the Shack is going to make the Model 16 stick, whether you like it or not.

It's my understanding that the initial bugs in the 16 have been repaired and that production is proceeding. The 16 will run the MII. But for MII owners, the future appears to be more ominous. . . and perhaps even the lower price for the system during bargain month is not enough.

Think about it. With the MII out of business, even the tiny amount of support that system got from the Shack seems destined to shrivel up. Thus, MII owners are faced with owning an orphan. The small base of systems that have been sold is not large enough to encourage software and accessory firms to go out of their way to support it. The Shack isn't known for openness with its sales figures, so it's anyone's guess as to MII sales. I'd estimate maybe 50,000 systems sold to date.

The MII would have done a lot better if the Shack hadn't had to turn most of their efforts toward keeping the Model III afloat. With the Federal Communications Commission putting the Model I out of business, they *had* to get the Model III running and supported. This seems to have put such a strain on the Shack that they were unable to do much for any other of their products, such as the Pocket Computer and Color Computer (Coco).

Now I'm told that the M16 will have a little software support for the 16-bit function for perhaps a year. It'll run the MII stuff, and there will be a Cobol compiler and an assembler, but Basic is still not even in sight. That's a kick in the head. The Model II was supposed to be designed for business applications. Most of the software written for it is for business. Writers of vertical programs have often chosen the MII since it does support 8-inch disks, which are needed for even a small business. But this brings up some serious problems, now that the M16 is in view.

A good accounting package that sells for $1,500 to $2,000 and runs on the MII will usually sell a computer and the software at the same time. Few businesses are sitting around with a MII on a desk waiting for software to be written, so it's natural to expect to sell both the computer and the software at the same time: a turnkey system.

But with the prospects of a much faster computer system once system and applications software for the M16 is available, I wonder how many firms will go for a M16 with MII software. . . even though it runs well? And without Basic and other needed systems software for the M16, will we see much activity from outside support firms for the M16? The Shack may be able to pull this one off, but I think they are going to have to invest a lot of time and money to do it.

Of course this slowness on the part of Shack with the M16 support may be another golden opportunity for entrepreneurs. With the help of this magazine to reach the customers, we may see another multi-million dollar support industry building up around the M16. . . with none of the products being sold by Shack, as usual.

The M16 looks as if it is going to be a good system. The price is not out of line with the MII when you consider that the M16 comes with more memory, double-density disks and so on. The price is positively cheap for businesses when you consider what a workhorse it may become.

One hopes that Shack has done a bit more engineering on this latest entry. The failure record for the MII has been sad with service a major problem. Indeed, any business should consider buying two systems when they computerize so that they will be reasonably sure that one will always be on hand and working. Repairs that go on into weeks can bring a business to a halt fast if a spare system isn't available.

One possibility comes to mind. With the uncertainty over the M16, will we see a shift toward MIII sales and the use of hard disk systems for them? The hard disk certainly overcomes the drawbacks of the smaller floppy disks, though we're still hung up waiting for the invention of an inexpensive back-up system.

Smaller businesses seldom have the need for the extra speed of the M16. And there is no good reason to throw away the program base of thousands of programs written for the MI and MIII systems. Remember that one of the main problems with the MII was its incompatibility with MI and MIII software. One wonders what went through the corporate minds at Shack when they decided not to make the MII upward compatible. Will a Model II pull a big price 10 years from now as a museum piece? It may turn into a totally forgotten computer. . . sort of like a DC-2 airplane. ■

Asian Tour

Every fall there is a tour of Asia that is designed to coincide with a series of electronics shows in Tokyo, Seoul, Taipei and Hong Kong. These shows focus on consumer electronics, so they have a good deal of microcomputer exhibits.

Hundreds upon hundreds of Asian firms—small ones—would like to import American products. . . or would like to make assemblies for our products. . . or sell their equipment to use. These firms have few other ways to make contact with smaller American firms than through shows such as these. They are looking for you.

I've been on two of these tours already and found each one invaluable in making contacts. They were also a lot of fun. I enjoy eating Japanese, Chinese, and even Chinese Chinese. You do get a lot of fantastic food on these trips. You also stay in the best hotels.

With the American dollar improving, there are some travel bargains to be had. The whole trip to Asia for about three weeks costs only around $2,500. This year one part of the group will be going on to a visit to Peking and then around the world to an electronics show in Munich. . . cost is only around $3,500.

Sherry and I missed the 1981 tour because we were getting *Desktop Computing* started and couldn't get away at the critical time. We made the 1979 and 1980 tours and are planning on the 1982 tour.

Continues on page 8

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Hello; I'm Joe's modem.

Before I came along, Joe's TRS-80 was a boring machine. He would sit for long hours entering programs from *80 Micro*, and what did he have in the end? Another way to balance his checkbook or perhaps a patch for Scripsit. That is not the type of stuff that gets MY transistors hot.

Oh, I suppose those programs have a purpose, and Joe is happy with them. But Joe didn't know what he was missing until his buddies in the computer club told him about me.

"Get a modem, Joe. It will add a new dimension to personal computing," they said. Joe was skeptical at first, but when he saw how inexpensive I was, he decided to check me out.

I've served Joe well since then, and he will be the first to tell you that. I give Joe access to information he might otherwise never be able to get. The other night he was "talking" to some fellow computerists on CompuServe (using me, of course), and one of them had the answer to a tough interfacing problem Joe had. He also learned of a great buy on a used printer when he accessed the local bulletin board last week.

Joe is an up-and-coming businessman as well; so he appreciates the stock reports and business news, often updated by the hour, that I allow him to see. Sure, he pays for this information, but it's a worthwhile investment.

I also provide computing power Joe thought was beyond his reach. Through some commercial data bases, Joe can write programs larger than his TRS-80 allows and often in something other than Basic or machine language. He downloads programs from bulletin boards, some of which have saved him from buying commercial software. He has also up-loaded some of his own programming creations in the spirit of hobbyist cooperation.

Yep, I think I've done Joe a lot of good. He sleeps better at night and he has more friends. I've brought Joe closer to his computer than ever before. He still insists on typing in those long programs, though. Maybe someday *80 Micro* will put those long listings on a bulletin board where I can help Joe with this problem, too.■

Continued from page 6

We'd love to have you along too. The tour starts about the end of October and goes about two weeks for Asia———and three if you go to China, Munich, and London. Or you can come back however you like.

In 1979 we went back and spent several days in Tokyo, meeting more of the people wanting to do business with us. The next year we went on to Hawaii, where I gave talks to local groups, and we lazed about the Waikiki Beach for an hour or two. On the last trip we also made side trips to Macao and up to Canton, China. I guarantee you this: you will *never* forget one minute of a trip to China. Not a minute.

Are there Big Macs in Hong Kong as good as at home? You'll never know until you've been there and had 'em.

The electronics shows are scheduled so that you have a couple days to see them, a day of travel, two more days of show, another day to travel, and so on. That allows you to visit four electronic shows in four countries in two weeks. Not bad.

For details—and you'd better get started with this now if you are going to have your visas all set in time (China can take a long time)—drop a note to Sherry, Commerce Tours, Wayne Green, Inc., Peterborough, NH 03458.■

The left bracket, [, replaces the up arrow used by Radio Shack to indicate exponentiation on our printouts. When entering programs published in *80 Micro*, you should make this change.

80 formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

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

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80 INPUT

"We here at 80 Micro *have no sentiments against Tandy."*

Missing Address

We were very pleased to hear that *80 Micro* published an article by one of our users on our M-80 microcomputer ("Building an M-80," March 1982). A customer subsequently called us and beat us mercilessly about the head and shoulders because the article failed to mention either our address or our distributor's address: Quest Electronics, 2322 Walsh Ave., Santa Clara, CA 95051.

Eric M. Miller, President
Miller Technology
647 N. Santa Cruz Ave.
Los Gatos, CA 95030

Tandy Defender

I am opposed to your sentiments against Tandy Corporation that have appeared in recent issues of *80 Micro*. Remember, if they weren't around, you wouldn't be either.

Philip Herbst
Staten Island Labs
Staten Island, NY

We here at 80 Micro *have no sentiments against Tandy. Indeed, you will not find anywhere a group more dedicated to the permanent success of the TRS-80.*

We are in the information business. Our job is to keep our readers informed. They feel that the best thing that has happened to their TRS-80 has been 80 Micro.

Wayne Green Inc. has been around years longer than Tandy and will continue to survive no matter what course Tandy takes with their TRS-80.—Matthew Smith, Assistant to the President

Right Decision

Just as I was wondering if I had subscribed to the right magazine two things happened. You finally said a good word about Radio Shack. Your magazine devoted a large number of pages to the Color Computer. Thank you.

I have had my Color Computer since January 1981 and I have enjoyed it very much. I have converted many Model I and III programs to fit the Color Computer. This has helped me to learn programming.

I enjoy *80 Micro*, most of all Dennis Kitsz's articles.

B.L. Mott
Bristow, OK

Archbold Speed-up Kit

In his Exclusive Oracle column (*80 Micro*, February 1982) Mr. Kitsz gave advice about the speed-up kit by Archbold Electronics. The information he gave was misleading. On page 42, he provides four points that you should consider before buying the mod. Each needs some clarification.

First, switching between speeds is an option provided by the kit under program or manual control. By asking "How?" Mr. Kitsz implies that the user has to design the option himself.

Second, true, the XRX-II mod will restrict the cassette baud rate to 500. However, the clock mod provides an option (take it or leave it) to automatically slow down the CPU during tape operation. Without XRX-II, the baud rate could be doubled or tripled depending on clock speed selected. But is being forced to use 500 baud cassette I/O a good reason not to increase the speed of everything else?

Third, using disks with the mod is no problem. You can wire the clock to slow back down while disks are in use. But patching TRSDOS or NEWDOS for high speed (normal is unaffected) is very easy (see *80 Micro*, April 1981, p. 240). (Or send an SASE to me for even better patches. TRSDOS only.) You'll find a surprising increase in disk speeds, especially from Basic.

Fourth, RAM access time is not as critical as Mr. Kitsz indicates. He says you must "install a completely new memory refresh/select circuit." This is totally incorrect! You actually bypass some existing circuits to speed access. At triple speed the instructions suggest having RAMs with, at most, 200 ns. access time. But I have some with 250 ns. and have had no problems.

The nebulous reference to a "digital delay line" as a new select circuit sounds very costly and complicated. It is nothing more than a 74LS04 inverter with all six gates wired in series to produce a slight delay. It sells for less than $1 and goes in the interface (if you have one).

The current mod from Archbold is an upgraded version (see *80 Micro*, July 1981, p. 236 for a review of the original). Perhaps this is the cause of the confusion. This clock mod is reliable, does not entail many expensive extras (only $19, Z80B for triple speed), and is worth serious consideration.

Michael Cashwell
7603 Comanche Drive
Richmond, VA 23225

Dennis Kitsz Replies

I had to turn back to that February article, because I didn't remember maligning the Archbold board at all. Sure enough, I didn't.

I was talking about homebrew *installations, although the passing mention of the Archbold unit in the same phrase might have confused Mr. Cashwell. The Archbold unit is well designed and has all the options Mr. Cashwell mentions. The digital delay unit, however, is not just a bunch of gates tied together, but rather an actual commercial DDU costing $18. The gate version sometimes works and sometimes doesn't (mostly does, but therein lies the homebrew problem). I reiterate: If you are speeding up, the Archbold speed-up is the best thing to consider.*

Dennis Kitsz
Roxbury, VT

Model III Banner

Nelson Ford's change for the prompt and banner in NEWDOS80 2.0 (*80 Input*, November 1981) is fine for those still on

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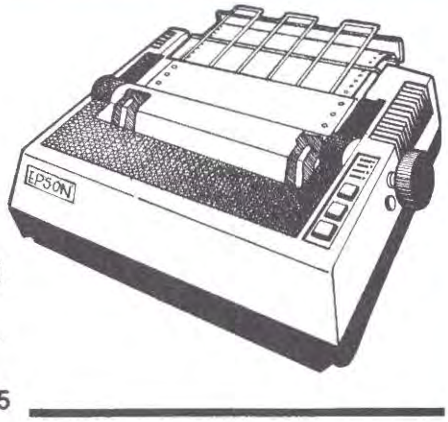

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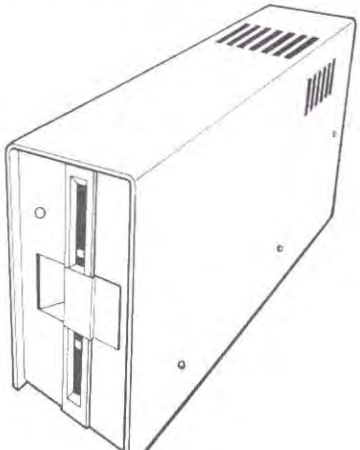

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the Model I but the locations for the Model III are different.

The Ready prompt is located at relative sector 164, relative byte EO-EE inclusive. The "Mini" prefix for Mini-DOS is in front of this at DB-DF inclusive, should you also wish to change it.

The first line of the banner is at relative sector 17, 88-98 inclusive and then 9C-C5 inclusive; the second line at relative sector 17, C8-FF inclusive and then relative sector 18, 00-01 inclusive; finally, the third line is at relative sector 18, 03-3B inclusive.

On another subject, does anyone have a patch to make TRSDOS 2.3B and 1.3 (Models I and III) run 80-track drives?

Allan F. Hawkins
P.O. Box 38-542
Howick, New Zealand

Invalid Complaint

I just read Dick McKenna's request ("Access Time," *80 Aid,* February 1982) for a patch to cause his foreign disk controller board to properly operate his Radio Shack TRS-80 Model III computer.

He says everything works but TRSDOS. I disagree with that and say that everything works but the non-Radio Shack controller and drives. McKenna then complains that Radio Shack's customer service (free computer hotline) wouldn't or couldn't tell him how to correct the incompatibility of his drives with the Model III. Funny, he didn't even mention calling the people who manufactured his drives and controller board for help. Did he call them for help; if not, why? If so, why didn't they provide the help?

If you are going to buy non-Radio Shack peripherals do not expect Radio Shack to correct the incompatibilities or defects in another manufacturer's hardware or software.

Leigh L. Klotz
McComb, MS

Bravo!

Three colorful cheers for your March issue on the Color Computer. Those graphic programs are super! I find this machine better than my Apple to teach programming. It's time to give this inexpensive but powerful machine some credit!

Marmo Soemarmo
Ohio University
Athens, OH

Faster Basic Word Processor

I have developed a compiled version of Delmer D. Hinrichs' Basic Word Processor (*80 Micro,* May 1980). I used the Accel 2 Compiler.

To use the compiler I had to modify the For. . . Next loops so that their indices are set to the final value if a test within the loop requires a jump out of the loop. Often I had to rewrite the test to use the complement condition to obtain valid results. With these changes the program compiles using Accel 2. The program takes about 1 min 45 sec to compile and the resultant code is slightly more than double the original value. Although it requires a machine with 32K of memory, it does not require use of a disk.

The compiled version of the Basic Word Processor speeds up typing in words and the blanking and compile commands.

Ronald H. Chapman
Wheaton, IL

Don't Forget an SASE

At the end of my article "Two-Way ANOVA" (*80 Micro,* March 1982) I included the offer of all my statistics programs to anyone who would send a disk and an SASE.

I was surprised at the high response and I appreciate the interesting letters. I filled each request almost immediately, even though I received requests at about five per day for a month after the article was published.

Some readers neglected to send the SASE and as a result I have a collection of extra disks waiting for use. Obviously, I cannot pay postage for the items. If you did not send the SASE you will not get the programs or the disk back until you do. Please send the self-addressed, stamped envelope—or appropriate postage—and I will return your disks with the programs you requested.

Thanks to all of you for your interest and your comments.

Richard C. McGarvey
221 Hirschfield Drive
Williamsville, NY 14221

Tasmon Update

Thank you for your kind review of our Tasmon program (*80 Microcomputing,* January 1982). Here are some additions to Rowland Archer's review which will be of interest to many of your readers:

Current versions of Tasmon are 1.12 for the Model I and D.5 for the Model III. If anyone has an earlier version, please notify us and we will ship out a new tape ASAP.

All commands are implemented in the above versions of Tasmon, including all disk I/O.

If purchasers of the Tasmon source code wish a copy of the source code on disk, they may include a disk with their order. The source code is available only from the author. Please specify whether you wish Model I or III.

Mr. Archer wishes more information on how to interface user routines with Tasmon. Bruce Hansen (author of Tasmon) has provided me with the routine which further documents this process (see Program Listing 1). Hopefully this will encourage more users to experiment with the (U)ser command.

In addition, I would like to encourage purchasers to return their registration. We have already mailed a list of important addresses within Tasmon to registered

Program Listing 1

```
                 ;
                 ;        TASMON USER PATCH - DISK DIRECTORY
                 ;
                 ;        by Bruce G. Hansen  -  01/25/82  09:55:00
                 ;
                 ;
5F00                      ORG     5F00H
5F00 CD5C69        USER   CALL    WL              ;DISPLAY THE "U" AND A SPACE
5F03 CDE360        USE10  CALL    KYINP           ;GET A KEY
5F06 FE30                 CP      '0'             ;LEGAL DRIVE # ?
5F08 38F9                 JR      C,USE10         ;GET ANOTHER IF NOT
5F0A FE34                 CP      '4'
5F0C 30F5                 JR      NC,USE10        ;GET ANOTHER IF NOT
5F0E D630                 SUB     '0'             ;MAKE IT BINARY
5F10 328A5F               LD      (DCB+6),A       ;SAVE DRIVE #
5F13 CDAB69               CALL    CLS             ;CLEAR SCREEN
5F16 AF                   XOR     A
5F17 325B7E               LD      (WRKSTR),A
5F1A DD215B7E             LD      IX,WRKSTR
5F1E 0608                 LD      B,8             ;NUMBER OF DIRECTORY SECTORS
                 ;        SHOULD BE 16 FOR MODEL III TRSDOS 1.3.
```

Program Listing 1 Continues

Reader Service for facing Page ✓13→

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Program Listing 1 continued

```
5F20 210200     00310         LD      HL,0002H
5F23 228E5F     00320         LD      (DCB+0AH),HL     ;SET FIRST SECTOR TO TWO
5F26 0E08       00330 USE20   LD      C,8              ;NUMBER OF ENTRIES PER SECTOR.
                00340 ;       SHOULD BE 5 FOR MODEL III TRSDOS.
5F28 11845F     00350 USE30   LD      DE,DCB
5F2B CD3644     00360         CALL    4436H            ;READ A SECTOR
5F2E FE06       00370         CP      6                ;ZERO FOR MOD III TRSDOS
5F30 2042       00380         JR      NZ,ERROR         ;JUMP ON ERROR
5F32 217B7E     00390         LD      HL,FLBUF
5F35 7E         00400 USE40   LD      A,(HL)
5F36 B7         00410         OR      A
5F37 282F       00420         JR      Z,USE60
5F39 FE18       00430         CP      18H              ;7FH FOR ALL FILES -
                00435 ;       INVISIBLE AND SYSTEM
5F3B 302B       00440         JR      NC,USE60
5F3D 110500     00450         LD      DE,5
5F40 19         00460         ADD     HL,DE
5F41 160B       00470         LD      D,11             ;DO 11 CHARACTERS
5F43 7E         00480 USE50   LD      A,(HL)           ;GET A FILE NAME CHARACTER
5F44 CDBA79     00490         CALL    WR               ;DISPLAY IT
5F47 23         00500         INC     HL
5F48 15         00510         DEC     D
5F49 20F8       00520         JR      NZ,USE50         ;GO DO ANOTHER
5F4B DD3400     00530         INC     (IX+0)           ;INCREMENT COLUMN COUNT
5F4E DD7E00     00540         LD      A,(IX+0)         ;GET COLUMN COUNT
5F51 1F         00550         RRA                      ;CARRIAGE RETURN OR TAB?
5F52 300A       00560         JR      NC,USE55
5F54 3E20       00570         LD      A,20H            ;WRITE SOME SPACES
5F56 CD5C69     00580         CALL    WL
5F59 CD5C69     00590         CALL    WL
5F5C 1805       00600         JR      USE57
5F5E 3E0D       00610 USE55   LD      A,0DH            ;WRITE A CARRIAGE RETURN
5F60 CDBA79     00620         CALL    WR
5F63 111000     00630 USE57   LD      DE,10H           ;SKIP REST OF DIRECTORY STUFF.
                00640 ;       SHOULD BE 20H FOR MODEL III TRSDOS
5F66 1803       00650         JR      USE70
5F68 112000     00660 USE60   LD      DE,20H           ;SKIP REST OF DIRECTORY STUFF.
                00670 ;       SHOULD BE 30H FOR MODEL III TRSDOS
5F6B 19         00680 USE70   ADD     HL,DE
5F6C 0D         00690         DEC     C
5F6D 20C6       00700         JR      NZ,USE40         ;GO DO ANOTHER ON THIS SECTOR
5F6F 10B5       00710         DJNZ    USE20            ;DO ANOTHER SECTOR
5F71 C3EE60     00720         JP      BREAK            ;GO BACK TO TASMON
5F74 217D5F     00730 ERROR   LD      HL,BDMSG         ;POINT TO ERROR MESSAGE
5F77 CDC96F     00740         CALL    WRITE            ;DISPLAY IT
5F7A C3EE60     00750         JP      BREAK            ;RETURN TO TASMON
5F7D 0A         00760 BDMSG   DEFB    0AH
5F7E 45         00770         DEFM    'ERROR'
5F83 0D         00780         DEFB    0DH
                00790 ;
                00800 ;
                00810 ;       THE FOLLOWING IS A "FAKE" FILE CONTROL BLOCK USED TO
                00820 ;       READ SECTORS.  IN THIS CASE, DIRECTORY SECTORS ARE
                00830 ;       TO BE READ.
                00840 ;
5F84 8028       00850 DCB     DEFW    2880H            ;2080H FOR MOD III TRSDOS
5F86 20         00860         DEFB    20H              ;00 FOR MOD III TRSDOS
5F87 7B7E       00870         DEFW    FLBUF
5F89 0000       00880         DEFW    0
5F8B A1         00890         DEFB    0A1H             ;15H FOR MOD III TRSDOS
5F8C FF00       00900         DEFW    00FFH
5F8E 0000       00910         DEFW    0
5F90 FF00       00920         DEFW    00FFH
5F92 110F       00930         DEFW    0F11H            ;0000 FOR MOD III TRSDOS
5F94 FFFF       00940         DEFW    0FFFFH           ;0F11H FOR MOD III TRSDOS
5F96 FFFF       00950         DEFW    0FFFFH
                00960 ;
                00970 ;
                00980 ;       THE FOLLOWING ARE EQUATES FOR ROUTINES IN TASMON.
                00990 ;       THE ADDRESSES LISTED ARE FOR THE MODEL I VERSION,
                01000 ;       THE MODEL III ADDRESSES ARE GIVEN IN THE COMMENT LINE.
                01010 ;
                01020 ;
695C            01030 WL      EQU     695CH            ;695BH
60E3            01040 KYINP   EQU     60E3H            ;60E1H
7E7B            01050 FLBUF   EQU     7E7BH            ;7EE5H
69AB            01060 CLS     EQU     69ABH            ;69AAH
79BA            01070 WR      EQU     79BAH            ;7A1CH
60EE            01080 BREAK   EQU     60EEH            ;60ECH
6FC9            01090 WRITE   EQU     6FC9H            ;6FCCH
7E5B            01100 WRKSTR  EQU     7E5BH            ;7EC5H
                01110 ;
                01120 ;
                01130 ;       PATCH INTO USER ROUTINE JUMP ADDRESS
                01140 ;
60DE            01150         ORG     60DEH            ;60DCH
60DE 005F       01160         DEFW    5F00H            ;5F00H
                01170 ;
0000            01180         END
00000 TOTAL ERRORS
32224  TEXT AREA BYTES LEFT


BDMSG   5F7D 00760    00730
BREAK   60EE 01080    00720 00750
CLS     69AB 01060    00250
DCB     5F84 00850    00240 00320 00350
ERROR   5F74 00730    00380
FLBUF   7E7B 01050    00390 00870
KYINP   60E3 01040    00180
USE10   5F03 00180    00200 00220
USE20   5F26 00330    00710
USE30   5F28 00350
USE40   5F35 00400    00700
USE50   5F43 00480    00520
USE55   5F5E 00610    00560
USE57   5F63 00630    00600
USE60   5F68 00660    00420 00440
USE70   5F6B 00680    00650
USER    5F00 00170
WL      695C 01030    00170 00580 00590
WR      79BA 01070    00490 00620
WRITE   6FC9 01090    00740
WRKSTR  7E5B 01100    00270 00280
```

"NORPAK offers full keyboard capabilities..."

users. This included the address of the Tasmon printer driver so users may interface their own driver (one of author Archer's complaints), and a user routine that permits ASCII display of disassembled mnemonics. We are planning at least one other mailing to registered users.

Charley Butler
The Alternate Source
Lansing, MI

Tabbing

An article entitled "Tab Extender" (*80 Micro*, February 1982) has prompted me to write this letter.

I own one of the least expensive printers on the market today, and I have never had any problem with tabbing anywhere from 1 to 80, and without the use of any additional lines or subroutines.

My method is simple and straightforward. If I want to LPRINT something at TAB(72) I type:

```
10 LPRINT"   here I hit the right arrow 9 times (9X8 = 72)
             and then type whatever I want at TAB(72)
```

I never even knew a problem existed until I read that article!

Raymond T. Schreiner
Tuckerton, NJ

Videotext Update

I would like to clarify a few apparent misunderstandings in Michael E. Nadeau's article "Videotext for the Masses" (*80 Micro*, January 1982).

The usual term by which the systems discussed by Mr. Nadeau are known generically is videotex (no final t). Videotex systems allow the user to access text and color graphics from a central computer host, and to create and store such information. Videotex systems currently in use or under development include Prestel in England, Teletel (Antiope) in France, Captain in Japan, and Telidon in Canada.

Strictly speaking, The Source and CompuServe, or any on-line ASCII data provider and access system, would not be termed videotex.

On page 62 Mr. Nadeau twice states (once in the glossary and once in the body of the article) that Telidon, sponsored by the Canadian government, is "run by Bell Canada." This is simply not so, and does a disservice to all of the other companies which are currently using the Telidon system. Full Telidon systems, including data bases, information provision and user interaction and access, are now being run by the federal Department of Communications, Infomart of Toronto, TVOntario (in broadcast mode), Sasktel (which is not Bell Canada), New Brunswick Telephone, and many other firms. The Bell Canada Telidon field trial—which is known as VISTA—has recently begun to be co-managed by Infomart and Bell Canada. It is a large system with many participants, but is certainly not the only Telidon system running, nor does Bell Canada have exclusive rights to Telidon systems.

Our final clarification is in reference to Mr. Nadeau's statement that Telidon "does not use a full keyboard, and therefore cannot access data bases such as CompuServe without modification." NORPAK offers full keyboard capabilities with several of its Telidon products. Our Integrated Videotex Terminal in particular can access both Telidon data bases and any ASCII on-line data base such as The Source or CompuServe and uses a full ASCII keyboard.

Herb G. Bown,
Vice-President Corporate Development
NORPAK Ltd.
Konata, Ontario
Canada

Yes, I erred in the January article. It is our editorial policy, though, to spell videotext with a "t" because, as best as we can tell, that is how the term was originally spelled.

You have my apologies.—M.N.

Cheers for *80 Micro*

Bravo! on your latest issue featuring the Color Computer (March 1982). You have restored my faith in you, and I must admit I was faltering! After Wayne's recent comments, I was afraid you had written Color Computer users off the family tree. I was glad to see some discussion of the true potential of this machine. I hope the issue will spark some interest among the readership and inspire some shy Color Computer programmers to surface.

Mark S. Mosty
Kerrville, TX

Neatlist for Disk

D.N. Ewart's program Neatlist (*80 Micro*, January 1982) is a welcome addition to my program library. I have a 48K system with one disk drive but many of my programs go beyond the 16K limit of this program. The location of a program in Disk Basic is different from Level II.

This program will run in Disk Basic with minor modifications (see Program Listing 2). I also added a small amount of coding to page the printer past the perforations. I have a Microline-80 printer and so the LPRINT STRING$(S,138) command does not work; I substituted an LPRINT" ". The top-of-form command on my printer is LPRINTCHR$(11).

I shortened the Data statements by one number to keep from losing the last digit during disk operations. Because I save the program on disk in ASCII, the Data statements cannot be as long as shown in the article.

To run the program in Disk Basic:

- Save the Neatlist program in ASCII as "NEATLIST",A.
- Load the program to be listed in the normal manner.

```
65504 CLS:CLEAR600:DEFINTA-Z:DIMK1(125):LM=5:RM=78:S=0:T1=5:POKE
16424,67:POKE16425,1:KK=1:I=PEEK(16548)+256*PEEK(16549)-2:GOSUB6
5510:PRINT@520,"";:INPUT"TITLE";A$:GOSUB65524
65505 IFI=32767THENI=-32768ELSEI=I+1:D=PEEK(I):IFD=0THENP=0:GOSU
B65524:GOSUB65515:LN!=PEEK(13)+256*PEEK(14):IFLN!=65500THENSTOPE
LSEGOSUB65520:I=14:GOTO65505ELSEIFD=58THENIFP=1THEN 65506ELSEGOS
UB65524:GOTO65505ELSE65506
65515 IFI<32765ORI<0THENI3=I+3ELSEI3=-1*(65533-I)
65516 IFI<32764ORI<0THENI4=I+4ELSEI4=-1*(65532-I)
65517 RETURN
65520 IFS=0THEN65522ELSEFORJJ=1TOS:LPRINT" ":KK=KK+1:NEXT
65522 LPRINTTAB(LM)USING"#####";LN!;:RETURN
65527 IFKK>58THEN65528ELSERETURN
65528 LPRINTCHR$(11):KK=0:RETURN
```

Program Listing 2

• Execute the program with MERGE "NEATLIST" and RUN65500.

In line 65504 I changed the definition of I to PEEK at 16548,16549 which points to the beginning of the Basic program in Level II and Disk Basic.

In line 65505 I added a test to see if the index counter goes beyond the 16K limit (32767), and if so changes it to minus.

In lines 65515-65517 I added a short subroutine to compute the variables I+3 and I+4 around the 16K limit.

Lines 65520-65522 and 65527-65528 are the revisions for my printer and for paging.

James H. Gates
Fair Oaks, CA

Make a Fortune

Many people are investing in Individual Retirement Accounts to relieve the social security burden in the future. The short program (see Program Listing 3) enables you to see the value an IRA can have in your future. It's amazing how a little per month set aside can amount to a fortune after 20 or more years.

Howard D. Ryder Jr.
St. Petersburg, FL

Scripsit vs. WordStar

We must disagree with a statement made by Richard Harkness in his review of Model II Scripsit (*80 Micro*, February 1982).

In comparing other word processing programs, near the end of the article he states "these other programs do not support Radio Shack's Daisy Wheel Printer II" (with reference to Electric Pencil II, Magic Wand and WordStar). We have had excellent results with our TRS-80 Model II, WordStar and Daisy Wheel Printer II, including use of features such as boldface printing, underscoring, superscript, subscript, and so on.

We have used both Scripsit and WordStar in our office and have found WordStar superior to Scripsit for our purposes. The print controls are much easier to use in WordStar. It is easier to advance through a document, add, delete or move pages or portions (even columns) of text and access the help functions. You may set the help function to one of four levels—depending on the current user skill—so that all, part or none of the help prompts are displayed on the screen. You may change the help level at any time—even during editing—so if you wish to have the complete screen for editing a document you can still call up the help menu without leaving the document or looking for the manual.

The MailMerge feature greatly enhances WordStar's already powerful qualities. We have found several uses for MailMerge other than the obvious form letter utility. With a little imagination it expands WordStar's capabilities by leaps and bounds.

You can even use WordStar for writing programs (such as in C-Basic) so that you can take advantage of already familiar editing features instead of trying to learn several sets of editing commands.

If you really want to know how well something works ask someone who has used it. After using both programs, the few minor modifications necessary to enable WordStar to use the Daisy Wheel Printer II's features were well worth the effort. The WordStar user manual contains a printer patch area with all the necessary information.

Kathy Morris
Joe M. Bennet, D.O. & Associates Inc.
Sedalia, MO

Faster March

I was sufficiently impressed with Mr. Boothe's program "Save All Humans" (*80 Micro*, March 1982) that I had to write in appreciation. While the general program is just another Space Invaders type program, its true value lies in the delightful human characters which march on and off the screen at the beginning and end of the battle. I would not have believed that the animation in the program was so simple to execute had I not typed it in myself.

Unfortunately, and as Mr. Boothe admits in his article, the graphics action is painfully slow. This is not completely due to inherent limitations of Basic as Mr. Boothe implies. I am including a small, but important, addition to the program. The addition of the following line results in a significant increase in speed: 165 DIM ES,F3,F,Q,T2,SL,P,B,A,K,SW,Z,X,G(5), TT,TE,C(6),S,E,DL,A,W,BN,SH,HX,M, TH,L,FL,R,E,TS. In addition, delete the DIM statements in lines 600 and 1770.

By placing all variables in a single DIM statement, from most to least frequently used, the Basic interpreter spends considerably less time searching the variable table for a variable encountered in a program. Hence, the program takes less time to execute.

Peter W. Snyder
Chicago, IL

Graphic Codes Revisited

I read with interest B.L. Howdeshell's letter "Graphic Codes" (*80 Micro*, December 1981) relating to Epson MX-80 graphics codes from NEWDOS80 V2.0. I have a Model III, 48K with disks.

I called up SYS3/SYS with Superzap and installed the 22-byte patch. I pressed the JKL keys (in NEWDOS80 this activates a screen dump); no graphics were printed.

The last used byte in SYS3/SYS is File Relative Sector (FRS) 4, Relative Byte (RB) A2. All of Mr. Howdeshell's code is at and beyond FRS 4, RB B9. Therein lies the problem! There is no link from SYS3/SYS to his code.

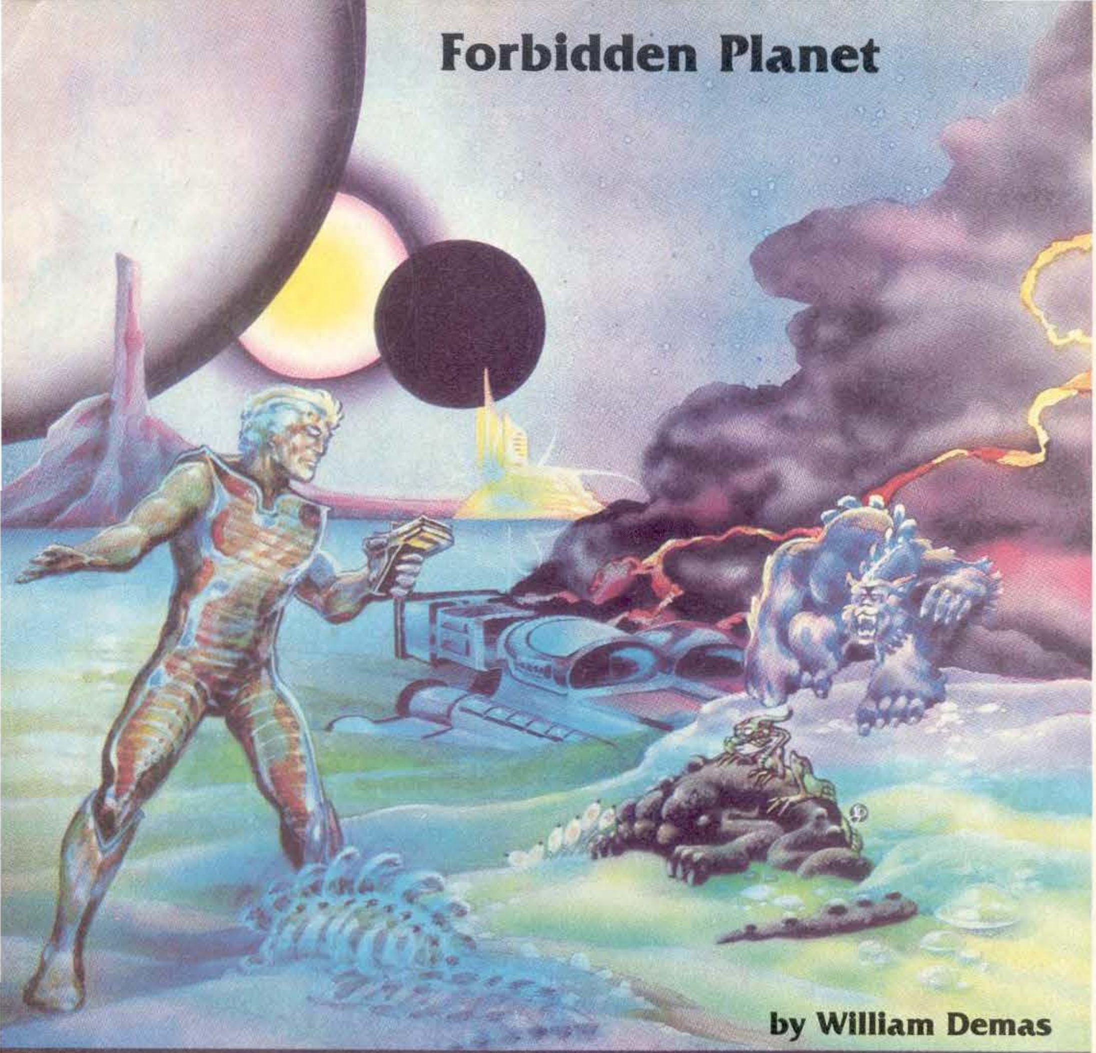
The desired linkage point is at FRS 4, RB 9C. I coded my own process of converting TRS-80 to MX-80 graphics. The result is the following 12 bytes of code, which should be appended starting at FRS 4, RB A3:

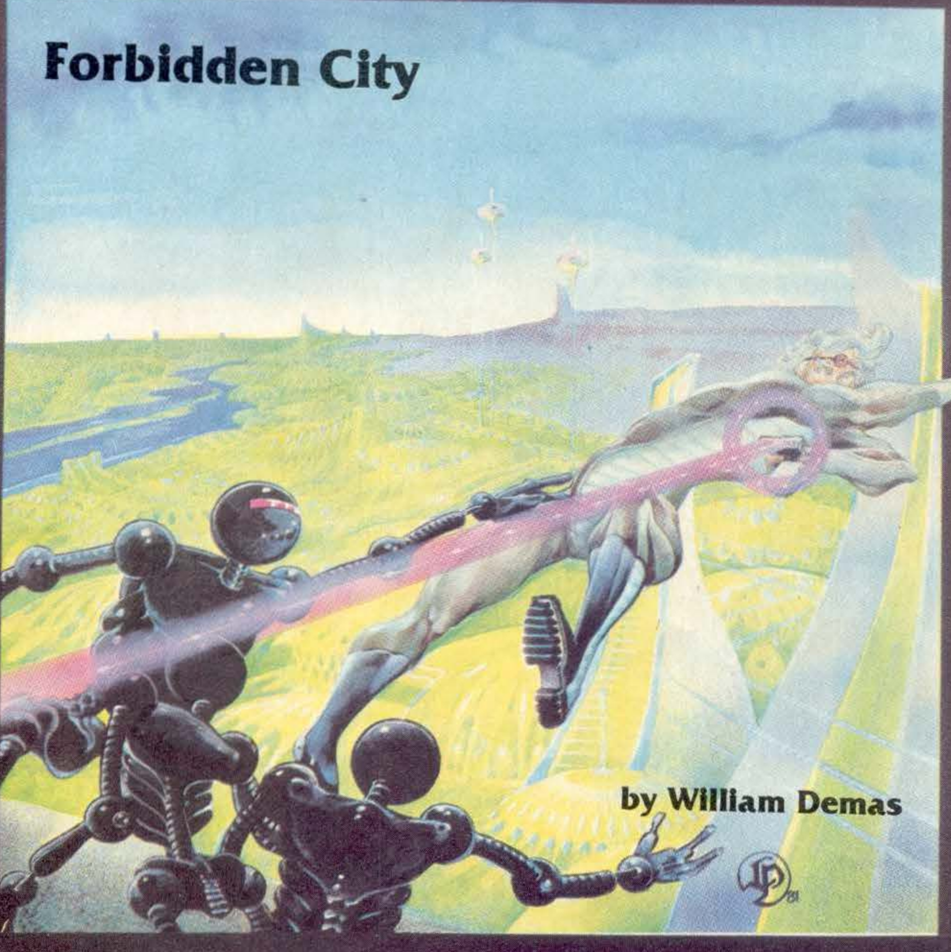
```
FE C0 3B 04 3E 2E 18 F3 C6 20 18 EF
```

To link this code to SYS3/SYS follow this procedure. SYS3/SYS FRS 4, RB 9C

```
10 CLS:FORI=0TO127:SET(I,1):NEXTI
20 PRINT@10," IRA/SAVINGS/INVESTMENT ACCOUNT CALCULATOR ":PRINT:
PRINT:PRINT
30 POKE16916,4'REM THIS LINE FOR MODEL III ONLY
40 CLS:L=0:INPUT "MONTLY INVESTMENT $";A
50 INPUT "ANNUAL INTEREST RATE PERCENTAGE";B
60 INPUT "NUMBER OF YEARS TO BE CALCULATED";C
70 E=A*12:F=B/100+1:FORX=1TOC
80 L=(E*F+(L*F)):NEXTX:PRINT
90 PRINT "YOUR ACCOUNT BALANCE WILL BE $";L:PRINT
100 P=E*C:K=L-P:PRINT"YOUR TOTAL INVESTMENT WAS $";P
110 PRINT "INTEREST YOU EARNED WAS $";K:PRINT:PRINT
120 INPUT"HIT 'ENTER' FOR ANOTHER CALCULATION";A$
130 IFA$=""THENGOTO40ELSECLS:END
```

Program Listing 3





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should show a 3E 2E byte sequence. Using Superzap zap these two bytes to 18 05.

When I use T-Bug to get some graphics into video RAM, JKL will now send graphics to the printer.

The bytes used for this patch are in Apparat's reserved zap area for this module. Document your change carefully in the event that Apparat comes out with a zap for SYS3/SYS. You may have to unzap this file.

William S. Collins
San Diego, CA

The following is an open letter to Ed Juge of Radio Shack.

Expansion Interface Worries

I have a TRS-80 and have generally been happy with it. I have stuck up for my machine when it's called a Trash-80 and when it has been compared to the Apple and Atari. However, I just received some news that upsets and angers me.

In the December 1981 issue of *80 Micro* Mr. Green said that the Expansion Interface may not be saleable. In the February 1982 issue of *Microcomputer News* Jon Shirley in his column "View from the 7th Floor" denied that rumor. I called the toll-free number and asked what the truth was. The answer was after June 1982 the Expansion Interface would not be sold in Radio Shack stores.

I was one of the last to buy a Model I (I bought the second last in the store). Your catalog says "We still support the revolution. . . we still provide full support for the systems in use. . ." I don't call that support. If I could afford to buy an Expansion Interface I would. I will not be able to save enough money to buy the interface by June. Your catalog also says that the interface is the hub of the system. I have already used one port with the printer. How am I supposed to expand my system and spend my money on disk drives and modems without an interface to hook them up to?

Do you still plan to support the Model I when the Expansion Interface is gone? Or should I just sell my computer and buy a Model III or an Apple?

Craig Stein
Bloomfield, NJ

Ed Juge Replies

Craig Stein's letter points up the confusion that existed (and maybe still does) over the F.C.C. rulings. That's what prompted Jon Shirley's February Newsletter item.

Jon said that the January 1, 1981 ban was on the manufacture (not sale) of non-approved equipment. Of our E.I.s, he said. . . "We obtained permission to make Model I Expansion Interfaces for one additional year and, as of December 30, 1981, we are not making any more E.I.'s, although they should be available from our stores until around the end of June."

Craig, we share your disappointment in having to discontinue the Model I equipment, but the choice was not ours.

And yes, we do intend to continue support for the Model I by keeping future hardware and software compatible whenever possible, as long as there is a demand. Consider, for example, our new Model I (only) double-density conversion kit, listed in catalog RSC-7. Of course there will be soft and hardware for Model III only.

Craig, we appreciate your choice of and enthusiasm for our TRS-80. We like to think you chose the best. By the time you read this, if rumors are correct, you should see that the Apple II is being replaced by a newer, more powerful, and cheaper model. Nobody is immune to the onward march of time and technology.

Ed Juge, Director
Computer Merchandising
Radio Shack
Fort Worth, TX

Even after June used Model I Expansion Interfaces will still be available for some time.—Eds.

> *"Does Radio Shack still plan to support the Model I when the Expansion Interface is gone?"*

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✔ 11

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80 AID

"Disabling the Break key will increase your program's execution speed."

Disabling Break for the Color Computer

I am writing programs for the TRS-80 Color Computer in Extended Basic. I would like some tips on how to protect these programs from being easily copied. I understand it is possible to command the computer to ignore the Break key, thus preventing it from listing a loaded program. How is this accomplished?

Robert E. Meyers
52 Botsford St.
Poland, OH 44514

Because the Extended Color Basic interpreter scans the keyboard after the execution of every Basic keyword looking for the Break and Shift@ keys, there is no simple location to POKE to disable the Break key.

In the February issue of Color Computer News, *Charles J. Roslund offers the Basic routine shown in Program Listing 1 which will disable Break and Shift@ when appended to an existing Extended Color Basic program (16K).*

Disabling the Break key is not only a way to protect your programs from tampering but will increase their execution speed, as well.

Two words of warning: this Break disable method will not work during the execution of an Input command and, once enabled, cannot be overcome; the only way to interrupt program execution is to press the Reset button!—Eds.

APL Character Generator Wanted

We are a small engineering consulting firm and are very interested in running APL (A Programming Language) on our TRS-80 Model II. Currently we are running Vanguard's APLV80 with Pickles & Trout's CP/M using the Model II as the computer and an Anderson-Jacobson terminal as the console. We want to be able to use the TRS-80 CRT to input data, edit programs, and so on, but we need to be able to generate the APL characters on the screen. During the past year we have tried to purchase an APL character generator for our Model II, but thus far we have been unsuccessful.

Can any readers help us find and purchase the APL prom?

Shelly D. Leith
Administrative Assistant
Texas Consultants Inc.
525 North Belt
Suite 250
Houston, TX 77060

LNW-80 Software Exchange

I would like to contact other LNW-80 microcomputer owners who would be interested in exchanging high resolution software and technical ideas. If there is enough interest I would be willing to start an LNW-80 user newsletter.

Jay J. Hokanson
4345 Manchester Rd.
Grand Island, NE 68801

Carbon Film Ribbons

I am using a TRS-80 microcomputer with a Daisy Wheel Printer II as a word processing system. One of my projects is preparing original articles for printing commercially as individual pamphlets, using AB Dick Offset Masters. My printer tells me that I need to print the pages on the masters with my printer using a non-correctable carbon film ribbon.

I have been unable to find a cartridge of non-correctable carbon film ribbon anywhere. A local office supply company has checked with its suppliers and finds that the appropriate carbon film ribbon is not available to them. They have also checked with appropriate business machine companies locally, with the same result. I have checked with the local Radio Shack computer store manager and he has not been able to locate anything for me. A call to Tandy Company—Radio Shack Customer Services in Fort Worth—yielded only the reply that they do not supply non-correctable carbon film ribbons for the Daisy Wheel Printer II. I would appreciate any help you can give me regarding this matter.

Joyce Babcock
1711 E. Miller
Jefferson City, MO 65101

Faster General Ledger

Has anyone transferred the Radio Shack General Ledger I program from Basic to machine language so that it runs faster for the Model III?

A. J. Beall, Jr. PE
Beall Associates
3901 Monroe Road
Charlotte, NC 28205

Model I Equipment Wanted

I represent a non-profit, charitable corporation which, over the past year, has been relying more and more on microcomputer equipment to conduct its daily affairs: for word processing, accounting, fund raising, mailings, correspondence,

```
1 IF PEEK(&H3EB9)<>&H32 THEN CLEAR200,&H3EB0:FOR I=&H82B9 TO &H831E
:POKEI-&H4400,PEEK(I):NEXT ELSE 5
2 FORI=0 TO 2:POKE&H3EBD+I,18,NEXT:I=&H3F1E
3 POKEI,&H26:P0KEI+1,&H3:POKEI+2,&H7E:POKEI+3,&H83:POKEI+4,&H22:POK
EI+5,&H7E
4 POKEI+6,&HA4:POKEI+7,&H4C
5 POKE&H19B,&H3E:RUN10
10 REM ** YOUR PROGRAM BEGINS HERE **
```

Program Listing

and so on. We have received some contributions of TRS-80 Model I equipment which, so far, is serving us well. We would be grateful if your readers might consider making a tax-deductible contribution of additional Model I equipment. Drives, printers, and expansion interfaces would be especially welcome.

If you can make such a contribution or would like more information, please write or call me (collect, if you like) at (617) 495-9020.

Robert Epstein, Ph.D.
Executive Director
Cambridge Center for Behavioral Studies Inc.
11 Ware St.
Cambridge, MA 02138

Special Education Aid

I recently attended a workshop on microcomputers. I see a potential for their use in my organization. As Director of Education at two community-based facilities for the mentally retarded, I am investigating hardware and software that are available in this area. I am interested in instruction, programming, and accounting. Please send me any information you feel would be appropriate for this application.

Michael R. Fonger
Director of Education
Opelousas Developmental Center
Post Office Drawer 1638
Opelousas, LA 70570

Automatic Troubles

I am experiencing a problem with my Epson MX-100 printer. When should I enable the automatic carriage return?

If I enable the switch, I can LPRINT my Basic programs and need not worry about carriage returns when outputting a line to the printer; however, all output from Electric Pencil is now double-spaced (including spacing for pagination).

If I disable the switch to utilize the full features of Electric Pencil (including pagination, automatic line adjustment, and the like) I cannot LLIST my Basic programs—the lines overprint each other!

Al Peponis
435 Monaco Ave.
Union City, CA 94587

Video Signal Info Needed

We are currently offering an applications software package for the Model III. We are often asked to give presentations before large groups of people. In order to demonstrate to such groups, we would like to transfer the screen image onto a larger monitor or wide-screen tv. Although we have a tv rf interface, we have been unable to determine precisely how to obtain the video signal from the Model III. Have any of your readers tackled this problem?

Earl B. Beutler,
Manager, Computer Sales Division
Trade Service Publications Inc.
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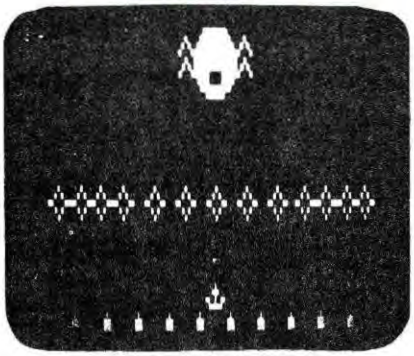

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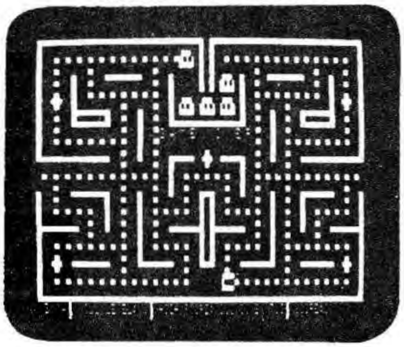

SCARFMAN

BEST SELLER

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

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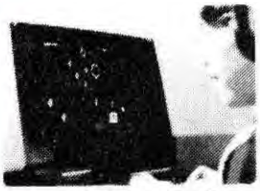
CAUTION: Played with the Alpha Joystick, Scarfman may become addictive.



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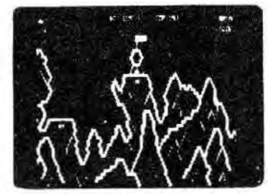

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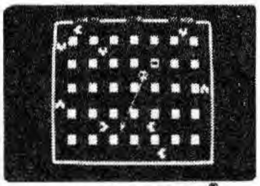

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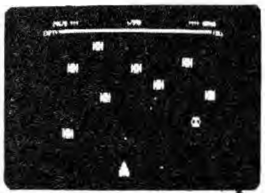

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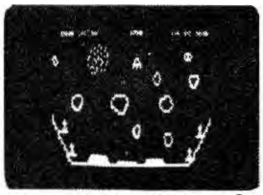

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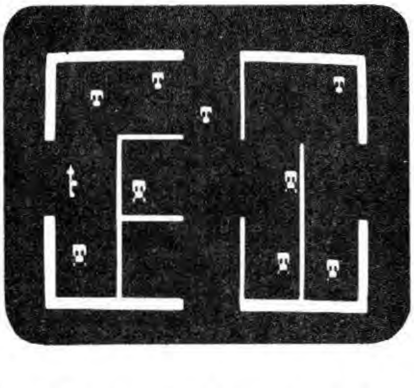

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>
> — 80 Microcomputing
> 80 Reviews, Jan '82

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80 DEBUG

"A wrong fix is more frustrating than the original problem."

Screen Scroll Fix

Mr. Keller's article "As the Screen Scrolls" (*80 Micro*, February 1982) is very interesting and useful.

I have a 16K Model I, Level II, but not the Editor/Assembler package. After typing Program Listing 3 (pg. 266), I found my screen scrolling and saving only the bottom line.

Program Listing 1, the source code, was written for the top of a 32K machine. Listing 3 POKEs this code to the top of a 16K

"That last digit was lost."

machine. This works fine until line 210 of Listing 1 tries to LD BC with the value stored at BB81H by line 190. BB81H is above the 16K boundary, 7FFFH. If you change this location to 7FD4H, (32724), just below the beginning of the program, things will work fine. Listing 3 should be as shown in Fig. 1 (changes are underscored). Be sure to set the memory size to 32720 or below.

The number of top lines to be protected is passed to the subroutine at line 65010, Listing 3, in PF. To change the size of the bottom field, simply increase or decrease the test value (16256) in line 65030 by multiples of 64. This subroutine can be made to do many things by using whatever test or directive you wish at line 65050. This line determines when the machine language routine is called.

Daryl Kraft
1301 Hughitt Ave.
Superior, WI 54880

```
65110 DATA 0,0,205,127,10,34,212,127,33,192,63,237,212,127
65120 DATA 237,66,68,77,42,212,127,17,64,0,237,82,84,93
65130 DATA 42,212,127,237,176,58,32,64,214,64,50,32,64,201
```

Figure 1

Wrong Fix

A wrong fix is more frustrating than the original problem! In my letter on the ULCBAS bug (*80 Micro*, February 1982, page 28), there was a missing digit. Line 10 should read: Y = PEEK (16561) + 256 * PEEK(16562) + 1. Somehow that last digit was lost on the printing room floor.

Nate Salsbury
608 Madam Moore's Lane
New Bern, NC 28560

A New Exhibition

There are two bugs in Program Listing 1 that accompanied my article "Pictures at a Model II Exhibition" (*80 Micro*, March 1982).

Line 30 should read GOSUB 280. Line 80 should read FOR X1 = 1 TO 121.

To turn off the compressed mode change line 270 to read CLS:PRINT@ 910,CHR$(26)"END OF PROGRAM" CHR$(25);CHR$(27);CHR$(15):END

Jesse W. Baker
P.O. Box 145
Fort Kent, ME 04743

In Matt Robins' article "HydraDisk" (80 Micro, *March 1982) the captions under Figs. 2 and 3 on page 208 were reversed.—Eds.*

I Can't Get Out!

Roy Green's Supermaze for the Color Computer (*80 Micro*, March 1982, page 148) is fun, but I had to change some lines to run the program.

In line 310 delete the apostrophe that appears before :PRINT@. In line 320 delete the apostrophe at the beginning of the line.

Change line 1150 to read IF X = A(100) AND D = 4 THEN 1300. Change line 1160 to read IF X = A(101) AND D = 2 THEN 1350.

The main program was omitted from Richard Ramella's article, "Shady Characters" (80 Micro, *March 1982). The listing appears below.*

```
100  REM SHADOW BOX BY RICHARD RAMELLA
110  CLS
120  CLEAR 126
     ...
     (DATA LINES)
     ...
1000 FORX=1TO150
1010 READ A
1020 READ B
1030 LPRINT STRINGS(A,"");
1040 LPRINT STRINGS(B-A,"#")
1050 NEXT X
1060 END
```

Michael Goldflam's sort routine ("Goldflam Sort," 80 Input, *February 1982) was incorrect as printed. The correct listing follows.*

```
1 INPUT"HOW MUCH MEMORY WOULD YOU LIKE TO SET ASIDE FOR ITEMS";B:C
LEAR B:INPUT"HOW MANY ITEMS TO SORT";A:DIMA$(A):FOR X=1 TO A:INPUT
 A$(X):NEXT X
2 FOR X=2 TO A:FOR X1=1 TO X-1:IF A$(X)<A$(X1) THEN 4 ELSE NEXT
3 NEXT X:GOTO5
4 B$=A$(X):FOR X2=X TO X1+1 STEP-1:A$(X2)=A$(X2-1):NEXT:A$(X1)=B$:
GOTO3
5 CLS:PRINT"DONE":INPUT"HIT <ENTER> TO CONTINUE";B:FOR X=1 TO A:PR
INTA$(X);"  ";:NEXT
```

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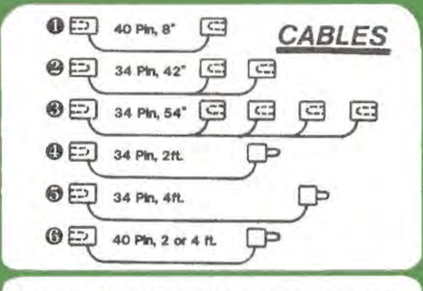

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Highest quality cable and high force, gold plated contacts ensure the utmost in connection reliability.

❶ KEYBOARD TO EXPANSION INTERFACE . . . . $21.
❷ DISK DRIVE CABLE FOR 1 OR 2 DRIVES . . . . $32.
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❹ DISK DRIVE CABLE EXTENDER . . . . $22.
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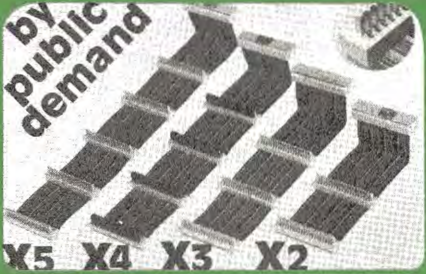
❻ 40 PIN BUS EXTENDER — 2 ft. . $22 4 ft. . . $24.

Custom cable configurations are also available. Call us.

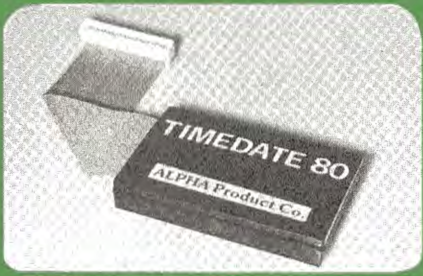


YOU ASKED FOR IT: "EXPANDABUS" X1, X2, X3 AND X4. CONNECT ALL YOUR TRS-80 DEVICES SIMULTANEOUSLY on the 40 pin TRS-80 bus. Any device that normally plugs into the keyboard edge connector will also plug into the "EXPANDABUS". The "X4" is shown with protective covers (included). The TRS-80 keyboard contains the bus drivers (74LS367) for up to 20 devices, more than you will ever need. Using the E/I, it plugs either between KB and E/I or in the Screen Printer port. Professional quality, gold plated contacts. Computer grade 40 conductor ribbon cable. X2 . . $29. X3 . . $44. X4 . . $59. X5 . . $74. Custom configurations are also available call us

ANALOG-80: A WORLD OF NEW APPLICATIONS POSSIBLE.

8 DIGITAL MULTIMETERS PLUGGED INTO YOUR TRS-80!!! Measure Temperature, Voltage, Current, Light, Pressure, etc. Very easy to use: for example, let's read input channel #4: 10 OUT 0,4 Selects input #4 and also starts the conversion 20 A = INP(0) Puts the result in variable "A" Voila! Specifications: Input range: 0-5V to 0-500V. Each channel can be set to a different scale.

Resolution: 20mV (on 5V range). Accuracy: 8 bits (.5%). Port Address: jumper selectable. Plugs into keyboard bus or E/I (screen printer port). Assembled and tested. 90 day warranty. Complete with power supply, connector, manual . . . . . $139.



TIMEDATE 80: REAL-TIME CLOCK/CALENDAR MODULE

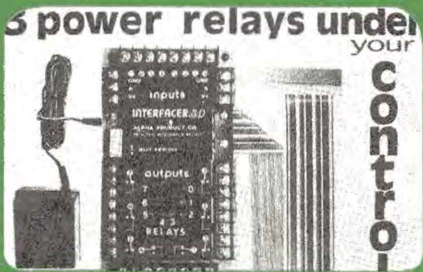
Keeps quartz accurate time for 3 years on 2 replaceable AAA batteries (not included). Gives MO/DATE/YR, DAY of WEEK, HR MIN SEC and AM/PM. Features INTELLIGENT CALENDAR and even provides for Leap Year. This compact module simply plugs into rear of Keyboard or side of Expansion Interface (may be slipped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

DISK DRIVE EXTENDER CABLE, FREE YOUR MINI-DRIVES.

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

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

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



INTERFACER-80: the most powerful Sense/Control module.

- 8 industrial grade relays, single pole, double throw isolated contacts: 2 Amp. @ 125 Volts. TTL latched outputs are also accessible to drive external solid state relays.
- 8 convenient LEDs constantly display the relay states. Simple "OUT" commands (in basic) control the 8 relays.
- 8 optically-isolated inputs for easy direct interfacing to external switches, photocells, keypads, sensors, etc. Simple "INP" commands read the status of the 8 inputs. Selectable port address. Clean, compact enclosed design. Assembled, tested. 90 days warranty. Price includes power supply, cable, connector, superb user's manual . . . . $159.

GREEN SCREEN WARNING

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

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

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

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

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

A last word: We think that companies, like ours, who are selling mainly by mail should •list their street address•have a phone number (for questions and orders)•accept CODs, not every one likes to send checks to a PO box•offer the 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

ALPHA Products

✓17

ADD $2.50 PER ORDER FOR SHIPPING AND HANDLING
ALL ORDERS SHIPPED FIRST CLASS MAIL
WE ACCEPT VISA, MASTER CHARGE, CHECKS, M.O.
COD: ADD $2.00 EXTRA
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N.Y. RESIDENTS ADD SALES TAX

85-71 79 St. WOODHAVEN N.Y. 11421 ☎ Info and order: (212) 296•5916

80 DEBUg

Data must have 105 items for each maze, so I added one zero as the first data item in lines 3250, 3260, 3290, 3300, 3330, and 3340. Example: 3250 DATA 0, 11011,. . . .

I also made a change to Supermaze that makes it easier to walk through the maze if you are unfamiliar with the keyboard. In line 250 change "F" to "↑"; in line 260 change "R" to "→"; and in line 270 change "L" to "←". You must also change lines 1110–1130. In line 1110 change "F" to CHR$(94); in line 1120 change "R" to CHR$(9); and in line 1130 change "L" to CHR$(8).

Daniel W. Phillips
289 S. Sheridan St.
Wilkes-Barre, PA 18702

The article "CP80," page 306 in the April 1982 issue has some technical errors which were missed. Line numbers 1600–2190 were deleted in the magazine, but are correct on the Load 80 tape and disk. They are shown in the listing below. The Key Box states that CP80 requires at least one disk drive. The minimum configuration is actually 32K Level II, and is not tested under disk operation. Lastly, on page 306 the article refers to a Compac program. This is a modem-driver package which will soon be appearing in 80 Micro. Our thanks to author Brian Cameron for pointing out these errors.—Eds.

```
7049 FE5B      01600          CP    5BH          ;UP ARROW?
704B 2007      01610          JR    NZ,NOTU      ;NO
704D 3EC9      01620          LD    A,0C9H       ;LOAD A RET
704F 328876    01630          LD    (POUT),A     ;STORE IT
7052 18C6      01640          JR    CMDHND
               01650 ;
7054           01660 NOTU     EQU   $
7054 FE2A      01670          CP    2AH          ;IS IT STAR?
7056 2009      01680          JR    NZ,NOTST     ;NO - BYPASS
7058           01690 CMORE    EQU   $
7058 CD9770    01700          CALL  OURKBD       ;GET COMMENT
705B FE0D      01710          CP    0DH          ;END?
705D 20F9      01720          JR    NZ,CMORE     ;NO - GET MORE
705F 18B9      01730          JR    CMDHND
7061           01740 NOTST    EQU   $
7061 CBAF      01750          RES   5,A          ;INSURE UPPER CASE
7063 FE44      01760          CP    44H          ;DISPLAY?
7065 CAF971    01770          JP    Z,DICMD
7068 FE53      01780          CP    53H          ;STORE?
706A CA0C71    01790          JP    Z,STCMD
706D FE41      01800          CP    41H          ;ADSTOP?
706F CA0575    01810          JP    Z,ADSTP
7072 FE42      01820          CP    42H          ;BEGIN?
7074 CA3074    01830          JP    Z,BCMD
7077 FE45      01840          CP    45H          ;E CMD?
7079 283D      01850          JR    Z,ECMD       ;YES
               01860 ;
               01870 ;
707B 00        01880          NOP
707C 00        01890          NOP
707D 00        01900          NOP
               01910 ;
707E           01920 ICMD     EQU $
707E CD7B76    01930          CALL  OURMSG       ;DISPLAY MSG
7081 0E        01940          DEFB  0EH          ;CURSOR ON
7082 0D        01950          DEFB  CR
7083 49        01960          DEFM  'INVALID COMMAND'
7092 0D        01970          DEFB CR
7093 00        01980          DEFB  EOM
               01990 ;
7094 C31A70    02000          JP    CMDHND        ;START AGAIN
               02010 ;
7097           02020 OURKBD   EQU   $
7097 CD2B00    02030          CALL  KBD
709A B7        02040          OR    A
709B 28FA      02050          JR    Z,OURKBD
709D CD8176    02060          CALL  DSP
70A0 C9        02070          RET
               02080 ;
               02090 ;
70A1           02100 WBLK     EQU   $
70A1 CD9770    02110          CALL  OURKBD       ;GET A CHAR
70A4 FE20      02120          CP    20H          ;IS IT A BLANK?
70A6 2001      02130          JR    NZ,NOTBL
70A8 C9        02140          RET
               02150 ;
70A9           02160 NOTBL    EQU   $
70A9 F1        02170          POP   AF           ;FREE UP STACK
70AA 18D2      02180          JR    ICMD
               02190 ;
```

TRS-80* COMPUTING EDITION

©1981 Percom Data Co., Inc. — The Percom Peripheral — 35 cents

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

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

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

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

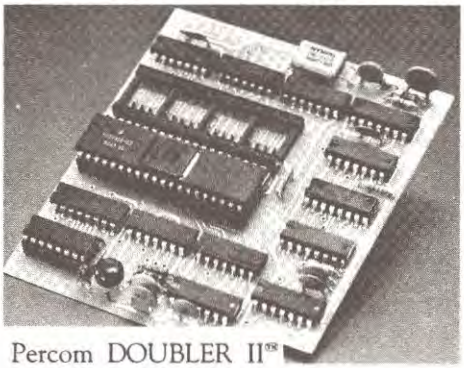
With a DOUBLER II installed, over four times more formatted data — as much as 364 Kbytes — can be stored on one side of a five-inch diskette than can be stored using a standard Tandy Model I drive system.

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

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

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

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



Percom DOUBLER II™

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

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

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

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

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

The DOUBLER II sells for $2~~19.9~~5, including the DBLDOS diskette. Now $169.95!

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

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

1

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

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

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

CRC ERROR–TRACK LOCKED OUT

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

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

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

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

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

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

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

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

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

2

All that glitters is not gold

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

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

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

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

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

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

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

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

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

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

There's no conversion, no re-recording.

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

And vice-versa.

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

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

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

Even OS-80 utilities are written in BASIC.

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

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

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

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

3

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™Trademark of Percom Data Company, Inc. *TRS-80 and TRSDOS are trademarks of Tandy Corporation which has no relationship to Percom Data Company. †Creative Computing Magazine, June, 1980, page 26.

See List of Advertisers on page 386

80 ACCOUNTANT

by Michael Tannenbaum C.P.A.

"I deplored the lack of tax planning software and suggested this area to software developers."

In my February column I discussed the state of tax preparation software as seen from the vantage point of November 1981. My thoughts were influenced by a survey of our staff conducted during September and October. As you might recall, I deplored the lack of tax planning software and suggested this area to software developers. I also noted that a micro might not be the best vehicle for automating tax preparation procedures.

Several readers have taken me to task for this conclusion. Mr. Fred E. Guth of Gooth Software (931 South Bemiston, St. Louis, MO 63105) suggested that I was not giving micros the break they deserve. He indicated that his software helped many tax preparers with return preparation and his clients all used TRS-80 models. Unfortunately, I did not receive a sample of the software so I was unable to evaluate it for this column. However, F. Lee Radzicki of IMPACC Associates (P.O. Box 93, Gwynedd Valley, PA 19437) did send me his Tax Master system.

The Tax Master System

The Tax Master system (TM) simulates tax forms on the Model II's display. Any tax return preparer familiar with the tax form will be able to use this system with almost no training. This feature of the TM system represents a radical departure from the normal service bureau input form. Although the input forms used by our firm's service bureau are well designed, we still require a pre-tax season training session in their use for our staff.

Elimination of the input form has a further benefit. Any ambiguities in how data input affects the tax return can be resolved immediately. Because of the interaction between tax forms, data entered on one form often affects calculations on another in unexpected ways. This interaction is not always obvious to novice tax preparers when entering data on service bureau input sheets. Should such a misunderstanding occur, time will be lost in all the input sheets and preparing the return again.

TM is for use on a two-disk Model II system. The programs reside on drive zero and the client data files reside on drive one. With this type of organization, the data disk can accommodate up to 75 clients. The TM software developer recommends an alphabetic indexing scheme for establishing client disk files. Regardless of the method used, the program's sophisticated client search method allows the preparer to separate and reference clients with the same last name, same first name, same state of residence but different telephone numbers.

"You cannot just pop a CP/M-based application system in your disk drive and expect it to work."

Once you have established a client master file, TM presents a menu of tax forms. Simply select the form and the program displays a facsimile on the screen. Because of screen limitations, the entire form cannot be displayed at once. The system's designers used logical breaks within the form to divide it into displayable groupings. A maximum of 23 lines is presented at one time. The last line is reserved for messages from the system to the user.

By using the control key, special function keys, the tab key and the curly bracket ({) keys data is entered on the appropriate lines on the form. Arithmetic operations can be made in numeric data entry fields. Each field is a calculator. For example, to sum the earnings of a husband and wife, the operator need only enter a plus sign after the first entry. Then when he enters the second amount and presses the Enter key the field will display the sum of the entries. Other arithmetic operations such as multiplication and division are also permitted.

When data is entered, the cursor moves to the next allowable data entry field. If the new field is a subtotal or grand total field, pressing the control key and the letter V automatically does the calculation. If the field is the result of calculations done on another form, the same key sequence extracts the appropriate total. If the other form has not yet been completed, the key sequence will return a zero. The preparer may override the zero amount if he desires to estimate the amount.

You can use an estimate for the unknown amount if an approximate tax value is to be calculated. The TM system permits estimated taxes to be calculated since there are two levels of calculation (local to the form and global to the return). This feature allows you to use the TM system as a tax planning tool. Once the global (entire return) calculation option is exercised, the estimate will be replaced by a zero if the proper schedule has not been prepared.

At any time the preparer can terminate data entry operations even if all information required is not entered. Once this is done, the data entered to date is stored on the disk and the forms selection menu is displayed. Should the preparer elect to work on another client, he can exit from the forms selection menu and select a new client name from the master file. The entire forms and client selection procedure makes the TM system a close analogue of manual procedures.

At any point in the tax preparation process you can print a set of tax forms. By entering appropriate commands when you select a form, the totals are dumped onto the printer. The format of the report has been designed so that you can place a tax form overlay on the printout and photocopy them. In a pinch, if a tax form overlay is not available, you can make the printout directly on the form. The latter course of action is not very desirable—it is difficult to line up the form so data is in the proper boxes. Getting a good copy takes patience and plenty of extra forms.

I evaluated the system by entering data for an actual taxpayer. As a novice user, unfamiliar with the program's control key structure, I made many mistakes. The system is quite forgiving but a bit frustrating to use. For example, when I made an error, the system presented a flashing message on the last line of the screen. You must enter control S to acknowledge the message. The system

✓See List of Advertisers on page 386

also requires an uppercase response to a bulletin message. While these procedures are sound, they are easy to forget and until they become automatic they add to a new user's frustration.

Once while entering data, the display froze. Rebooting the system brought up the ominous message "Internal Error at E086." The manual advises you to reset the system if a strange message appears when booting it up. I tried the recommended procedure and the problem went away temporarily. When I tried to return to the form I was working on when the system failed, the same problem occurred again. The files had been left in an open status. The program includes no error trap for this occurrence.

Since all programs in this system are supplied in compiled form, the lack of a trap for this type of error could be due to the compiler used by the system developer. I detected no other untrapped errors during the evaluation sessions. I was subsequently advised that a utility is provided to close the files. Unfortunately, the otherwise excellent documentation does not indicate the availability of this utility.

None of my problems should persuade a potential purchaser to avoid this system. The problems I encountered are typical of those any user must expect with a new system. The fact that I prepared an accurate return in such a short time proved to me the user-friendliness of the TM system. The professional tax preparer should have no difficulty using the system after a brief instruction period.

During the evaluation process the system demonstrated its worth when a K1 and a 1099 showed up for the test case after I had prepared the manual return. Entering the new data on the appropriate forms and selecting the global calculation method generated a revised return in minutes. The opportunity for a quick payback of the system cost is obvious.

The TM system is equipped to prepare 28 different types of personal tax forms. Unfortunately, this does not include forms for any state. A tax preparer in a state where income tax returns are required must still resort to pen and pencil for the state return. This limits the market for an otherwise excellent software product. Despite its cost of $1300, TM will be worth its weight in gold during tax season. Since it is a forms oriented system updates are required to adjust the system for form and law changes. Updates, available for $300 per year, keep the system current.

The Shortax System

The TM system is designed for the Model II and utilizes all graphics features available on the integrated CRT. It stands in sharp contrast to another tax related system I received for evaluation. Shortax works on a CP/M-based system. Because of the large number of different equipment configurations, application programs for CP/M systems usually do not use elaborate graphic displays.

Shortax's lack of fancy graphics does not hinder its usefulness. Shortax is a planning aid for the professional tax consultant. Because it groups categories of tax return data you cannot use it to prepare a tax return. However, if you enter the appropriate data, it will calculate the tax liability of individuals, corporations and trusts for up to five different time periods. (Shortax was designed by Vernon K. Jacobs, a Kansas City CPA who is a professional tax and fanancial consultant.)

You can use a tax preparation system such as TM for planning; however, its forms orientation makes tax forecast calculations cumbersome. If you use the TM system for planning, only the 1981 rates are available. Shortax contains rates and tables valid from 1979–1984. Clearly the two systems are designed to serve different functions.

Getting Shortax operating was a graphic illustration of the difficulty a TRSDOS user can have when moving to an unfamiliar operating system environment. As is common for systems supplied to CP/M users, Shortax arrived on a single density disk without the operating system and the Basic interpreter. To operate Shortax I had to acquire the operating system and the CP/M version of Basic-80. In the future the system will be supplied in compiled form, eliminating the need for the Basic-80 interpreter. But you cannot just pop a CP/M based application system in your disk drive and expect it to work. The purchaser has to bring together the applications software and the operating system.

Fortunately, I had all the parts...so I thought. Unfortunately, I was using the Lifeboat implementation of CP/M. Shortax expects the Pickles and Trout version. This incompatibility became apparent when the computer simply lost its mind during processing. I resolved the problem quickly and proceeded with my evaluation without further incident.

The Shortax system requires entry of 23 different facts to prepare an individual tax projection. The first three items include the tax year to be projected, the filing status (single, married filing jointly, and so on) and number of exemptions. The next 13 items relate to different categories of income. If there are variations in categories peculiar to a tax year, only the categories relevant to the year being projected will be displayed. For example, the categories "Long term gains prior to 6/10/81" and "Long term gains after 6/9/81" are only important for the 1981 tax year and will be displayed only when a 1981 tax projection is desired.

All deductions are grouped into two categories: "Medical, tax and loss deductions" and "Interest contributions and miscellaneous deductions." For many tax planners these categories may be too broad. Also because a recalculation of adjusted gross income might affect some of the deductions, you should use the system carefully. Without detail, the deductible amounts will not be recalculated as you vary the components of income.

You can enter other categories into the system, including tax credits, withheld and estimated tax paid, net tax preference income and the prior four-year base period income. The tax planner can review the raw data, alter it and calculate the potential tax due. The system will display the results of the calculation indicating the figures in Table 1.

With this data the planner will have a great deal of information concerning tax consequences. If the results of the calculation indicate an unexpected tax, the tax planner can alter the input parameters and recalculate the tax. Each set of input data can be stored on disk for recall as required. You can also print the data for distribution to interested parties.

The same data can be projected to another tax period. You can alter the original data by a fixed or percentage amount. You can then store the new profile on the disk, use it for a new tax calculation or merge it with another profile. When merging two profiles, you can add or subtract the amounts. Once the files are combined they will remain in memory to be used for a tax calculation or stored on disk.

In addition to combinations of raw profile data, the system permits you to merge the results of tax calculations made on different profiles. The tax combination feature is useful in determining the total tax liability where clients have accumulation trusts or closely held businesses. The system also projects tax liabilities of accumulation trusts and corporations. Illustrations of all of these featues are covered in a series of test cases included on the distribution disk.

Because the system covers five tax years and a major change in tax law, computations of tax liability are quite complex. Mr. Jacobs cautions the user to become familiar with the system's operations before putting it into general use. The best way to do this is to enter test cases and test the tax calculation manually. When the manually calculated tax agrees with that calculated by Shortax, the user has developed an understanding of how the system is handling the profile data.

Shortax is a useful system for the professional tax planner who takes the time to understand the system's limitations and its potential. It is well worth the $500 charge. Shortax is available from Syntax Corporation, 4500 W 72nd Terrace, Prairie Village, KS 66208.■

Alternative minimum tax	Total Income (including tax exempt income)
Net tax due after estimate payments and withholding	Adjusted Gross Income
FICA tax	Taxable Income
The sum of all federal tax	Tax from tax rate schedule
Capital loss carry forward	Maximum tax (if any)
Income after taxes	Income averaging tax calculation
Highest tax bracket	Tax credits and payments
Average tax rate all taxes	Self-employment tax
Average tax rate income tax only	Add-on minimum tax

Table 1

✓See List of Advertisers on page 386

SOFT BITS
a basic/assembly column

by Roger Fuller

Many couples marry in June—to celebrate, I will talk about the union of Basic and machine code. Basic is a language, but we often think of it as an operating system. The distinction is important since we can modify an operating system easier than we can change a language.

There are many ways to install machine code in a Basic program. In past columns I have put it in the initialization stack area, a string constant, the input buffer, and high memory.

You can install a machine-code routine anywhere there is memory. It should not conflict with your operating system or your program. That leaves arrays, strings, video memory, free memory or any unused spot open for installing your code.

All the routines I present this month are at 7000H and are relocatable (except Program Listing 3—to relocate this one you must either adjust the address of a subroutine or duplicate the subroutine in both places it is called. This adds 24 bytes but reduces the total count by six since two Call instructions are eliminated).

You access each routine by a USR call. The USR function allows easy transfer of a single value to and back from the machine-code subroutine.

If you study the ROM code involved in USR, you will note a call at 27FEH to the reserved RAM. The address called (41A9H) normally contains a return, but in Disk Basic it holds a call to a routine evaluating which USR call (0-9) is desired. You can intercept the USR function here for special purposes. For example, you can add numbered USR calls to a non-disk system.

> *"I will talk about the union of Basic and machine code."*

Another interesting thing about USR is that the call at 2802H-252CH will evaluate any valid expression. This includes single precision, double precision, and even strings. Note that the routine at 252CH sets the type flag. Errors occur when the type of the argument is not integer and Call 0A7FH is used in the USR call. All of the following work:

```
10 A% ½USR ( A% )
20 A! = USR ( A! )
30 A# = USR ( A# )
40 A$ = USR ( A$ )
```

USR is a numeric function and you should try to use it that way. To make it evaluate and return strings is a violation of syntax.

Disk Basic does not have the same syntax for USR as Level II Basic. I have discussed patching the Level II USR function to have numbered calls like Disk Basic. Patching Disk Basic to ignore them is very simple; just disable the call at 41A9H by POKE 15553, 201. This changes the call to the return instruction of Level II.

Inverting a Screen

The program in Listing 1 inverts a screen. Only spaces and actual graphic codes are inverted. This USR routine needs no argument; just calling it inverts the screen. The code starts by loading HL with the address of the first location on the screen. Next BC is loaded with the number of screen locations.

The scanner loop is labelled Test. It gets a character from the screen and checks for a space in line 150. If the character is a space it is replaced by a solid white block and control jumps to the label Next (the loop boundary).

If the screen character is not a space a relative jump passes control to line 190. Here the character is compared to 80H (a graphic blank). If the value of the character is less than 80H the carry flag is set and control passes to Next. If the screen character is greater than 191 (a solid white block) then the compare in line 210 will not produce a carry and control will pass to Next.

If control still has not passed to Next then a CPL instruction will change the state of all bits. All graphic codes have bit 7 set and bit 6 reset. A CPL will leave these two bits incorrect. Restore them by XORing with a mask containing only bit 7 and bit 6 set. Figure 1 shows the bit patterns.

The XOR will set bit 7 since it is zero af-

```
                00100 ;         INVERTER                PUBLIC  DOMAIN
7000            00110           ORG     7000H
7000 21003C     00120           LD      HL,3C00H        ;FIRST SCREEN ROW
7003 010004     00130           LD      BC,1024         ;ONE SCREEN
7006 7E         00140 TEST      LD      A,(HL)          ;GET SCREEN BYTE
7007 FE20       00150           CP      ' '
7009 2004       00160           JR      NZ,$+6          ;IF NOT SPACE
700B 36BF       00170           LD      (HL),191        ;PURE WHITE
700D 180C       00180           JR      NEXT
700F FE80       00190           CP      80H
7011 3808       00200           JR      C,NEXT          ;IF BELOW GRAPHIC
7013 FEC0       00210           CP      0C0H
7015 3004       00220           JR      NC,NEXT         ;IF ABOVE GRAPHIC
7017 2F         00230           CPL                     ;INVERT ALL BITS
7018 EEC0       00240           XOR     128+64          ;SET BIT 7  RESET BIT 6
701A 77         00250           LD      (HL),A          ;REPLACE BYTE
701B 23         00260 NEXT      INC     HL              ;NEXT SCREEN POSITION
701C 0B         00270           DEC     BC              ;DROP COUNT
701D 78         00280           LD      A,B
701E B1         00290           OR      C               ;TEST FOR BC=0
701F 20E5       00300           JR      NZ,TEST         ;LOOP TIL DONE
7021 C9         00310           RET
0000            00320           END
00000 TOTAL ERRORS
```

Program Listing 1

BIT POSITION →	7	6	5	4	3	2	1	0
BIT VALUE →	128	64	32	16	8	4	2	1
GRAPHIC CODE →	1	0	X	X	X	X	X	X
AFTER CPL →	0	1	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
128 + 64 MASK →	1	1	0	0	0	0	0	0
AFTER XOR →	1	0	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$

$\bar{X}$ MEANS THE COMPLEMENT OF X WHERE X CAN BE 0 OR 1.

Figure 1

Reader Service for facing page ✓47→

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ter the CPL and bit 7 of the mask is one. Bit 6 is one after the CPL and will be reset to zero since bit 6 of the mask is also one; XOR will reset if both values are one. All other bits are left the same. Alternately you can replace line 240 with an Add A,64 instruction. This changes bit 6 to zero and the carry changes bit 7 to one.

At Next the screen pointer HL is moved one position and the byte counter BC is reduced by one. Then the B register is loaded into A at line 280 and ORed with C. If both B and C are zero the result is zero and the loop falls through; otherwise, control passes back to Test and the loop continues.

If you delete lines 150–180 only screen positions with graphic codes will be changed. This allows you to flash graphic sections on the screen, leaving spaces in text or around the screen undisturbed. If you are hand-assembling and remove these lines remember to adjust the relative jump at line 300 to reflect the loss of eight bytes.

Program Listing 2 is a routine to change all lowercase letters in a string to uppercase. This requires that you pass the location of the string via the USR argument to the machine code. Therefore the argument of the USR function is the VARPTR of the target string. To capitalize all characters in S$ use this code: 10 X = USR (VARPTR (S$)).

The VARPTR of a string variable does not return the address of the first character of a string, but the address of a descriptor block. The first character is the length of the string and the next two are the addresses of the actual string in LSB,MSB format. The USR routine will place the VARPTR address in Basic's arithmetic work area. You can transfer this integer address to the HL register pair by calling 0A7FH as in line 120.

The length of the string is loaded into the B register and tested for zero. If it is a null string no action is taken. Since the address pointer for a null string must point somewhere, any modification of that location may be unwanted. If the string is not null lines 170–200 load the address of the actual string of characters into the DE register pair. Line 210 swaps the DE and HL register pairs, allowing the more versatile HL register pair to serve as the pointer.

At CAPTL the first character is loaded into the accumulator and tested for a value less than 61H (lowercase A). If so, no action is needed; otherwise the character is tested for a value below 7BH (the next ASCII code after a lowercase Z). If the character is below 7BH then it is a lowercase letter and line 270 resets bit 5. This action occurs directly on the byte in memory, not on its image in the accumulator.

HL is moved up one place and a DJNZ drops the B register one, tests it for zero and loops back if not zero. Remember the B register was loaded with the string length in line 130. If the B register is zero control returns to Basic.

Here is an example of how to use the above routine: 10 L$ = "" : INPUT L$: PRINT USR (VARPTR (L$)): GOTO 10. This Basic line requires that you already set up the USR. Assigning L$ a value prevents a function call error if no characters are entered for L$. If no characters are entered L$ is not defined for the VARPTR function.

```
                00100 ;            CAPITALIZER      PUBLIC DOMAIN
7000            00110              ORG     7000H
7000 CD7F0A     00120              CALL    0A7FH    ;GET STRING POINTER ADDRESS
7003 46         00130              LD      B,(HL)   ;GET STRING LENGTH
7004 78         00140              LD      A,B      ;
7005 B7         00150              OR      A        ;TEST FOR NULL STRING
7006 2813       00160              JR      Z,LOOP+2;     EXIT IF NULL
7008 23         00170              INC     HL       ;POINT TO STRING LSB
7009 5E         00180              LD      E,(HL)   ;        GET IT
700A 23         00190              INC     HL       ;POINT TO STRING MSB
700B 56         00200              LD      D,(HL)   ;        GET IT
700C EB         00210              EX      DE,HL    ;NOW HL => STRING ITSELF
700D 7E         00220 CAPTL        LD      A,(HL)   ;GET STRING CHAR
700E FE61       00230              CP      61H
7010 3806       00240              JR      C,LOOP-1;BELOW A LOWER CASE A
7012 FE7B       00250              CP      7BH
7014 3002       00260              JR      NC,LOOP-1;ABOVE A LOWER CASE Z
7016 CBAE       00270              RES     5,(HL)   ;CONVERT TO UPPER CASE
7018 23         00280              INC     HL       ;POINT TO NEXT STRING
7019 10F2       00290 LOOP         DJNZ    CAPTL
701B C9         00300              RET
0000            00310              END
00000 TOTAL ERRORS
```

Program Listing 2

```
                00100 ;            REVERSE A STRING     PUBLIC DOMAIN
                00110 ;
7000            00120              ORG     7000H
7000 CD7F0A     00130              CALL    0A7FH    ;GET STRING POINTER
7003 4E         00140              LD      C,(HL)   ;    LENGTH TO C
7004 AF         00150              XOR     A        ;ZERO A
7005 47         00160              LD      B,A      ;NOW BC=LENGTH OF STRING
7006 23         00170              INC     HL       ;POINT TO STRING LSB
7007 5E         00180              LD      E,(HL)   ;        GET IT
7008 23         00190              INC     HL       ;POINT TO STRING MSB
7009 56         00200              LD      D,(HL)   ;        GET IT
700A D5         00210              PUSH    DE
700B E1         00220              POP     HL       ;NOW HL = DE
700C 09         00230              ADD     HL,BC    ;POINT  HL TO END OF STRING +1
700D 2B         00240              DEC     HL       ;BACKUP TO ACTUAL END
700E 41         00250              LD      B,C      ;GET LENGTH AGAIN
700F CB38       00260              SRL     B        ;DIVIDE LENGTH BY TWO
7011 2809       00270              JR      Z,EXIT   ;IF LENGTH TOO SHORT
7013 4E         00280 RVERSE       LD      C,(HL)   ;GET END CHAR
7014 1A         00290              LD      A,(DE)   ;GET FIRST CHAR
7015 77         00300              LD      (HL),A   ;FIRST SHALL GO LAST
7016 79         00310              LD      A,C      ;
7017 12         00320              LD      (DE),A   ;LAST SHALL GO FIRST
7018 13         00330              INC     DE       ;MOVE UP START POINTER
7019 2B         00340              DEC     HL       ;MOVE BACK END POINTER
701A 10F7       00350              DJNZ    RVERSE   ;LOOP TIL DONE
701C C9         00360 EXIT         RET
0000            00370              END
00000 TOTAL ERRORS
```

Program Listing 3

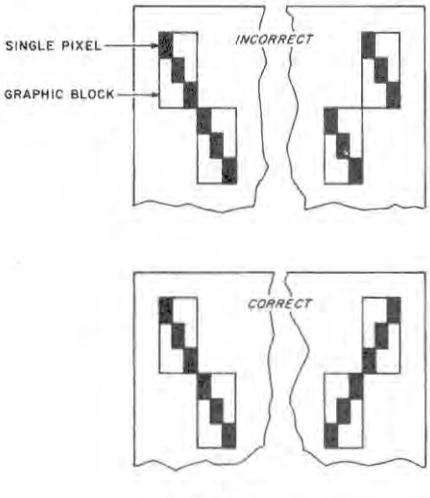

Figure 2

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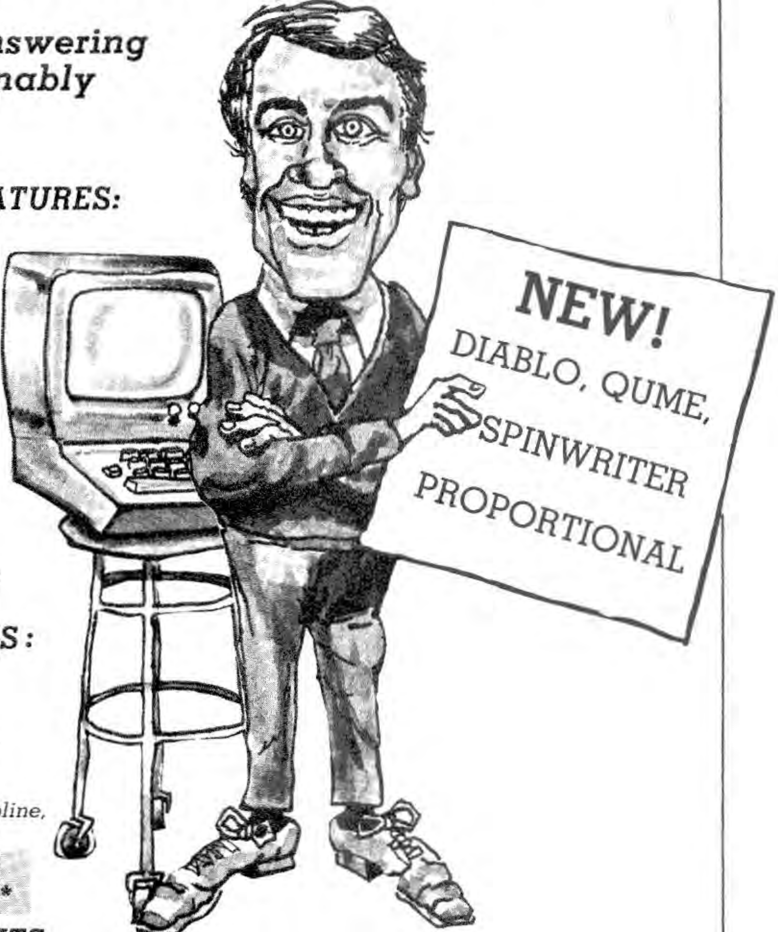

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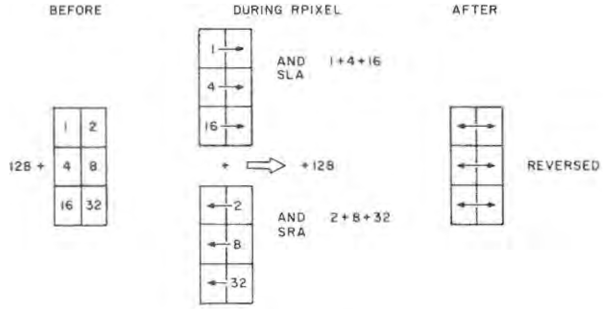

Figure 3

```
10 DIM S$(15)
20 FOR R=0 TO 15 : M = VARPTR ( S$(R) )
30      POKE M,64
40      POKE M+1 , R * 64 AND 255
50      POKE M+2 , R  / 4 + 60
60 NEXT
70 FOR R = 1 TO 47 : SET ( R , R ) : NEXT
80 FOR R = 0 TO 15 : M = USR( VARPTR ( S$(R) )) : NEXT
90 GOTO 80
```

Program Listing 4

From Back to Front

Listing 3 reverses the order of characters in a string. It also reverses any graphic codes along a vertical line down the middle of each graphic block. This way a diagonal line is a mirror image of itself when reversed. If the strings reversed are the first and second lines of the screen Fig. 2 would show a correct and an incorrect reversal.

The USR routine uses CALL 0A7FH to determine the address of the string's descriptor block. BC is loaded with the string's length. In lieu of loading the B register with an immediate zero byte, XOR A packs the code in a string constant. Remember Basic uses the zero byte to find the end of a Basic line. Once again the actual address of the string is loaded into the DE register pair, but instead of a swap a Push-Pop combination loads HL with DE.

This Push-Pop technique is very slow, taking 22 T-states to execute. A tandem set of register-to-register loads take the same number of bytes, but only eight T-states. The instruction in line 230 computes the end of the string plus one. To see why this is so, pretend a string of length one was at address 1000H. Since the start is also the end, adding the length to the address would give 1001H—one past the actual end. DEC HL adjusts this address to its proper value.

Lines 250–270 perform two tasks. They divide the length of the string by two and test for a string length which does not need reversing. Such a length is zero or one. The SRL divides by two to prevent a double reversal of each character. I could have used a RET NZ in line 270 instead of the conditional jump but that would allow two exits including one in the middle of the program.

RVERSE does the actual switching. If you do not want the graphic codes reversed remove the subroutine RPIXEL and the calls to it in lines 300 and 330. Otherwise the last character is loaded into C and the first into A. Now each is in the chip instead of in memory. RPIXEL is called to reverse A if it is a graphic code. Then the last character is placed first and the first character in C is loaded into A and sent to DE.

DE (the start pointer) is incremented in line 350 and HL (the end pointer) is decremented in line 360. Since the B register still contains the length to reverse (one-half the original length) DJNZ drops the count and loops back until done.

RPIXEL

Lines 400–430 test for graphics to be

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```
                 00100 ;       HORIZONTAL SCROLL      PUBLIC DOMAIN
7000             00110         ORG     7000H
7000 CD7F0A      00120         CALL    0A7FH          ;GET TYPE BYTE
7003 CB7C        00130         BIT     7,H            ;TEST FOR NEGATIVE
7005 2022        00140         JR      NZ,LSCRL-6     ;IF NEGATIVE SCROLL LEFT
7007 0610        00150         LD      B,16           ;16 ROWS TO MOVE
7009 DD21FF3B    00160         LD      IX,3C3FH-40H   ;END OF TOP ROW
                 00170                                ;BACKED UP ONE ROW
700D DDE5        00180 RSCRL   PUSH    IX
700F E1          00190         POP     HL             ;HL IS ROW POINTER
7010 C5          00200         PUSH    BC             ;SAVE ROW COUNTER
7011 014000      00210         LD      BC,64          ;ROW LENGTH
7014 09          00220         ADD     HL,BC          ;MOVE ROW POINTER DOWN
7015 5D          00230         LD      E,L
7016 54          00240         LD      D,H            ;DE => END OF ROW
7017 E5          00250         PUSH    HL
7018 DDE1        00260         POP     IX             ;IX => END OF ROW
701A DD7E00      00270         LD      A,(IX)         ;GET LAST CHAR ON ROW
701D 2B          00280         DEC     HL             ;SET UP FOR MOVE
701E 0B          00290         DEC     BC             ;MOVE 63 BYTES
701F EDB8        00300         LDDR                   ;MOVE THEM
FIELD OVERFLOW
7021 DD77C1      00310         LD      (IX+256-63),A  ;LAST CHAR TO FIRST PLACE
7024 C1          00320         POP     BC             ;RESTORE COUNTER
7025 10E6        00330         DJNZ    RSCRL          ;TIL 16 ROWS DONE
7027 1820        00340         JR      EXIT
                 00350         ;
7029 0610        00360         LD      B,16           ;16 ROWS TO MOVE
702B DD21C03B    00370         LD      IX,3C00H-40H   ;START OF TOP ROW
                 00380                                ;BACKED UP ONE ROW
702F DDE5        00390 LSCRL   PUSH    IX
7031 E1          00400         POP     HL             ;HL IS ROW POINTER
7032 C5          00410         PUSH    BC             ;SAVE ROW COUNTER
7033 014000      00420         LD      BC,64          ;ROW LENGTH
7036 09          00430         ADD     HL,BC          ;MOVE ROW POINTER DOWN
7037 5D          00440         LD      E,L
7038 54          00450         LD      D,H            ;DE => START OF ROW
7039 E5          00460         PUSH    HL
703A DDE1        00470         POP     IX             ;IX => START OF ROW
703C DD7E00      00480         LD      A,(IX)         ;GET FIRST CHAR ON ROW
703F 23          00490         INC     HL             ;SET UP FOR MOVE
7040 0B          00500         DEC     BC             ;MOVE 63 BYTES
7041 EDB0        00510         LDIR                   ;MOVE THEM
7043 DD773F      00520         LD      (IX+63),A      ;FIRST CHAR TO LAST PLACE
7046 C1          00530         POP     BC             ;RESTORE COUNTER
7047 10E6        00540         DJNZ    LSCRL          ;TIL 16 ROWS DONE
7049 C9          00550 EXIT    RET
0000             00560         END
00001 TOTAL ERRORS
```

Program Listing 5

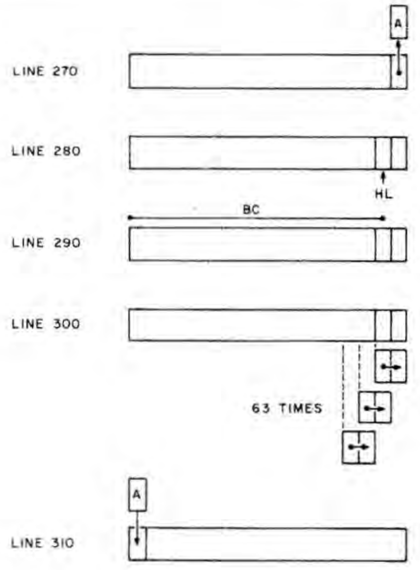

Figure 4

reversed. Note that a blank or solid block is not reversed. The BC counter is saved in order to use B as a temporary storage location. AF is saved since the value in the accumulator must be operated on twice and the result combined.

The operations move the left three pixels to the right and the right three pixels to the left. This is easy to do by multiplying and dividing, respectively. The drawings in Fig. 3 show how this works. Remove the extraneous bits by ANDing them with the correct mask. After each side is moved over the results are added and bit 7 set by adding 128. BC is popped off the stack and control returns to the calling program.

The Basic code in Program Listing 4 alters the descriptor blocks of the variables in string array to point to each row of the screen. This code POKEs a value of 64 into the length byte and alters the pointer address to point to the addresses of the start of each video row. Then a loop reverses the strings one by one.

You can make this run much faster by making the USR routine do all 16 rows at once. I challenge beginners to see if they can figure out how to do it. You might get an idea by studying the last program (Listing 5).

This program does a horizontal screen scroll of one position upon each call. The routine needs a value passed to it. This value determines which direction the screen scrolls, left if negative or right if positive. After getting the value via CALL 0A7FH, a bit test on bit 15 of the integer value (bit 7 of the H register) determines the sign.

If a right scroll is required, the B register is loaded with 16 (the number of rows to scroll). Then IX is loaded with the pointer to the end of the row. This is originally backed up one row to allow for the row increase in line 220, which precedes actual scrolling. Lines 180 and 190 contain a Push-Pop combination (you cannot load the IX from another register pair).

The row counter BC is saved on the stack in line 200, allowing the BC register pair to increase the row address by one row in line 220. Then DE is loaded quickly by a tandem pair of register-to-register loads. Lines 250 and 260 load IX with the increased address for later use.

This routine does the scroll by saving the last byte on the row, moving the first 63 over one, and putting the saved byte in the first position. This process repeats 16 times, once for each row (see Fig. 4).

Line 310 includes the strange expression because of a bug in the Radio Shack Editor/Assembler program. This line will give a field overflow error, but will assemble correctly. To avoid the error I made the value positive by adding 256. The LSCRL is very similar to the above. ■

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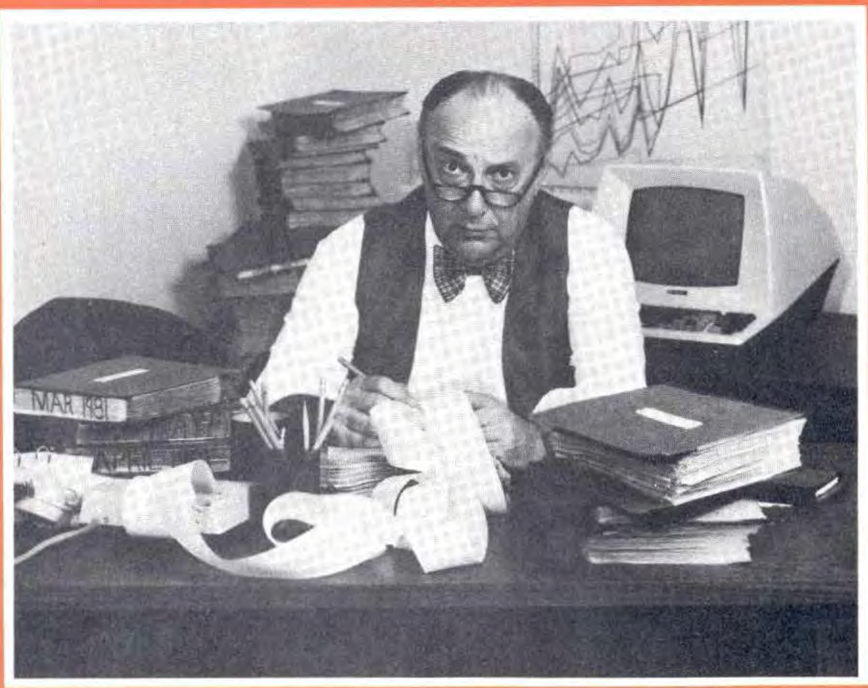

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80 REVIEWS

edited by Janet Fiderio

"Anyone from a businessman to the hobbyist can benefit from the vast amount of information that a modem allows them to access."

Modem 80
ICROM Enterprises Ltd.
1240 Bay St., Suite 205
Toronto, Ont.
Canada M5R 2A7
Models I & III
$289

by Mel Patrick

With the increasing number of computer communication networks such as CompuServe, The Source, MicroNet and the standard CBBS (computer bulletin board service), a modem is rapidly becoming very popular with computerists. Anyone from a businessman to the hobbyist can benefit from the vast amount of information that a modem allows them to access.

I decided to join these ranks in mid-October and began looking for a modem that would offer the highest versatility while maintaining an economical cost.

The market offers some astounding products. Companies offer modems with direct-connection (versus the older style acoustic connection), auto-answer, auto-dial, and units that do not require the infamous RS-232 to control their various functions. Since I was using a Microtek expansion unit at the time (which does not have any facilities for an RS-232 unit), I was narrowing the field of choices available. Only two choices were worth considering. One was the MicroConnection (reviewed August 1981), and the other more recent entry called the Modem 80. After looking at the software support that each had to offer, I chose the Modem 80.

The Modem 80 is a complete unit. There are no extra items to buy (even a phone extension patch cord came with the unit). The unit includes all cables, instruction manuals and most important, a tape containing six programs for software support.

Modem 80 is a direct-connection modem that connects to either the TRS-80 Expansion Interface or to the back of the Model I keyboard's extension bus. The Modem 80 is also compatible with the TRS-80 Model III (Model I is a 40-pin bus, Model III is a 50-pin bus).

The unit measures 8 by 3 1/2 by 1 1/2 inches. On one end are two modular phone jacks for connecting to the phone line and the telephone, although the latter is not required for operation. The opposite end houses a ribbon cable and an edge card connector (this is extremely handy if you want to connect other devices to the TRS-80 bus). A special Y power cable extends from this end as well. One end of this cable connects to the TRS-80 power socket on the computer, the other connects to the jack on the other end of the power pack. Two LEDs are on the top of the unit to indicate on-line and carrier-detect conditions.

Inside the Modem 80 is what first appears to be a 50-pin bus for the connection to a Model III computer. ICROM builds the Modem 80 for the TRS-80, Pet and Apple. The edge card bus inside the Modem 80 is for the Apple card slots.

Two pages of instructions are included for initial setup and a self test to ensure proper connection. Two manuals also accompany the Modem 80. One describes operation from Basic, and the other describes all the command functions in the terminal mode.

Software

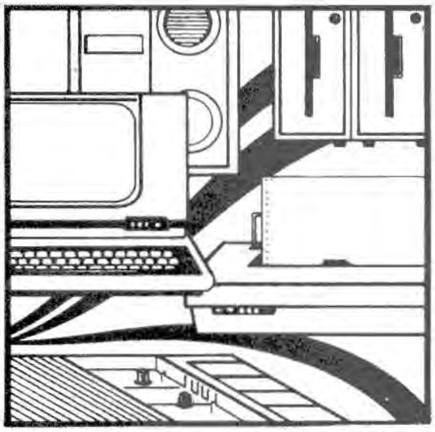
The Modem 80's strongest point is its software. Four of the programs supplied on tape are for Basic operation between two Modem 80-equipped systems. Two of these programs are in machine language for the actual modem input and output. The other two programs are host programs which work in conjunction with the machine-language programs to support either tape or disk.

The last two programs on the tape are machine-language terminal programs. These smart terminal programs allow users to access computer information networks.

Modem Basic

After loading either of the machine-language programs for Basic operation (16K version or 48K version), eight new Basic commands are available. You can incorporate these into your own programs or use them directly from the command mode (without a program). Table 1 lists the new Basic commands.

The other two Basic programs (disk or



tape) use these new commands to configure two computers as host and terminal. In this mode Basic programs, machine-language programs, and data may be transferred from one system to the other. Also during program or data transmissions Modem Basic has automatic line-error detection and re-transmission, thus providing very reliable communications.

Modem Terminal Software

Two machine-language programs (tape or disk) are provided to allow access to computer networks. These programs are not the standard dumb terminal, but rather smart terminal support. These programs are excellent and I have not encountered any problems with either of them to date. There are 32 command functions in the terminal mode. The manual explains them clearly and concisely.

Eight programmable function keys allow the user to define eight lines of text with a maximum of 32 characters per line. Any one of these lines may be selected and transmitted to the host system. A ninth programmable key sends any ASCII file that was loaded in to the host system.

An upper/lowercase switch is used when the host system understands only uppercase letters.

You can set the baud rate at any value from 25 to 300.

There is no limit on the number of digits you can dial.

The redial-phone-number feature

redials the last number entered. There is also a disconnect-from-line feature.

All of the material received is held in a buffer. The terminal program signals when the buffer is full, and you may either clear it or ignore it. Once full no more is accepted into it (but is still displayed on the video).

The display menu shows all commands supported.

You can set parity from the keyboard at even, odd or no-parity. You can also toggle between full and half duplex.

The write/load buffer command stores any information contained in the computer's buffer on tape or disk. All information that your computer receives from the host system is stored in the buffer until it is full.

The transmit buffer command loads the buffer from tape or disk and then sends its contents to the host system.

The save/load function keys enable you to store the eight pre-programmed keys on tape or disk.

The scroll-buffer command allows you to display all information previously stored in the buffer. You can display the buffer in either direction continuously or one line at a time.

The line-printer buffer command sends the buffer's entire contents to the line printer.

The place-markers-in-the-buffer command allows you to insert start and stop markers to tape or disk, or send it to the line printer.

All of the above commands are invoked by using a letter key with either a shift key or the clear key. Some host systems require that the terminal be able to transmit control characters. A control character is invoked by pressing the clear key with the required letter.

Hardware

Since Modem 80 does not require an RS-232 unit, it uses a port to control its functions and for input and output. Inside the Modem 80 are all the integrated circuits that make it work. Unlike some other companies that solder the ICs directly to the board and then sandpaper the part numbers of the devices, ICROM utilizes sockets for all but two of the ICs and leaves the part numbers on. Circuit layout is uncrowded and provides for easy servicing.

The Modem 80 is designed around the Motorola modem IC (MC14412). While this chip is capable of either answer or originate modes, the Modem 80 can only send in the originate mode, but can receive in either mode. Any mode switching is done by setting a bit in a control word and then sending it to the Modem 80's port (port 120). The remainder of the ICs on the board are for decoding input/output port control words and the active filters to respond to only the other modem's signal transmitted over the phone line. A filtered power supply is also on board for power requirements.

Using the Modem 80

Until I acquired the Modem 80, I knew little about such things as word length, parity, and stop bits. After reading the terminal manual I knew a little more, but after my first connection to a local bulletin board it was still not enough. Through inquiries made from friends and reading everything concerning modems, I concluded that most systems need either a seven or eight-bit word length, no parity, and one or two stop bits. I switched to eight-bit word length, no parity, one stop bit and dialed the bulletin board again. This time the information was displayed correctly on my screen.

Over the next two weeks I signed onto various bulletin boards in Canada and the U.S. All worked well with only a few exceptions. Occasionally the phone line would go dead or the modem could not read the first few characters on a line. The reason for this seems to be the speed that the host system starts sending the next line after sending a carriage return.

I found two methods to cure this. One was to specify about 4–5 nulls when asked by the host. This causes the host to delay 1–2 seconds after a carriage return before resuming transmission. The second was to increase the baud rate I was using to about 310. Although the manual states that the baud rate is variable from 25 to 300, I found that it accepts values as high as 318. By using either of these two methods, I was able to access any bulletin board with excellent reliability. Out of 17 systems that I have accessed, only 3 required these fixes. I assume the source of these problems originates with the host system rather than with the Modem 80 terminal software.

Modem 80 has proved to me that reliable communications between systems is possible for a low initial cost. I have downloaded (received Basic programs), uploaded (sent Basic programs) and chatted with various sysops (system operators) with complete success.

One other interesting point is that ICROM is producing modems for the TRS-80, Apple, and Pet. This is not unusual in itself but they plan to make all the modem host programs compatible with one another. This means you can dial up a friend with an Apple or Pet and send him your program in memory, or vice-versa. Because of the different Basics involved, you would have to edit the programs, but it would be easier than typing in the whole program. ■

MOPEN	: dial a number or wait for a call and then sign on to the other system.
MCLOSE	: disconnect from the phone line.
MLOAD	: load a Basic program from the other computer.
MPRINT	: send a message to the other computer.
MPUT	: send data to the other computer.
MINPUT	: request a response from the other computer.
MDATA	: request computer type identification.
MOUT	: generate an audio tone through the cassette port.

Table 1

PI80C Parallel Printer Interface
The Micro Works
P.O. Box 1110
Del Mar, CA 92014
Color Computer
$69.95

by Howard Berenbon

The Micro Works must be working overtime to develop software and hardware for the TRS-80 Color Computer. A new product which I recommend is their PI80C Parallel Printer Interface. It is designed so that you can use a parallel printer, such as the Centronics 730, through the serial port of your TRS-80C. You do not have to buy a serial printer if you happen to have a parallel printer nearby, say from a Model I.

The Hardware and Connection

The printer interface is supplied in a ROM pack, though the instructions warn you that it is *not* a ROM Pak and should not be plugged into the ROM slot of your Color Computer. A DIN plug connects to your computer's serial I/O jack. An edge connector connects to your parallel printer cable. A transformer plugs into a 120 volt ac outlet (the interface has its own power supply). I used a Centronics 730 parallel printer to test the interface, but any Centronics-compatible printer should work as long as it can do a line feed automatically. To output to the printer, follow the directions in the Color Computer manual. It requires no software to operate. It uses the commands that Color Basic provides: LLIST and PRINT #-2.

Radio Interference

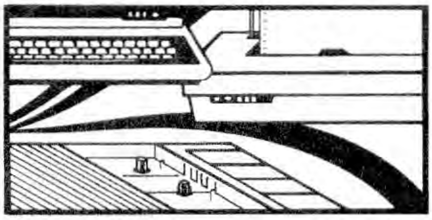
The interface causes slight radio frequency interference and snow on the tv screen. This can be minimized if not eliminated, by moving the interface away from the tv. This move is limited by the cable that connects to the computer's serial I/O jack; the cable is only about 10 inches long. This could be lengthened, say to three or four feet, so that the interface may be moved further away from the tv. I used a black and white portable tv with the Color Computer. I do not know what interference, if any, results when using a color tv.

Data Processing

The interface must convert your serial data to parallel before printing: this slows down the printing process somewhat. You will notice this delay when listing a program. The short program line may have no noticeable lag, but the longer line will take about ¼ of a second to process before the printer prints it. Serial printers I have seen operating with the Color Computer do not seem to have any noticeable printing lag.

Since the printer interface requires no software, there is no problem using the printer's available functions, which require control characters from the computer for activation. If you want to elongate your character set, or do whatever your printer is capable of doing (proportional spacing, double striking, underlining, and so on), follow the instructions that come with your printer. The interface will accept these control characters, as it accepts any data your computer sends, allowing your computer to control your printer.

The PI80C printer interface is a useful piece of hardware for the TRS-80 Color Computer. It can save you the expense of a serial printer if you already own, or have access to, a parallel printer. ■



Escon Selectric Interface
Escon Products Inc.
12919 Alcosta Blvd.
San Ramon, CA 94583
Models I, II, & III
$599

by Mike Rigsby

The Escon Selectric typewriter interface kit enables any Selectric typewriter to operate as a printer. The kit includes an electronic interface (blue box) and electro-mechanical components. The kit works with any Selectric and operates at a maximum speed of 12.5 characters per second. The electronic interface accepts data in RS-232 or TTL parallel form. You may use 110, 150, 300, 600, 1,200, 2,400, 4,800 or 9,600 baud rates. The interface has a 96-character buffer and it will accommodate various forms of handshaking. Instructions are included for interfacing to the TRS-80 Model I (with or without Expansion Interface), the TRS-80 Model II, Apple, Sorcerer, an SSM AIO Card, and the Northstar (parallel).

Although this kit works with any Selectric, the early versions of Model I with serial numbers beginning with four have a small problem. A spring which debounces the space bar gets in the way of solenoid mounting. You can remove the spring and the unit will not suffer as a printer, though it will be very poor as a typewriter. As an alternative, IBM will modify the typewriter to operate like the later models and it will then perform well as a printer or typewriter.

The instruction manuals are very thorough and Escon's staff is helpful with questions, but solenoid installation is not for the timid. It took me about one week (every spare moment after work and all weekend) to make the modifications. The cover did not come off my machine in any of the indicated ways in the instructions; I removed a screw from the bottom and slid the lower part of the case towards the rear of the machine to get it off. I never could get the top cover off, though it turns out that I did not need to.

Although you should read the instructions carefully before attempting the installation, you must perform one operation early in the sequence and at the time the instructions state. After all the solenoids, levers and wires are in place (five days into the project) the instructions tell you to use an ohmmeter to assure that none of the solenoid wires are shorted to the chassis. If a short is found at this point, you must undo much of the previous mechanical work, correct the problem (a 30-second fix) and then reassemble the unit. To avoid this frustration, I strongly recommend checking for shorts between the solenoid wires and their metal frames before, during and after each installation. There is an electrical checklist which involves reading specific values with an ohmmeter. Diodes are involved, thus the polarity of the meter leads can determine whether you obtain the desired readings.

Operating this unit from a TRS-80 Model I without an Expansion Interface requires a printer interface cable (Radio Shack number 26-1411) which you must then wire to the blue box of the interface unit.

The machine worked almost perfectly the first time I printed a message. There was a slight problem with the shift mechanism which I adjusted in less than 10 minutes. The instructions are quite clear on how to adjust the linkages; they caution to expect imperfect copy until you have made adjustments. With no further adjustments I have typed over 200 pages and the machine has worked flawlessly.

Documentation on the system is good and would allow the user to repair or modify the unit with relative ease. I am using Scripsit (cassette) and the type-

". . . I strongly recommend checking for shorts between the solenoid wires and their metal frames before, during and after each installation."

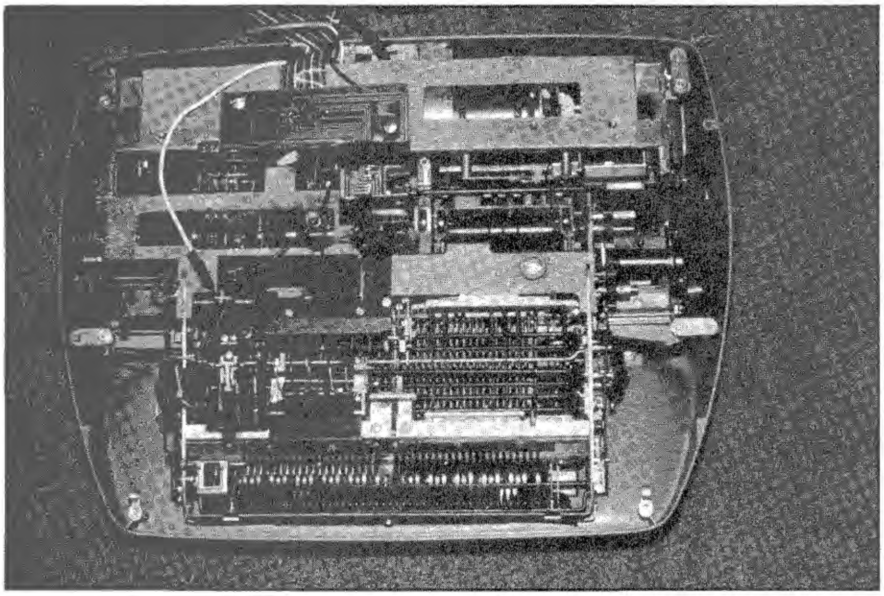


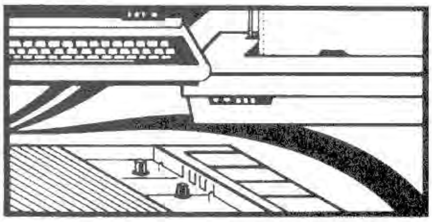
Photo 1. Inside view of typewriter, all parts in place

"Solenoid installation requires work and patience. . ."

writer appears to be totally compatible with the software.

Economically, this system would be easiest to justify for someone who already owns a Selectric typewriter—used Selectrics in fine condition cost $300 or more. Solenoid installation requires work and patience (and the nerve to pull guts from that costly Selectric). Escon will install the solenoids (for a fee) if the job seems too formidable.

For letter-quality printing on a reliable, sturdy (slow) machine, the Escon interface and a Selectric typewriter combine to form an attractive printer alternative.■



Color Computer Disk System
Radio Shack
Fort Worth, TX
26-3022
$599

by Howard Berenbon

The TRS-80 Color Computer Disk System is for everyone, or for at least anyone that can afford disks. The system is easy to operate and requires a 16K Color Computer with Extended Basic. The 92-page manual is written in a style similar to Radio Shack's Color Basic manual, including sections for the programmer and newcomer to programming. Its simple and direct language takes you slowly, and clearly, step by step through the disk operating system (DOS), and features examples of the commands and Disk Basic.

The system costs $599, but is available for somewhat less if you decide to purchase it through the mail from the discount Radio Shack dealers that advertise here in *80 Micro*.

The System

The system consists of the disk interface in a plug-in program pack cartridge, a cable, and a 5¼-inch disk drive. The cable connects to the disk interface and the disk drive with one free connector allowing you to connect a second drive. A second drive is not required. The interface controls up to four drives, but an additional cable is required when adding two more drives. The 35-track double-density, 18-sectors-per-track disks hold about 161K bytes of data.

If you want to add another drive to your system, I'm sure that a 40-track drive will work (usually available for about $310 mail order) but you'll get only 35 tracks of storage because that is all the DOS supports.

The DOS is part of the system (on ROM), and it only uses 2K of your computer's RAM. When you PCLEAR 1, it leaves you with a little over 11K of RAM. If you require more memory for longer programs, it may be necessary to upgrade your 16K computer to 32K.

"The TRS-80 Color Computer Disk System is for everyone. . ."

Commonly Used Commands

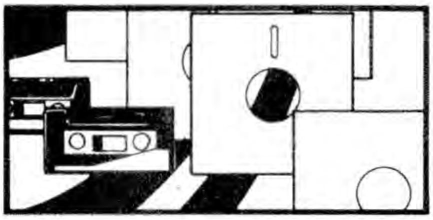
The DSKINI0 command automatically formats any disk in drive 0, while DSKINI1, formats any disk in drive 1, and so on. You can access your program directory by entering the DIR0 command, or just DIR if you intend to look at the directory of the disk in drive 0. DIR1 displays the directory of the disk in drive 1, and so on. All your existing files are displayed.

With the Merge command you can merge one program from disk with another currently in memory. The Kill command deletes any file from disk while the Load command allows loading any Basic program file into memory. LOADM allows loading machine-language files. There is also a machine-language save command, SAVEM. And speaking of machine language, there is a section in the manual on machine-language with examples.

One annoying point about this system is that the supplied disk drive does not have an On/Off indicator light making it difficult to know if the drive is on or off. There is a white dot on the switch to be used as an On/Off indicator, but this is inadequate.

The Color Computer Disk System works well, is easy to operate, and has excellent documentation.■

Reader Service for facing page ↗50→



Litigation Support System
Tandy/Radio Shack
Fort Worth, TX
Model II
$299

by Edward D. Young III

Every junior lawyer has heard it a thousand times "Haven't we had a case like this before? I seem to recall that George handled a case like this several years ago; see if you can find the file." The request sends the junior attorney scurrying to a mammoth file cabinet and a conglomeration of index card boxes. If he is lucky, he will eventually find that Harry, not George, handled the case which occurred only four months ago, not years.

With Radio Shack's Model II Litigation Support System, savvy lawyers no longer need to waste time searching old files. After an hour of learning the system, anyone (even a lawyer) can create, store and retrieve files.

The Litigation Support System is composed of two files: a Clients file and a Forms file. The Client file can hold up to 375 files. You can use the client record to store information such as the client's personal background, case history and prior correspondence. The Forms file is used to conduct legal research. The user enters the area of law, case number, keyword, or any other criteria desired, and the computer searches up to 570 records for that criteria and displays all matching records until the user decides which one he wants to use.

In addition to storing and retrieving information, the Client and Forms files can generate reports. The Client file program can generate two reports; a Client Representative report and a Client Personal Data report. The Client Representative report prints the current date, client's name, client number, type of case, attorney of record and other relevant information for each client selected. The Client Personal Data report prints the name, record or case number, address and phone number of each client selected. The Forms file report generates a list of cases, subjects, forms or keywords based on any criteria you select.

The availability of these storage and reporting features means lawyers can conduct research on recurring legal issues and familiarize themselves with the case history of their clients in a fraction of the time it took using traditional filing systems. Therefore lawyers can manage their cases more carefully and respond faster to client or court inquiries concerning the status of the case. By entering times and dates in the user-defined input fields, a lawyer can even use this program to keep track of scheduled appointments.

Excellent Documentation

Perhaps the most impressive feature of this program is its documentation. The documentation is so complete even a person who has never touched a computer can run the program successfully. The instructions are clear, consise and easy to read. In addition to illustrating, in great detail, the procedures for creating, storing and retrieving client records, the manual also provides instructions for making back-up disks. The ability to create a back-up data base is very important in the legal environment. The loss of vital information could severely damage a client's case and the lawyer's reputation.

The manual also provides meticulous instructions for printing client reports, using various formats: alphabetical order, chronological order, by attorney's name, or by just about any other criteria you desire. You can also adjust the page length and paper width to accommodate your printer.

Added Features

The Litigation Support System is designed both for expansion and for use with other Radio Shack programs. A section of the user's manual is devoted to explaining how to run the program on a system with more than one disk drive. That section also explains how to convert client and back-up files created on a one-drive system into files to be used in a multi-disk environment.

". . . the most impressive feature. . . is its documentation."

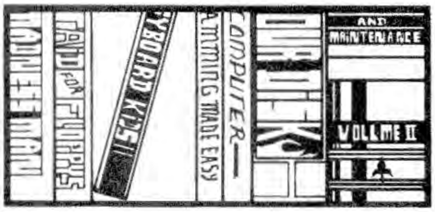
The manual explains how to merge Scripsit with the Litigation Support System to create commonly used documents such as form letters, leases and powers of attorney. This feature alone can save a law office much time and effort.

Additionally, the Litigation Support System has the capacity to print mailing labels. This feature is particularly valuable for filing documents with courts. Rather than type the address of the court each time a pleading is sent there (which the average lawyer does at least 2,000 times a year), a lawyer can simply enter the name of the court and the mailing label is printed instantly.

The Litigation Support System can be used with Radio Shack's Time Accounting System. If you have this system, you can give clients the same client numbers assigned to them by the time accounting system. This way, users of both systems can maintain the continuity, accuracy and accessibility of the client record system.

This program allows lawyers to do legal research, manage their cases and send out repetitive documents with a minimum of effort. The program works so well that you wish that you had more storage capacity so you could store complete opinions, excerpts from legal treatises, or even legal briefs. ■

(Editor's note—The reviewer is a graduate of the Harvard Law School and a practicing attorney in Washington, D.C.)



Robot Intelligence—With Experiments
David L. Heiserman
Tab Books
Blue Ridge Summit, PA 17214
Softcover, 322pp.
$9.95

by Don Stauffer

What, another book on building a robot? I have several of these books and although the robots sound interesting, I find it hard to justify spending the money for the necessary hardware. But after reading its back cover and taking a quick thumb through, I realized *Robot Intelligence* is different. It is not a book about building robots; it is a book about simulating robot behavior on a TRS-80.

The book's theme is the computer simulation of machine intelligence developed by a technique the author calls Evolutionary Adaptive Machine Intelligence (EAMI). Heiserman warns the reader early that these simulations are not very spectacular, but they do illustrate behavior that will prove thought provoking if you have an interest in machine intelligence. The reader/programmer must study the explanations of how the programs work to gain anything from the simulations, the author warns. Typing the programs in and watching them run will not be enough.

"What, another book on building a robot?"

Heiserman classifies the intelligence of the creatures created by the simulations into three categories of increasingly complex behavior: Alpha, Beta and Gamma. Each of these categories is subdivided into two levels: level I and level II. Even the most intelligent creature in this book is no robot genius. The fascination stems from the complex behavior that results from relatively simple programming.

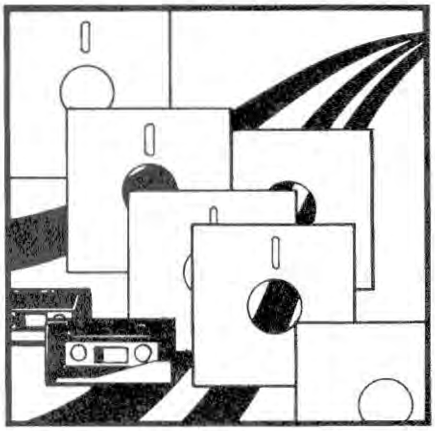
The programs are straightforward and well documented; the author includes hints on debugging them. He makes extensive use of subprograms, easing the task of entering the increasingly larger programs. Most of the subroutines from early chapters are used in the higher level creatures of later chapters. So, for each step up in intelligence only the short main program must be revised and the new subroutines added.

Although the book is a source of much fun and interest, there are a few faults. As is common in Tab publications, the book lacks sufficient editing, as evidenced by the large number of typographical errors. There are typos in the program listings, though the printout "composite" listings at the end of the chapters are generally error free.

The lengthy discussion of the philosophy of machine intelligence in the early part of the book may bother some who are anxious to get to the experiments. I enjoyed the discussion, though it may appear to others that the author belabors the point.

I also take slight issue with Heiserman's comment that, "There is absolutely no programming devoted to telling the creature exactly what it is supposed to do under any particular set of circumstances." I have not tried to prove the point, but I think some of the creature's responses are somewhat less "autonomously self-programming" than Heiserman claims.

These small criticisms do not detract from the fascination if this book and the creature it creates. If you own a computer other than a TRS-80, the Basic is fairly standard, except for the graphics, and can be easily converted by any competent programmer. *Robot Intelligence* will provide many hours of fascination and provoke thoughts about the nature of machine intelligence. ■



dBASE II
Ashton-Tote
3600 Wilshire Blvd. #1500
Los Angeles, CA
$700

by Craig Hilton

Benchmark Standard	dBASE II	Profile II +
Orientation		
Level of required user sophistication	beginner	competent
Quality of supporting documentation	adequate	poor
Ease of Use		
Overall use of entire DBM (human engineering)	excellent	very good
Creating a file	excellent	very good
Editing a file	excellent	excellent
Screen/Report customization	very good	very good
Creating the File		
Maximum number of fields per record	32	36
Maximum size of 1 record	1000 characters	852 characters
Maximum number of records with maximum record size	65,535	2,400
Maximum number of records with 10 character record size	65,535	20,000
Editing the File		
Can one file update another	yes	no
Can groups of records be altered or updated with a single command	yes	no
Number of 'layered'* sort levels possible	unlimited	0
Maximum sort length	unlimited	30,000 char.
Reporting the File		
Screen reports	yes	no
Subtotals on reports	yes	no
Type of reports available	unlimited (in Command mode)	3
General Features		
Support algebraic functions	yes	no
Can non-DBM data be accessed	yes	no
Can non-DBM programs be run concurrent with DBM	yes	yes
Text processor	yes	no
Can routines be programmed into subroutines	yes	no
Speed		
Time to index 1,000 records	70 sec	31 sec
Time to locate a record within a 1,000-record file	2 sec	22 sec
Time to locate a record within a 10,000-record file	2 sec	190 sec
Time to locate and modify a record within a 1,000-record file	2.5 sec	23 sec
Cost	$700	$299

Figure 1

Many powerful Data Base Managers (DBMs) are written under CP/M to reach the widest potential market; dBASE II is one such manager.

Written in Assembly language, dBASE II is a novel approach to sophisticated data base management for the price. Figure 1 details the results of a comparison between dBASE II and Profile II Plus, another popular DBM.

Most data base managers operate exclusively in an interactive mode where the end user manipulates data one step at a time. Programming diversity is generally traded off for simplified data manipulation techniques. DBASE II approaches the "diversity or simplicity" dilemma from a new direction. Adapted from techniques developed by NASA, dBASE provides two entirely separate modes of operation. An interactive mode, similar to other DBMs, allows data manipulation in discrete steps under end-user control. However, it is the command mode that makes dBASE II unique. Like a high-level language, it allows complex sequence functions to be programmed in a Pascal-like structured language.

Many complex routines, that would require numerous Basic statements to accomplish, can be called using dBASE II with a single command: Create, creates an entire file structure; Sort, sorts a file; Total, sums portions of a file; and so on. Through the use of a wide range of qualifiers to the commands, diverse and very sophisticated programs can be written (Fig. 2).

The two modes of operation function in a relational management environment, meaning data elements are represented internally in a two-dimensioned table. Without the internal complexity of the usual DBM hierarchal management environment (where linked lists and pointers maintain data relationships), indexing speed and efficiency are not affected by file length. Impressively quick operations are a result of the relational system. An indexed record can be located in a 100 or 65,000-record file in the same time—two seconds. Each file can handle up to 65,535 records of 1,000 characters each in 32 fields. The only limit to the number of files contained within the system is imposed by the available storage capacity. Two separate files can be used simultaneously, providing extremely fast manipulation of data from one file to another. Non-dBASE programs and files can be used directly under the command mode control, allowing the incorporation of the dBASE power within the user's existing routines and data files.

Included in the newly released updated version is a respectable text editor (sorely lacking in the previous version) and several file-handling enhancements including a fascinating "window-like" Browse command.

Problems? The system suffers from inadequate documentation of its abilities only partially satisfied by the newly updated manual. I am surprised that a system with the sophistication of dBASE is not carefully supported with comprehensive programming examples and a step-by-step tutorial. Be ready to spend hours learning the system's hidden abilities by trial and error. I was also disappointed in the interactive mode report writer. To generate truly customized report formats, plan on writing the formats yourself using the command mode. One more sore point—a file cannot be split between drives. Though not a serious flaw, it does require multiple-drive users to carefully plan file placement.

Overall, this is a very powerful, fast and sophisticated data base manager. I found the efficiency of file organization, speed of execution, and the command mode programming most impressive. In the most rigorous and complex string manipulation operations, where I have previously found most serious DBM problems, data integrity was never compromised under dBASE II. The novice can expect to create useful data base applications immediately. The competent user can expect, by trial and error, to master the command mode functions. The system is capable of fulfilling nearly any data base requirement conceivable in the micro environment.■

Sample Command Mode Program

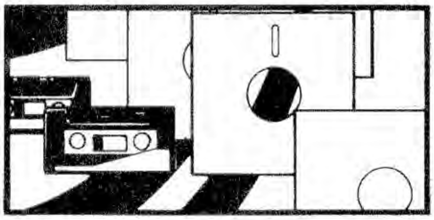
```
CLEAR
USE Test INDEX Test1
STORE 1 to X
DO WHILE X< = 10
  APPEND BLANK
  ACCEPT 'Name' to MName
  REPLACE Name WITH MName
STORE X + 1 to X
ENDDO
```

Here an indexed file is called (Test1), the user is asked for a 'NAME', the name is inserted into the file where it is automatically indexed, and the process is repeated 10 times.

The Enhanced dBASE II Commands

Create	Change	Do	Find	Modify
Copy	Delete	Select	Locate	Call
Report	Recall	Sort	Skip	Erase
Save	Pack	Accept	Do While	Skip
Index	Display	Insput	If. . . Else	Update
Inser	Read	Get	Bell	Accept
Browse	Edit	Sum	Save	Input
Replace	Total	Restore	Clear	Macro
				Append

Fig. 2. Enhanced dBASE II commands and sample command mode program



GR Basic 3.0
Med Systems Software
PO Box 2674-T
Chapel Hill, NC 27514
Models I & III
$19.95 cassette
$24.95 disk

by Bruce Powel Douglass

Med Systems Software sells quality products and provides excellent service and support. Case in point: GRBasic by Simon Smith.

Previously, you had to get different versions of GRBasic depending on your operating system. GRBasic now integrates with any operating system and provides much enhanced graphics and sound capabilities. I received the disk version.

GRBasic comes on disk with three versions, one for each memory size. It comes on a non-systems disk, so TRSDOS users with only one drive have a problem. Med Systems offers a solution to this, however. You may send them a TRSDOS disk, and they will place GRBasic on it for you. They will also pay you back for your postage.

The manual is a small format (5 by 7 inches), but well written and very well reproduced. The manual is 20 pages long and has a very useful table of contents. A short index should be included for memory-size tables and other information that I like to have at my fingertips. The first five pages tell disk and cassette users how to load GRBasic into their TRS-80s. The rest of the manual tells you about the graphics and sound commands.

Besides the GRBasic programs, you also get MISSILE/BAS, a demonstration program, and SEDIT/BAS, a shape-table editor, written in Basic.

When you execute GRBasic from your operating system, GRBasic automatically loads in Basic and begins Basic for you. The commands are integrated into the interpreter's parser, so you only need to type in the command, with the appropriate syntax and parameters, to execute it. If you have improper parameters or have incorrect syntax, you are informed of this error through the normal Basic error routines.

The commands fall into four categories: line drawing—LDRAW(R) and LDRAW(S); circle drawing—CIRCLE(R) and CIRCLE(S); shape drawing—SDRAW(R), SDRAW(S), Size, and Turn; and sound generation—Audio.

The S and R are mandatory and tell if the line or shape is to be drawn using Set (S) or Reset (R). The LDRAW commands draw a line from one point to another, or from the current point to another. It does this very quickly, on the order of hundredths of seconds. To draw a line from (0,0) to (127,47), you enter the command LDRAW(S) 0,0 TO 127,47, or, if the last command drew a line to (0,0), you need only enter LDRAW(S) TO 127,47. You may use variables for these parameters also.

You may chain points together as deeply as you like in a single LDRAW command. For example, to frame the video screen, you could enter LDRAW(S) 0,0 TO

"GRBasic now integrates with any operating system and provides much enhanced graphics and sound capabilities."

127,0 TO 127,47 TO 0,47 TO 0,0. This draws the frame around the screen in considerably less than one second.

You also have a command to draw circles. You must specify the coordinates of the center of the circle and the radius of the circle. The upper limit on the radius is 23, since that is the largest circle that will fit on the screen. A visually interesting program is:

```
10  FOR R=1 TO 23
20      CIRCLE(S) 64,24,R
30      CLS
40  NEXT R
50  GOTO 10
```

This program draws a circle that gets larger and larger and then starts over. Children will enjoy it.

More interesting is the ability to draw shapes from a shape table. GRBasic does this extremely quickly, and as far as human reflexes go, instantaneously. You encode a shape as a set of numbers and POKE it into a block of memory (there is a 127-byte block reserved for this). Two diagrams in the manual explain this fairly well.

"You may also scale or rotate your shape."

You indicate a direction by a number. You have eight directions in which you may move from a given pixel. You have the same eight directions but different numbers if you wish to redraw the line rather than draw it. You terminate a shape with a 99. If you want to draw a box that is two pixels long in the X direction and three in the Y direction, POKE in the numbers 1,1,3,3,5,5,7,7,99. The 1 tells it to go right one unit, the 3 tells it to go up one unit, the 5 tells it to go left one unit, and the 7 tells it to go down one unit. The 99 indicates the end of the shape. You can easily have several shapes in your block of memory. The command SDRAW(S) X,Y, USING N indicates the specific shape. The N tells GRBasic which shape to use. The X,Y tells it where to start drawing from. You need not specify the USING parameter if you wish to use the same shape again, but to reset the pointers, you must use a SDRAW(S) X,Y USING 1.

You may also scale or rotate your shape. The Size N command gives GRBasic a scaling factor to multiply the lengths by. The Turn N parameter, where N is a number between 0 and 255, specifies the number of 45 degree turns to make. This is a bit inconvenient, since you may specify only 45-degree rotations. A better idea would have been to divide the 360-degree circle into 256 even parts and rotate by that factor instead. One problem with all this is that the TRS-80 graphics are 3 by 2 units. Rotation causes some rather strange distortions in shape. The command is useful and it would be difficult to implement in Basic every time you wanted to do it.

You can return to the correct size by entering Size 1. You may return from an N turn by specifying 8–N turns if N is between 1 and 8. The shape drawing uses a clipping algorithm so that if a point drawing is off the screen, no error will result since the point will be drawn in extended space. There are several such algorithms in existence, and this one works well. This algorithm solves a potential problem with rotations and scalings.

The manual also gives instructions on how to POKE the shapes into strings, and how to tell the shape-table pointer where to look.

The last command GRBasic provides is Audio. This command permits the production of tones over an amplifier connected to the TRS-80's cassette port. The Audio command is interesting in that you may play a single tone for a set duration, or you may play a scale of tones from one to another using the given duration. The syntax is Audio X,Y,N. If X=Y then a single tone is played, otherwise a range of tones is played from X to Y (if X<Y) or Y to X (if Y<X). N is the duration of the tones to be played. You may specify a fourth argument, and it indicates the number of times the Audio X,Y,N command is to be played. You can get some very interesting tones from this command and it significantly enhances the overall package.

GRBasic is a useful tool for the development of games and even some plotting programs. It allows you to view things in a variety of perspectives and provides very useful line, circle and arbitrary shape-drawing commands, as well as sound producing commands.

As good as GRBasic is I would like to see the following improvements: Change the Turn command as mentioned; allow the user to input three-dimensional objects and have GRBasic display the two-dimensional isoclines of the figure (projections of the figure onto a plane); and change the Audio command so that you can play musical scales (minor and major).■

✓See List of Advertisers on page 386

Uniterm
B.T. Enterprises
171 Hawkins Road
Centereach, NY 11720
Models I & III
$79.95

by Sal Navarro

Uniterm is short for Universal Terminal Program. According to Webster's, universal means "pertaining to, or characteristic of all." This word totally explains Uniterm.

Regardless if you have a Model I or Model III you only need one terminal program for both. It can be used with NEWDOS+, TRSDOS, DOSPLUS, LDOS and NEWDOS80 Versions 1 and 2. The minimum system requirements are a Model I or III with one drive and 32K of memory and some type of serial interface, either an RS-232C interface, Lynx modem, Chatterbox modem or Microconnection modem. The manual comes in a looseleaf binder with 74 pages of comprehensive user instructions. It also gives tips on how it can make your communications easier.

Getting Started

When you first turn on the computer, you can initialize a Command I and set up a INIT/PAR file with the parameters you will be using for that type of communication. You have to answer a few simple questions such as Auto Log-on Message and Sign-on Message. I answered my ID number for the log-on message and my password for the sign-on message. Now when I enter Micronet I just give an up arrow-C and an up arrow-S and I have transmitted my ID number and password with just two keystrokes. All of these parameters are stored on the disk, and every time you call up Uniterm it automatically initializes all that you need.

Command Mode

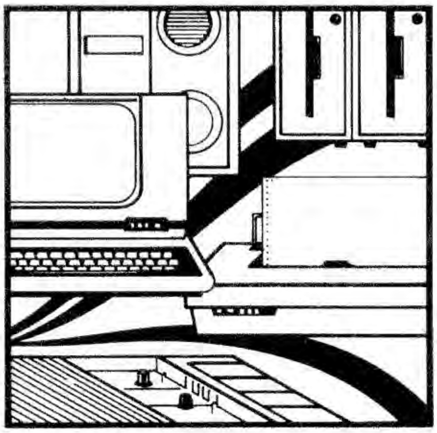
The following is a summary of the command mode.

A—auto buffer open/close: This is a powerful feature that allows Uniterm to accept a clean copy of text from the host computer. It allows the host to open and close your computer's buffer automatically, and the text will be ready to be saved to disk.

B—load/save binary file: The command B allows you to send and receive binary files automatically. Uniterm converts them to ASCII before transmission and before saving them to disk.

C—close buffer: This command allows you to manually close the buffer.

D—display/print buffer: Unlike many



other terminal programs, Uniterm allows you to look at your buffer to see what you are about to send or what you have just received. You can also send the contents of the buffer to your line printer.

E—exit to DOS: If you want to return to DOS for a moment to check something, you can by the command E. You can then return to Uniterm by the R/CMD file included with Uniterm.

H—half/full duplex: If you want to change from half duplex to full duplex while in Uniterm, you just have to do a command H and enter either an H or F.

I—define your initialization parameters: These parameters are usually set up just once the first time you boot up Uniterm. The exception is if you are using a different number of systems that require different parameters. In this case you can make up different files for the different systems or different disks set up for the particular system.

L—load ASCII file to buffer: Command L loads any ASCII file that has been saved to disk either by the command S or one of the word processors. In this mode you can also add to the contents of your buffer, in effect combining two or more files than you would by resaving to disk or transmitting them to another computer.

M—change modem parameters: To temporarily change your modem parameters, you use this command. The permanent change is done via the command I.

O—open and zero the buffer: The command O can manually open and zero the entire buffer. This way the only thing in the buffer will be what you are receiving at the time. While in this mode you can toggle the buffer open and close with a shift-@. Doing this you can capture only the data that you want, such as specific messages on the bulletin board.

P—send buffer in prompt mode: The command P transmits what you have stored in buffer.

R—send buffer with auto open/close buffer codes: This feature is designed to

"Uniterm conforms to the way you want to do things."

be used with the Auto Buffer feature for automatically opening and closing the buffer during transmission.

S—save buffer in ASCII format: The S command automatically saves your buffer to disk in ASCII format.

T—transmit buffer: This sends out the entire contents of the buffer in block format. This means that it keeps sending the contents as long as the receiving system does not halt or abort the transmission. While in this mode and in full duplex, reliability increases tremendously.

W—set screen to desired width: W allows you to set your screen width to any desired length up to 64 characters. By using a smaller value you are assured of no words being broken up.

X—type to buffer from keyboard: This very handy feature lets the operator add text to the buffer before sending to another system or saving to disk.

Z—display this command list: Activating the command Z displays all the command codes and what they are for. This is handy in the beginning while you are still learning the codes.

The Manual

A glossary of terms is included in the manual. It fully explains different words and phrases used in smart terminal programs. There are sheets on how to build a special table if you so desire. If at any time there is an update for Uniterm, there is a sheet explaining how and where to get it off a bulletin located in your section of the country. A technical information section explains overlays and locations that Uniterm uses and for what. A list of public access systems that are in use around the country is also provided. It includes what type of system, phone number, access hours, baud rates and special interest codes for the particular system.

Summary of Uniterm

I have been using Uniterm first with my Model I with a Novation Cat and RS-232C, and now with my Model III with a Lynx for about six months. Now that I am used to the command and control keys I find it a lot easier to use than the terminal programs that I had been using before. Uniterm conforms to the way you want to do things. ■

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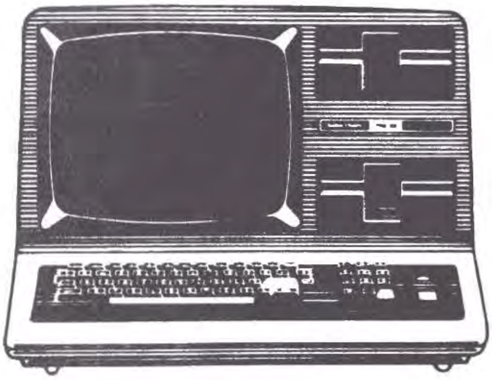

GAMES GAMES GAMES

The computer was not meant to be ALL business! We carry a complete stock of Adventure & Arcade style games. Each game has been subjected to extensive testing by one of our less productive staff members. (* denotes rated great!)

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Packer 1.5
Cottage Software
614 N. Harding
Wichita, KS
Models I & III, 16K, 32K or 48K
$29.95

by Tim Knight

Most programmers aspire to write programs which are fast, efficient, and tidy looking. Unfortunately, the process of debugging and modifying often results in a program less tidy or efficient than planned. Packer 1.5 solves some of these programming woes.

Packer 1.5 is a machine-language program which enhances the Basic of a Model I or Model III with or without disks. It is especially helpful to non-disk owners since it provides some commands not found in other non-disk systems. The package, made and distributed by Cottage Software, is one of the most helpful command-adding programs on the market—next to Level III Basic by Microsoft.

After loading Packer, it is immediately up and running. Basic programming and all regular commands and functions are the same. In addition, Packer provides some extra commands using the Disk Basic command Name (which now works on any system, whether tape or disk). The commands are entered as Name xxxx: BLN,ELN", with xxxx as the command, BLN as the beginning line number, and ELN as the ending line number.

Commands

The Short command packs the resident Basic program by removing unnecessary words, spaces, and remark statements. When any of the commands are implemented, a *beginning* byte count is shown. At the completion of the command execution an *ending* byte count is flashed on the screen. This is very useful in helping a user keep track of the space being saved, and see directly the benefits of using Packer.

The second command, Unpack, does exactly what it sounds like. Unpack breaks the program into single-statement lines, places spaces between all data statements, and also between almost every keyword in Basic. This results in a very neat looking program, though somewhat less efficient, and consuming a great deal more memory. If you are wondering how this is useful, consider debugging packed program lines. Problem spots are always easier to spot in well spaced, unpacked program lines. Also, some magazines prefer this type of listing when submitting programs, and the magazine reader will appreciate them since they are easier and less bugprone to type.

The Pack command condenses the program as much as possible making it highly memory efficient. This command maintains all program logic. If two lines should not be joined, Pack will not join them.

Many Level II users have longed for a command to renumber their programs. Packer supplies this function with the Renum command. A program may be renumbered in any way desired.

The last command is Move. As the name implies, it moves any block of program lines to any place in the program.

I highly recommend Packer 1.5. Anyone frustrated with the limitations of Basic should consider it for his or her software library. It is easy to use, extremely well documented, and for the money, the best utility I have bought for my TRS-80. ■

Smart Terminal Program
Howe Software
14 Lexington Rd.
New City, NY 10956
$69

by Richard K. Wallace

Smart Terminal Program (STERM) is designed for a 16, 32 or 48K tape or disk-based Model I or Model III. STERM, with an RS-232 and modem, allows access to another computer over telephone lines. In addition, the terminal program can transfer files to or from the host system. STERM contains features not found in dumb terminal programs such as Radio Shack's Videotex, but is plagued by limitations not evident in many disk-based terminal programs.

Features

STERM's communications parameters can be set to conform to the requirements of the host computer. The baud rate, full or half duplex, the number of bits per word, the number of stop bits, even, odd or no parity, and a line feed after carriage return option are all software selectable.

STERM can store whatever appears on the screen in a memory buffer and dump the buffer on command to a disk file, a tape file or a printer. Disk and tape files can be read by both Scripsit and Electric Pencil. In addition, everything on the screen can be simultaneously routed to the printer, with or without saving it in memory. You can type text or programs directly into the memory buffer for later transmission to the host computer one line at a time, upon receipt of a one to five-character, user-defined prompt string, or continuously. Files to be transmitted may also be prepared with Scripsit or Electric Pencil, saved to tape or disk, and then read into the memory buffer by the terminal program. Disk users can read and store Basic programs in disk files. The host computer can automatically send and receive data from the TRS-80's memory buffer if the host is capable of sending Standard Device Control Characters.

Other special commands include a true break code and an exit to DOS without rebooting. All available commands can be displayed on the screen. The user can redefine the control keys to transmit any ASCII character. Thus, symbols such as {, }, [,], and / can be sent to the time-sharing computer, although they do not appear on the TRS-80 keyboard.

Faults

STERM allows considerable communication flexibility; however, it contains several shortcomings. For example, only alphabetic control keys can be redefined to send arbitrary ASCII values. Since many keys already correspond to necessary control functions (cursor motions and line feeds), and the TRS-80 keyboard lacks many standard characters, the program would be more useful if it allowed definition of numeric control keys. Note also that defining a key only allows the transmission of that character through the RS-232. Special characters or control codes cannot be typed into memory for later automatic transmission.

Unless you have a disk-based system, Basic programs and data cannot be read into memory for transmission to the host system. For example, one could accept stock prices from an information network, but not store those numbers on tape for subsequent processing by Basic programs. Also, if you regularly require a specific communications protocol other than the default values or special control key definitions, you must set these values every time you load the program. There is no way to save the parameters to disk or tape.

Any data stored in memory can only be scanned one line at a time. After displaying the current line, the line pointer must be moved forward one line and the current line displayed again. This process repeats to slowly scan memory. Additional minor complaints include the lack of absolute cursor positioning and no provision allowing the system clock to keep track of connect time. The Model III version only comes on a 500-baud cassette, making

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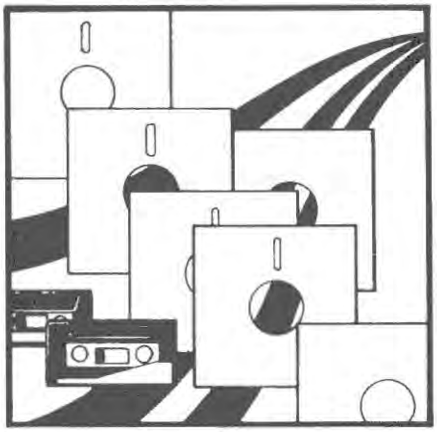
"The documentation is fairly clear."

tape reading and writing unnecessarily time-consuming.

The detailed documentation is fairly clear. Only the discussion of changing baud rates and redefining control keys is confusing; however, experimentation with those commands should clarify their use. The most significant omission in the program package is that of a telephone number. If you experience any difficulty with the software, you are completely on your own.

In summary, STERM provides many features not found elsewhere for tape-based computers. Disk users may prefer the significant advantages of somewhat more expensive programs such as ST80-III or Omniterm. ■



The Patch Version 2.0
CECDAT Inc.
Box 497
Hayden Lake, ID 83835
$125

by Bruce Powel Douglass

The Patch is a lowercase modification that requires *no software* to drive it. It interfaces with the ROM chips inside the keyboard and monitors the calls made to the ROM. When something relevant to its operation is called, it takes control and substitutes its own bytes rather than those from the Level II ROM. You can also get (optionally) a shift-lock (just like a typewriter) and a block cursor. The lowercase is up and running as soon as you turn on your machine. You can turn the lowercase on (press Shift-up arrow) and off (press Shift-down arrow). You can, therefore, revert to an uppercase-only keyboard with a double keystroke. The lowercase works with all the word processors as well as all DOSes, if you happen to have a disk-based machine. Some of these have to be modified slightly, but I'll get to that in a moment. The Patch is also compatible with Omikron's Mapper I and works without problems with this modification.

The shift lock is a useful feature. By tapping the shift key, you can go temporarily into all uppercase mode. You stay here until you hold down the shift key for a slightly longer fraction of a second. It takes only a few tries to become proficient at switching modes, but there is a slight problem with this if you use it with a disk-based machine.

Most DOSes currently have a debounce feature to get around the keybounce problems of the Model I. This debounce must be defeated for the Patch to work correctly. The Patch debounces the keys by itself. The manual shows the zaps to the various operating systems including TRSDOS 2.3, NEWDOS80 versions 1.0 and 2.0, NEWDOS+, Exatron ESF, and DOUBLEDOS. Several DOSes are not mentioned. MultiDOS users can defeat the keyboard routine by holding down the shift key during the boot. Other DOS users will have to consult the manufacturer of that particular DOS. This problem appears only if you also have the shift-lock option.

What's the Catch?

The Patch requires more extensive modification to your TRS-80 than you may feel comfortable doing. It involves cutting a trace, removing the ROMs and replacing them with a printed circuit board, and soldering in a piggy-backed chip and a few other wires. Although my experience should not necessarily be considered normal, I did have problems.

I am all toes (that's somewhat worse than all thumbs) when it comes to hardware. So rather than install it myself (and risk destroying my precious computer), I asked the electronics expert to put it in for me. The result was that the computer refused to function at all, even after removing the unit and trying to reconstruct the system. I called CECDAT. They tried to be helpful, but nothing worked. They advised me that I could send them the keyboard and they would repair it for $15 per hour, half their normal rate. So I sent it off, but it failed to work when I got it back. Fearing the worst, I opened the keyboard and found that in shipping, the PC board had come loose. After replacing it, it worked fine, and I have had no more problems with it.

"They tried to be helpful, but nothing worked."

Even if you know what you are doing, it is possible to screw up this modification. I am not sure what went wrong in this case; CECDAT advised me that all they did was clean up the soldering a bit, although we checked it thoroughly before we sent it. If you send them your keyboard, they will make the modification for you. You pay the shipping expenses both ways. If you are unsure of yourself, you might consider that option.

The original instruction manual I received was not very well written. It tended to verbosity on trivial things, and was vague on more important matters. This problem appears to be removed with the new instruction manual which includes drawings of the circuit board, where relevant, and takes you by the hand and leads you through the modification procedure. Even I could do it with these instructions, but after my previous experience I am not anxious to try.

The manual also includes a program listing to use if you ever have to remove the Patch chip from the circuit board and return it for repair or update.

The nicest feature of the new manual is that a large number of error symptoms are listed with a complete description of how to overcome them. For example, if you turn on the computer and get a screenful of squares, your ROM is unplugged. This troubleshooting guide is handy, and probably necessary.

If you are serious about having lowercase for your computer, the Patch is the best modification around. This is true because it does not require a lowercase driver program to operate, and also because you can have a hardware shift lock with the shift key. These two features definitely make it worth the time and money. ■

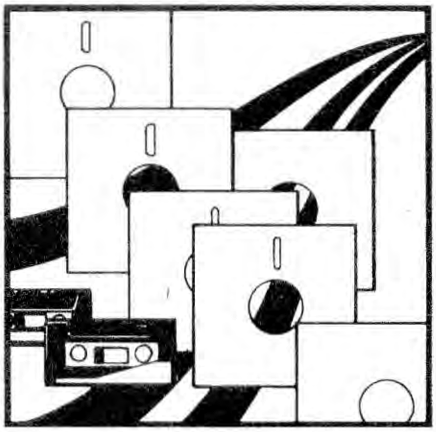
Wordsmith
ABS Suppliers
3352 Chelsea Circle
Ann Arbor, MI 48104
$19.95 cassette and disk

by Hugh M. Ruppersburg

Wordsmith is an extremely inexpensive word processing program produced by ABS Suppliers of Ann Arbor, MI. It is written in Basic in two versions: one for 16K machines without disk, the other for 32K machines with at least one disk drive. The 16K version is generally identical to the disk version, though it lacks the latter's search and kill functions and requires the B-17 Tape Operating System, marketed by ABS, to run. The disk version which is reviewed here comes on cassette and can be CLOADed under Disk Basic and then saved to disk.

Wordsmith is one of the least expensive word processing programs available. Though it might satisfy a hobbyist interested in playing around with word processing for casual letter writing or keeping a diary, it will not suit those who want to use their computers for more demanding writing applications. Wordsmith *will not*—its claims of being time-saving and elegant to the contrary—make such projects as writing term papers, newsletters, or books easier. It requires an intolerably slow typing speed which only masters of the hunt-and-peck system will feel comfortable with. Typists who work at moderate to rapid speeds will find that Wordsmith has difficulty keeping up with them, often losing characters (especially at the beginning of lines), and occasionally locking up completely until typing stops. Many hunt-and-peck typists who do not need the sophisticated capabilities of Scripsit or Electric Pencil will find Wordsmith satisfactory.

The instructions which accompany your cassette are clearly written and accurate. With the exception of the editing function, most of the program is simple enough; you should be able to use it without difficulty the first time you load it. After you run Wordsmith, the screen inquires whether you want to use the lowercase option. If you answer yes, after a few seconds a message appears informing you that the lowercase option has been loaded and that you should type run once more. Once the lowercase option has been loaded, the first 10 lines of the program, which enable lowercase, are deleted from memory, so be sure to save the program to disk before running it. Otherwise you will lose the lowercase capability and will have to CLOAD again to regain it.



Once in the lowercase option, the computer asks what line length you want to use. (Wordsmith allows a length of up to 60 characters.) Then a menu appears listing the 14 program functions. To begin composing, type F for Fill and a column of 15 numbers, each representing an empty line, appears on the screen's left side. A heavy vertical line on the other side of the screen marks the right margin. You type in your text in the normal manner. Wordsmith features word wraparound, which means no words will be split in half at the ends or beginnings of lines.

Unfortunately, Wordsmith does not allow simultaneous composition and editing, and its menu-oriented design is a definite disadvantage. In the fill mode you can delete words only by typing over them, an arduous process since the cursor backspaces very slowly. Insertions, deletions, and other changes must be accomplished from the edit mode. To edit, exit the fill mode by pressing Clear, which returns you to the menu, where you type E. To make an insertion, press shift and the up arrow keys simultaneously. Then move the cursor to the desired position on the line and type in as many characters as the line length allows (the text does not automatically adjust itself past the end of the line as in more sophisticated word processors, so the number of inserted characters may not exceed the number of empty spaces in a line—another drawback).

Deletions are accomplished more easily by typing D, which deletes the character beneath the cursor. Characters can also be changed simply by typing over them. Although the cursor moves slowly in the edit mode, you can speed things up a bit by using a character-search function: Press Enter, type the letter you are looking for, and then the number of its occurrence (the first occurrence, the second, and so on), and the cursor positions itself on that letter. You exit the edit mode by typing Shift and @ twice simultaneously.

Editing is also possible in the delete and insert modes of the menu. If you press D, the computer queries the number of the line or lines you wish to delete. When you answer, Wordsmith deletes the lines, renumbers the text, and returns you to the menu. Single words, sentences or paragraphs cannot be individually deleted, only lines and whatever they contain.

If you type I, the computer asks for the number of the line where you want to make an insertion. Once you answer, Wordsmith displays the text with the cursor at the beginning of that line. You can then move the cursor to the desired position and begin typing your insertion. Unlike insertions in the edit mode, additions made through the insert mode can exceed the line length, and the computer renumbers the text to accommodate the added material. If you finish inserting and find yourself in the middle of a line, however, the text below will not readjust upwards, and you will find a big hole in the middle of a paragraph unless you can find some way to delete or add enough words to fill in the gap. A move mode also allows you to move up to 47 lines of text at a time, while a search feature locates every occurrence of a specified word or phrase in the text.

Wordsmith's editing functions are cumbersome. Most writers, whether amateurs or professionals, edit as they write—trying one word, discarding it, trying another, and so on, until they happen upon the right one. They insert, delete and move sentences and paragraphs around constantly. Word processors are designed to make this particular aspect of writing much easier, and the good ones do. Wordsmith does not. You cannot make changes unless you return to the menu and enter the edit mode, an irksome distraction which may break your concentration, and which wastes time.

Once you have written your text, Wordsmith allows several means of formatting its appearance for display on the screen or on the printed page. Menu functions allow the centering of individual lines, as for titles or subheadings, and right justification. The print mode allows more latitude in formatting. You can print all of the text or only the lines which you specify, with or without line numbers. You set the left margin, call for single or double spacing, automatically number pages in sequence beginning with the page number you indicate, and determine the number of lines printed on each page.

Designed for use with the MX-80 printer, Wordsmith provides several functions related to that printer's capabilities, including specified print density, emphasized strike, and double strike. I was unable to print the text I wrote with Wordsmith. ABS provided me with the MX-80 control codes, but I use my TRS-80 primarily for writing and bookkeeping; I cannot write programs or make program changes without written guidance, so I was unable to modify the program to print through my Daisy Wheel II. Prospective Wordsmith purchasers who do not own the MX-80 should be aware that they will have to modify the program so that it will work with their own printers.

Wordsmith provides no way of exiting the program. You can press Break, of course, to reenter Disk Basic. To return to TRSDOS, however, you must press Break and then type NEW to erase the program from memory. Otherwise, Wordsmith will rerun each time you try returning to TRSDOS. If you use Wordsmith in lowercase, you must reboot or reset your computer to escape the lowercase driver which is part of the program. I found no other way to escape the driver. When I returned to TRSDOS and tried loading Scripsit, the screen exploded into chaos.

In comparison with more expensive, more sophisticated word processing programs, Wordsmith has little to offer. If you do not need one of those expensive programs, or if you are not a fast typist and you would merely like to use your computer to write letters to friends or to make notes, then Wordsmith might be exactly what you are looking for. Its low price is hard to argue with. If you want to make serious use of microcomputer word processing, though, look elsewhere.■

ICL (Interactive Control Language)
XYZT Computer Dimensions, Inc.
2 Penn Plaza, Suite 1500
New York, NY 10021
Models I & III, 32K
$59 disk

by Bruce Powel Douglass

Those who have worked on mainframes need no introduction to a job control language (JCL). For the rest of the microworld, a JCL is a language that controls how the computer processes programs and commands. A JCL supervises the operating system and controls its function. This is important in time-sharing systems, but how useful is it in a one-user microcomputer?

ICL is a simple job control language for TRS-80 microcomputers with NEWDOS 2.1 or NEWDOS80 and 32K or 48K RAM. ICL is an interpreted language, as any JCL must be. It controls various DOS commands and functions and allows you to program any order of their execution. The simplest example of a use for ICL is running batches of programs that require no intricate program intervention or supervision. Who wants to sit around and load programs and watch them execute? ICL frees you from supervising your computer.

ICL can load and run DOS programs with interpretive control over their execution, with as little as one command. As an example, those of you who have used BASCOM from Microsoft know how many commands it takes to compile a Basic program: write the program, store the program, run the compiler, specify the source and object file names, run the linker, link to BASLIB, and so on. That can take a long time. ICL allows you to enter, with a single command, all those commands and put them in a keyboard queue. When keyboard input is expected, ICL automatically loads whatever is in the keyboard queue for keyboard input rather than require you to sit around and type in predetermined answers to the queries.

A queue is a line. It is similar to a stack. A stack differs from a queue in that a stack operates with a last-in, first-out logic, whereas a queue has a first-in, first-out ordering. ICL lets you set up a keyboard queue, and then as keyboard input is required by some program (as in an input statement), ICL checks to see if the queue contains data. If so, it substitutes its data for a keyboard answer.

But other programs on the market do that. IRV, from Programmer's Guild, and KBE from The Alternate Source, both have that capability. What makes ICL a language, rather than a macro-key definition program (such as the other two programs mentioned) is the implementation of control constructs.

A control construct is a language element that controls the logic flow of a program, such as GOTO, If, and so on. KBE has a simple conditional control construct, which The Alternate Source refers to as conditional macro-key expansion, but this capability is limited. KBE is not meant to be a language; it is a full screen editor with some fancy capabilities. ICL, on the other hand, has full control constructs making it a true, although simple language.

The Manual

One of the first things I look at when I review a software package is the manual. It is here that most programs are made or broken. The ICL Manual is better written than most I have seen, although it is not the best. The writing is a bit terse, and I doubt that a relatively new computer user could follow all of it. Several examples are: a useable table of contents, an alphabetical reference section of the commands and pseudo-ops, examples to aid learning the language, and an Advanced Techniques section for developing skill in more interesting uses of ICL.

On the other side of the coin, the manual ought to be indexed, and the use of variables could be better explained. The manual is a better reference than tutorial. As a tutorial, it lacks depth and breadth. The Programming Methods section could be expanded to benefit the user.

ICL Cometh

You must specify whether you have NEWDOS 2.1 or NEWDOS80 in order to receive the proper format disk, although the program actually works with both. Some of the programs are ICL32/CMD and ICL48/CMD (an interpreter for all seasons), L/ICL, EXEC/ICL, DEBUG/ICL, FGO/ICL, QDIR/ICL; and RNAME/ICL, MKILL/ICL, and LNK/ICL.

Except for the first two, all the programs listed are example ICL programs. To begin using the ICL interpreter, you boot up and enter ICL32 or ICL48, depending on your memory size. The interpreter performs a few house-cleaning chores and then returns with &DOS READY =00=. You may enter all DOS commands in the normal fashion, as well as execute ICL programs. The L/ICL program lists ICL programs, for example. To list LNK/ICL, you need only enter L LNK.

The Language

The five divisions of commands are I/O commands, I/O support commands, commands for ICL interpreter, commands initiating execution, and commands handling control interception.

ICL is a semi-structured language in that it supports procedures, labels and line numbers, as well as variables. Before a given ICL line is executed, all the variables are parsed and their values are substituted into the expression. Variables can be combined in interesting ways. A variable for ICL is preceded by an &. You can assign a variable a value in your program, or get the value from user input via an &READ command. You may have the line 10 &A = 1100 or 20 &B = &A22. If these lines are both in the sample program, the value that is substituted for B in line 20 is 110022. A bit different from Basic, at least. You can even assign numbers to be variables, provided they are preceded with an ampersand. Thus, 40 &1100 =

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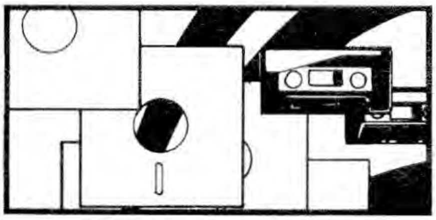
+ + + + + + + + followed by 50 &TYPE &&A transforms line 50 (after substitution) into 50 &TYPE + + + + + + + + . The variables may be used and substituted in a very flexible manner.

ICL is a procedure-oriented language, which is also different from Basic. You may execute an ICL procedure either by entering it directly from DOS, or by calling it with an &RUN command from another procedure. Nesting your procedures adds greatly to ICL's power.

Logic-flow statements within a procedure are the &GOTO, &IF, &JUMP, &RESUME and &RUN. The &GOTO causes program execution to begin at some specified label. &IF is the conditional statement in ICL. Its format is &IF operand_1 condition operand_2 statement. The conditions are equal, not equal, greater than and so on. Interestingly, the writers of ICL chose not to use the more common Boolean operator symbols and used two-letter abbreviations instead. This may be to stress the point that all comparisons are arithmetical and not logical.

As an additional illustration of how variables are different than in a more classical programming language, the variables are substituted into the expression before evaluation. If &A is a null variable, the expression &IF &A EQ YES &GOTO -ADDRES will be expanded into &IF EQ YES &GOTO -ADDRES, which is an invalid statement, since the &IF construct requires two operands. However, you can concatenate a character with the variable to make sure that the statement remains valid. The example given in the manual is



&IF .&A EQ .YES &GOTO -ADDRES which, in the case of &A being a null variable, will expand into &IF . EQ .YES &GOTO -ADDRES, which is valid. I think that this flexibility may make for some interesting programming tricks and short-cuts, once you become adequately acquainted with the syntactical possibilities.

ICL has some other useful capabilities. You can display text messages, read data from the keyboard, clear the keyboard queue, cancel a running program, specify a number of options, output text to the printer, place text in the keyboard queue, or suppress display of text. The options mentioned above include: disable common video display driver, toggle the display of the current ICL line being interpreted, turn on/off the keyboard queue, allow for single-byte keyboard requests, copy display output to the keyboard queue, enable/disable non-alphanumeric characters to be present in data taken from the queue. ICL also returns an error code, displaying the execution state of the last procedure.

The DQ, or direct output to queue, option makes ICL a usable product. Since you have the &READ command, it is simple to run a program and process the output differently depending on the nature of the output. Perhaps a simpler way to say this is that you can place a running program's output in the keyboard queue and then &READ it, giving you the ability to analyse the output of said program and to continue processing in a manner appropriate to that output.

For example, you may have the old water-powered disk drives that are, at best, flaky. BASCOM is a tedious compiler to use with such drives, since it takes a long time to run, and if it fails you must redo the process. If the problem is in the drive, it may just require that you recompile it, and then it may (or may not) store the program correctly.

Manual control of BASCOM under such circumstances can be a real pain. But ICL allows you to read the output, and if the compilation was unsuccessful, you can recompile it until it works. You can further check for the type of error made. If it was a Fatal Error message, you can &EXIT the procedure, but if it was a Parity Error, you can retry the compilation process. Then, when it finally runs, you can go ahead and link it with the linker, and even execute your compiled program. All with no user intervention!

ICL is an interpretive job-control language for disk operating systems. While the language is simple, it is sufficiently powerful to automate many of the more tedious procedures that we all have to perform in using our computer. After all, computers are supposed to *save* us from work, right? ICL is a good product, and may be just what you have been waiting for. ■

TDS/DFT
Bob Withers
Big Systems Software
27574 Via Rosalie
Mount Clemens, MI 48043
Models I & III, 16K
$29.95 and $19.95 respectively
$40 for both

by Tim Knight

If you have a modem for your computer, you should not be without TDS/DFT (Tape Downloading System and Direct File Transfer).

These two programs are machine-language smart terminal utilities. TDS is similar to many "smart terms" on the market, but it is extremely easy to use and comes with two supplemental programs which complement it well. DFT, on the other hand, is of a different sort; it can transfer machine-language programs directly. DFT uses a utility to transfer any kind of file without conversion. This is a plus for anyone who enjoys downloading and uploading (the process of receiving a program through your modem, and vice versa). DFT also has many extra features which will come in handy as your expertise develops.

Before receiving TDS/DFT, I had never used a smart terminal before. Except for one initial problem, the well documented manuals explained the programs' use clearly. My only problem occurred when I first loaded TDS and attempted to call up the system. I had absolutely no results. I soon discovered that with a Model III and Lynx modem, I must enter the command POKE 16912,56 before using the program.

TDS Features

In addition to uploading and downloading, I can access Basic directly by pressing Clear. After receiving a Basic program via downloading, I can go directly to Basic and run, edit or save the program to tape. You cannot LPRINT it since LPRINT sends programs to the uploading computer. Other useful capabilities are: support of all ASCII control codes, including upper and lowercase; 10 different transmission speeds; and 10 user-definable control keys.

One of the supplemental programs, SYSCVT, changes a machine-language program to an encoded Basic program. This Basic program will not work until you use SYSCVT to change it back to a machine-language program. This procedure allows you to save the Basic version to tape.

What good does this do? Very little if the computer operator at the other end does not have the TDS package. That other operator has to undo your conversion. If the operator does have TDS, transferring machine-language files is

GIMME FIVE! BIG FIVE, THAT IS

DEFENSE COMMAND

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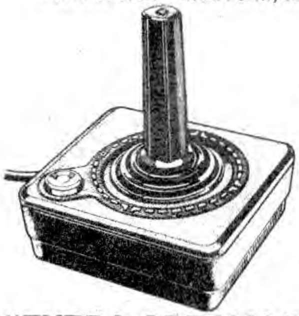

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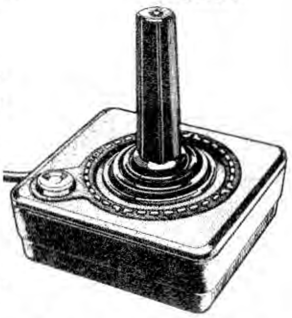

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fairly easy. You load the machine-language program, use SYSCVT to change it into Basic, save the Basic program, load the Basic program with TDS, and send the file to the other operator. That operator then reverses the procedure. The need for both operators to have TDS is a severe limitation though.

The second complementary program is AUTOL. This one is easier to understand than SYSCVT. After loading AUTOL, you type a log-in code (the code which gets you into bulletin boards such as Connection 80), and use that code whenever it is needed. This cuts down time on-line by bypassing the need to log in manually with first name, last name, city and state. All I do now is press shift @.

"The first option. . . Chat. . . can be used when logging on to the host computer, or to "chat" with other computer operators."

DFT

The DFT system is primarily downloading and uploading oriented. Direct File Transfer is a simple way of transferring Basic and machine-language files as opposed to all the loading and saving required by SYSCVT and TDS. After loading DFT, a menu is displayed. The first option is Chat. Chat can be used when logging on to the host computer, or to "chat" with other computer operators.

The second option is the most useful: File Transmission. It requires no ASCII-to-hex conversion. You can send and receive files with File Transmission, and most of the procedure is performed by the two computers on-line. All you do is hit one key and the program either comes to you or your program is transferred to the host computer. Again, the disadvantage is that the host computer must also be DFT oriented.

DFT is becoming more popular, though, with more bulletin boards using it. For example, Westside Downland of Detroit, MI, maintained by Ralph Landry, uses the program. Westside Downland's number is (313)533-0254, and it is free.

The third option changes the baud rate from 110 to 9,600, alters the Chat-mode duplex (half or full), and contains commands for input/output to the tape recorder or disk. A high/low cassette rate option is included in the Model III version of DFT.

I recommend that you buy the two programs as a unit; you will save money on some excellent utilities. ■

EPROM Programmer
Model AN-551
Design Solution Inc.
Box 1225
Fayetteville, AR 72701
$99.95

by Mel Patrick

With the increasing number of development systems and add-on options for the TRS-80 Model I you need an economical method of programming your own EPROMs. Low cost programming units have only recently become available to the occasional user. Before that only commercial programmers were available, but their cost was so high that the hobbyist was hard pressed to justify the expense.

I was only one of many in this position and had to have my EPROMs programmed by a local electronics firm. Since most of these firms charge by the hour for entering the data into the EPROM, programmer cost is an important factor. I calculated that after I had three EPROMs programmed I could have purchased my own unit.

The Model AN-551 EPROM programmer manufactured by Design Solution Inc. is a simple unit that enables anyone to program their own EPROMs with a low-cost outlay.

The Programming Unit

The EPROM programmer comes assembled and tested with its own power supply and instruction manual. The unit will program the two most common EPROMs on the market today: the 2716, a 2K byte device, and the 2732, a 4K byte device.

The instruction manual contains all the information on the concept, connection and programming. Two Basic programs enable the user to program the 2716 and the 2732 EPROMs. The user must enter the programs; they are not supplied on cassette or disk (programs are only 17 lines long). The programs transfer data from the TRS-80 memory to the EPROM and verify the data to ensure its accuracy.

Although the initial advertisement for the EPROM programmer stated that information could be copied from ROM to EPROM or load TRS-80 memory from either ROM or EPROM, the software listings do not include this facility. However, since the programs are in Basic, this is fairly easy to accomplish yourself.

The unit is in a plastic case measuring 6 by 4 by 1 inches and has a 40-pin edge card connector protruding from one side. The user must construct a special cable to connect the programmer from this bus to his system. The cable is simply a ribbon cable that has a female 40-pin edge card connector on opposite sides of the cable. A standard extension cable will not work because of the configuration of the EPROM edge card bus.

On the face of the unit are three switches that control the power on/off, write/read, and 2716/2732 mode option. Two LEDs indicate the status of these switches. There is a standard 24-pin socket for the EPROM. No zero insertion force socket is provided although the user could easily install one. A jack on the top of the unit provides a connection for the power supply. The power supply is 12 volts ac, not dc as you might normally expect. The programmer requires 26 volts during the programming mode and a dc adapter would not supply that, hence the reason for the ac transformer.

Programming Operation

To program with the unit, you must have a blank EPROM. To verify that your EPROM is blank simply read all the address locations and make sure their data is 0FFH or 255 decimal. If your EPROM is not completely blank you must erase it with an ultraviolet light. The lamp source should have a rating of 2537A (spectrum frequency) and deliver a dosage of at least 12000uW/cm_2. Using a source like this takes about 12-20 minutes to completely erase the EPROM.

This method requires that you either have access to such a light or you buy one. These light sources are fairly expensive and hard to justify if you are not going to use it much. As an alternative I bought a light that is normally used for checking stamps. The lamp has two filters for different spectrums of the ultraviolet range. To use this lamp, remove the filters and the filter holder to expose the bulb. Place the EPROMs about 1/2 inch below the bulb

MULTI-USER OASIS HAS THE FEATURES PROS DEMAND. READ WHY.

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and turn it on. It should take about 12 minutes to erase the EPROM (which will get very warm, so allow it to cool before using it). The light source emits a light blue light; *do not* look at it.

Once the EPROM is blank you have to enter the information you want to transfer into memory. The software listings will not load a program into that location for you. You will have to use a machine-language monitor or devise some other method of loading the program at 7000H (starting address for data transfer).

Connect the unit to your computer. Place the switches in the proper positions and run the program. The software programs the EPROM and verifies it for you in about 300 seconds. If during the verification process you obtain an error all you can do is erase the EPROM and try again. If errors are still present you may have a bad EPROM.

You should place an adhesive label over the window on the EPROM once it is programmed. This protects the chip from accidental erasure and you can label it for reference.

I have used the programmer for about three months and it has operated without fail. This excellent device needs a better software support program. It should have been written in machine language and included the options mentioned in the advertisement. This EPROM programmer is ideal for anyone who wants to program his EPROMs at a low cost.■

SDS80C Editor/Assembler/Monitor
The Micro Works
P.O. Box 1110
Del Mar, CA 92014
Color Computer, 16K
$89.95

by Howard Berenbon

Anyone interested in developing software for a 6809-based microcomputer system will be interested in The Micro Works editor/assembler/monitor package—the SDS80C. Its price includes the software on a ROM pack cartridge, a completely documented 41-page manual, and an MC6809-MC6809E eight-bit microprocessor reference card.

This is an outstanding program package for anyone interested in using a Color Computer for software development. The Micro Works people have realized the value of the Color Computer as an inexpensive tool for the programmer.

The Editor

The Editor is screen oriented. What appears on the display is what is in the text buffer. Editor constantly displays the amount of RAM left in the buffer, in decimal, at the top right corner of the screen. This number reduces as you enter text. Since the program is located at hex address C000 in ROM, most of the RAM memory is available for use by the text buffer.

The Commands

In order to enter a program for assembly into the text buffer, type L to enter the Insert-line mode, next enter the program listing. Here is a sample program entered to test the editor function:

```
        NAM CLEAR
START   LDX #$800 START ADDR
        LDA #$00 LOAD 0
UP      STA 0,X STORE 0 INDEXED
        INX INCREMENT
        CMPX #$900 END ADDR?
        BNE UP BRANCH NOT =
        SWI SOFTWARE INTERRUPT
        END
```

This program clears memory by placing zeros in each byte, beginning with the hex address 0800 and ending with 0900.

Labels are typed in starting with space one on each line, as with START in line two and UP in line four of the above program text. After entering a label, entering a space moves the cursor to the eighth column on your screen, where mnemonics are entered. If no label is required on a line, just type a space. The program moves the cursor to the mnemonic field. After entering the instruction, you may enter a comment after entering a space. Pressing Enter moves you to the next line.

To get back to the Command mode, type Break. Once you're in this mode, you have the use of the single-key entry options. A particularly useful feature of editor is the find-string functions. They allow searching through your text buffer, finding a desired string, and changing it. Other useful features are the move-the-block-of-text and the copy-block-of-text functions. They save editing time when moving a block of program text to another area in your buffer.

Additional features include writing a file to cassette and reading a file from cassette. Finally, if you must reset the machine for one reason or another, you may recover your file after reset by entering an & sign.

The Assembler

The Assembler accepts source statements in standard 6809 Assembly language and produces object code to tape or memory. It expects the source statements to be in memory in the format used by the Editor. Also, it can produce a listing of the source and object code to the screen or to a printer. The Assembler is entered by calling it from the Editor.

The manual does not go into great detail when it comes to 6809 Assembly-language programming. It assumes that the user is familiar with the language. Some of its features and options are: support of 6800 instructions for cross assembly, local labels, conditional assembly, and pause/break/speed control of listings.

The assembler is accessed from the editor by entering an @ sign, then any of the options for assembly, in any order:

```
L Produce listing
S Produce a sorted symbol table
M Generate object code to memory
T Generate an object cassette tape
! Start listing in single-step mode
3 Send output to 32-column printer
4 Send output to 40-column printer
8 Send output to 80-column printer
= Do not assemble; go to ABUG
```

For samples of the program text assembled, type @ LM and press Enter when in the Editor. This accesses the Assembler and first produces a listing on your screen and then generates object code to memory. The following is displayed:

```
0001 066D
        NAM CLEAR
0002 066D 8E0800
START   LDX #$800 START ADDR
0003 0670 8600
        LDA #$00 LOAD 0
0004 0672 A784
UP      STA 0,X STORE 0 INDEXED
0005 0674 30001
        INX INCREMENT
0006 0676 8C0900
        CMPX #$900 END ADDR?
0007 0679 26F7
        BNE UP BRANCH NOT =
0008 067B 3F
        SWI SOFTWARE INTERRUPT
0009 062C
        END
ABUG:
```

The ABUG Monitor

ABUG is the monitor program that oversees the execution of programs during debugging. It is entered from the Editor by typing @ = and pressing Enter. It may also be entered from the Assembler after an object program has been written to memory.

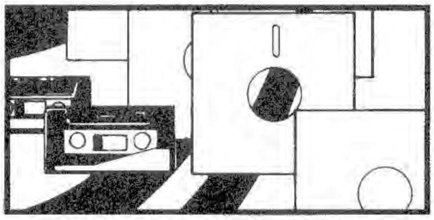
In the above example, after the object code was written to memory, the display printed: ABUG: Now ABUG is in control. You may run the program by entering a G. After entering G, the program executes and the 6809 registers are displayed. This is caused by the SWI instruction and command returns to ABUG. You can verify the program has zeroed memory between 0800 and 0900 by typing M to examine memory, and 0800 to display eight bytes of memory.

The cursor may be moved up, down, left or right with the arrow keys to display the contents of the computer's memory. Hex data may be entered or changed in this mode. Examining the memory from 0800 to 0900, by pressing the down-arrow key, verifies that all memory in that area has been zeroed.

The object code may be saved to cassette by entering an S, the beginning address, the ending address, the starting address, and the file name. The tape can be loaded from Basic using CLOADM, and run by typing EXEC and pressing Enter. It may be loaded from ABUG by L and the file name. (During assembly you may generate an object cassette, so it may or may not be necessary to save a program while in ABUG.) To return to the Editor, type an asterisk.

The manual contains some useful information including programming hints and techniques. Appendix 2 contains information on the Basic ROM entry points, with some of the more useful subroutine calls listed. Appendix 3 contains information and programs on timing loops, and appendix 4 contains information on interfacing a printer to the Color Computer.

The Software Development System SDS80C is quite a useful software package. ■



Edit
Southern Software
Allen Gelder Software
Box 11721 Main Post office
San Francisco, CA 94101
Models I & III
$40

by Tim Knight

When I first received Scripsit from Radio Shack and began learning how to use it, I wished that the same easy editing capabilities in Scripsit were possible with my Basic programs. Things such as cursor control, scrolling, and global find and replace were so neat to have, but were unavailable on the Model III. Well, my troubles and the problems of many programmers are over now that Edit is available in the United States.

Edit was published originally by Southern Software in England, and I ordered it through Allen Gelder Software in San Francisco. It will work on almost any TRS-80 computer system.

From the moment I loaded Edit, I couldn't believe my eyes. I can now control what my programs look like, and I plan to use Edit whenever I write a new program.

Of course, the Edit command is available in Level II Basic, but the Edit program is much more. After loading this machine-language program, the computer returns to a normal Ready prompt. I may go ahead and work with any program just as I always would, except that if I want to initialize the Edit program, I type in System and the starting address of the program (specified before loading it). Suddenly, the edges of the screen are bordered, and my program is listed within. The last line, as in Scripsit, is reserved for commands.

The Commands

The cursor is mounted on the first character of the first line. By pressing any of the arrow keys, the cursor moves in the corresponding direction. If an arrow key is held down, the cursor moves rapidly across the screen.

There are also special keys available in the Edit mode. Hitting Break enters you into the special command mode, while a second Break returns you to Basic. Enter completes all operations made, while Clear erases all operations made after the Enter key was last pressed. Oddly enough, the "@" sign is the control key, just as it is in Scripsit.

The keypad is very important in Edit, too. Pressing "@" and another number together completes functions such as cursor motions, deleting, inserting, and so on. The alphabetic keys are also vital since the majority of the commands are achieved by pressing the "@" control key along with a letter. Line commands are easy to perform, with commands for functions such as delete line, insert line, split line into two lines, or join two lines into one.

One of the features I have found only in Edit is the replicate function. This makes a new line identical to the one the cursor is on. The replicating can be handy for things such as repetitive data statements. There are even commands to move or position lines.

Block functions are available, also. In case you don't know, a "block" is a group of program lines (such as lines 100 through 210). Blocks may also be manipulated in various ways, which is great for large programs.

"From the moment I loaded Edit I couldn't believe my eyes."

Of course, one of the programmer's worst enemies is the dreaded bug. A bug is a problem in the program, causing the program to crash, not work, or the entire system to explode into radioactive fragments. The "Global Search and Find" feature with the Edit program can track down and exterminate bugs quickly and effectively. By pressing Break (special command) and typing G or F followed by whatever you are looking for, the cursor goes to it. The F key stands for Find, while the G key stands for Global search and replace. For example, if I remember that there was a part in my program that didn't work, because of some typographical error like "FOR I=1 TO 1000: NEXXT" (NEXXT should be NEXT), I would hit Break while using Edit, and type in the special command G NEXXT NEXT. Doing this, the NEXXT would change to a proper NEXT, eliminating the bug. You must admit, it is a lot easier than searching through the program, and then executing all of the regular editing functions to remove that extra X.

Should I Buy It?

If you are a programmer looking for an easier editing mode, the Edit is right for you. If you have used Scripsit before, Edits' commands are almost identical to Scripsit and you should have no problem at all. On the other hand, even if you have never worked with a computer before, the thorough documentation will teach you how to use this utility quite effectively. So, to answer the question "Should I buy it?," my answer is an emphatic "Yes!" ■

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All in all, they've got the features that make them destined for stardom. But the best part is that beneath this software bonanza beats the

Uh...three legends.

heart of an Epson. So you still get a bidirectional, logical seeking, disposable print head, crisp, clean, correspondence quality printing, and the kind of reliability that has made Epson the best-selling printers in the world.

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What's next? Wait and see. We're already expecting. ✓97

EPSON
EPSON AMERICA, INC.
3415 Kashiwa Street • Torrance, CA 90505 • (213) 539-9140

FEATURE	ORIGINAL MX-80	GRAFTRAX-80*	ORIGINAL MX-100	MX-80 with GRAFTRAX-Plus	MX-80 F/T with GRAFTRAX-Plus	MX-100 with GRAFTRAX-Plus
Bidirectional printing	X	X	X	X	X	X
Logical seeking function	X	X	X	X	X	X
Disposable print head	X	X	X	X	X	X
Speed: 80 CPS	X	X	X	X	X	X
Matrix: 9 x 9	X	X	X	X	X	X
Selectable paper feed			X		X	X
PAPER HANDLING FUNCTIONS						
Line spacing to n/216		X		X	X	X
Programmable form length	X	X	X	X	X	X
Programmable horizontal tabs	X	X	X	X	X	X
Skip over perforation			X	X	X	X
PRINT MODES AND CHARACTER FONTS						
96 ASCII characters	X	X	X	X	X	X
Italics character font		X		X	X	X
Special international symbols				X	X	X
Normal, Emphasized, Double-Strike and Double/Emphasized print modes	X	X	X	X	X	X
Subscript/Superscript print mode				X	X	X
Underline mode				X	X	X
10 CPI	X	X	X	X	X	X
5 CPI	X	X	X	X	X	X
17.16 CPI	X	X	X	X	X	X
8.58 CPI	X	X	X	X	X	X
DOT GRAPHICS MODE						
Line drawing graphics				X	X	X
Bit image 60 D.P.I.		X	X	X	X	X
Bit image 120 D.P.I.		X	X	X	X	X
CONTROL FUNCTIONS						
Software printer reset		X		X	X	X
Adjustable right margin			X	X	X	X
True back space		X		X	X	X
INTERFACES						
Standard — Centronics-style 8-bit parallel	X	X	X	X	X	X
Optional — RS-232C current loop w/2K buffer	X	X	X	X	X	X
RS-232C x-on/x-off w/2K buffer	X	X	X	X	X	X
IEEE-488	X	X	X	X	X	X

*Tandy TRS-80 block graphics only available with GRAFTRAX 80.

ABCDEFGHIJKLMN abcdefghijklmn *ABCDEFGHIJKLMN abcdefghijklmn* Ø1234
ABCDEFGHIJKLMN abcdefghijklmn *ABCDEFGHIJKLMN abcdefghijklmn* Ø1234
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ABCDEFGHIJKLMN abcdefghijklmn *ABCDEFGHIJKLMN abcdefghijklmn* Ø1234
ABCDEFGHIJKLMNOPQRSTUVWX abcdefghijklmnopqrstuvwx *ABCDEFGHIJKLMNOPQRSTUVWX abcdefghijklmnopqrstuvwx* Ø1234567

COMMANDER 80

by Jake Commander

"There I was resting on my laurels... when suddenly it's time to write my column again."

Ring...Ring...Ring...Click!

"Hello, Jake here...Column, column. What column? OH *THAT* column—oh yes...Urgent you say...Ready by when? You kidding or what? I only just finished the last one!...OK it'll be ready by yesterday."

Click. Silence. Dull uninspiring silence. Good grief! What happened? There I was resting on my laurels, thinking how easy it is to write a magazine column, when suddenly it's time to write my column again. And I've got to do this every month? I think I'll just wait here in front of the word processor until some revelation drops out of the sky. After all, I'm never short of ideas for programs, so why should mere words be a problem? Hmmm...still nothing. Where are all those thousands of ideas I had when I volunteered for this project? How do all those other authors do it?

I'm starting to feel terribly guilty about all those manuscripts I've read for *80 Micro* and rejected. Think of all the time and effort that's been put into those articles only to be rewarded with a not-today-thank-you-note. It's all my fault too. Of all the things I do for the Wayne Green publishing corporation, that's one of the most important. Reading and selecting articles for the magazine has a profound effect on the end result, so it's an awesome responsibility. Now it's my turn to be on the keyboard end of things and feel the "blank paper" syndrome that has faced many an author whose work I've ploughed through until the early hours of the morning.

Why would potential authors put themselves through that mill? It must be the lure of fame and fortune, or maybe the desire to share the latest programming effort. You get a really great idea for an article describing your best ever programming solution. You're sure it is going to turn the whole world on its head. You squirm in your chair playing at "engineering with words" until a semblance of an article evolves. A paragraph added here, a sentence deleted there; and it's still too short. Rewrite the conclusion, rephrase the introduction; it's enough to drive you out of your tree.

Eventually your masterpiece is ready to present to the unsuspecting public, so you cram it into the smallest envelope you can possibly stuff the paper into and send it to *80 Micro* to let fate take its course. Fate, in this instance, is me. Not that I reject a particularly horrendous amount of unsolicited material. It's just that while I'm sitting here still waiting for some divine inspiration, I feel awfully bad for all the aspiring authors I may have nipped in the bud. Don't give up! What are all the things that can put off the guy dealing with all those submissions? Well I suppose I'm in an excellent position to tell you; and there's a lot to tell.

Bear in mind that I can only tell you what I think on a personal level, since no matter how objective I try to be, I'm bound to show a bias. Neither do I purport to be an expert author who thinks he knows best; but I do know when a manuscript has been enjoyable reading and have some feel as to how that relates to our audience which now runs in excess of 110,000 readers. And I'm not without a degree of compassion. I too have suffered the anonymous rejection slips from unappreciative publishers; I'm especially proud of my rejections from Apple Corps—the past music publishing empire of the Very Beatles Themselves. Nevertheless I may be able to purge my conscience as regards those rejected articles.

Considering the sweat involved in creating an article (especially the longer ones), it's no wonder some people are annoyed at a rejection; we've even had a couple of disgruntled writers threaten to cancel their subscriptions. One guy wrote and told me he'd analyzed the adhesive tape on the program cassette he'd sent and had come to the conclusion that we hadn't tried his program; ergo, we hadn't given his offering a fair crack of the whip. All that did was cause me to unseal every cassette box, juggle the tape around, leave a few fingerprints, get some dirt on the cassette case—and then reject the article anyway. If you were confronted with an article which started, "I am an expurt on Proggraming," and became progressively worse and included sundry inaccuracies, would you run the "Proggram" to give the "expurt" the benefit of the doubt? No. I'll tell you what you'd do; you'd unseal the cassette box, juggle the tape around...

Of course I'm going from the sublime to the ridiculous to make my point. Even if the six thousandth home-budgeting program is well written, it may be such overworked material that the cassette remains untouched anyway. So there's an important point: If what you have to say has been said a thousand times before, then why bother to say it again? Keep the ideas coming, but keep them new. The world of microcomputing as seen through the eyes of a TRS-80 user is so multifarious that there's no excuse for repetition. I'll repeat that. There's no excuse for repetition. One garden variety of personal financing program a year is more than enough, thank you.

If you're serious about writing for *80 Micro*, you should get a copy of our authors' guidelines. This leaflet tells you all sorts of sensible facts about writing in general and how to submit your manuscript. If you're unsure whether your article will be novel enough to warrant careful consideration, write in beforehand with an outline. This may save hours of toil and "blank paper blues" like I'm now suffering. Novice authors sometimes ignore or misunderstand some obvious facts in the authors' guidelines. These are the most important: Manuscripts must be in upper and lower case. Editors and typesetters cannot work with copy which is all uppercase as printed on old teletype machines. The manuscripts also must be double spaced, which (in case you don't know) means that every line has to have a blank line below it. This is another must for editing purposes. And editing is something which will happen to your work, so don't get bent out of shape when you get authors' proofs containing all manner of alterations. This is done by a staff of professionals to ensure the magazine has a consistent style, so when you get your proofs, check them for accuracy and make any comments you have regarding the editing—that's what they're for.

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AGING REPORT FOR LYNN'S A/R SYSTEM

Aging Report 01/31/82 Page 1

Account	Current	30-60 Days	60-90 Days	90+ Days	Total
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Old Co. Inc.	00.00	84.40	165.20	00.00	249.60
New Co. Inc.	97.75	00.00	00.00	00.00	97.75
Deadbeat Inc.	00.00	00.00	00.00	345.00	345.00
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LYNN'S

Account Receivable System	$49.95
Account Receivable Aging Report	$20.00
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Send $10.00 Per System
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Equipment Needed: 48K Model I or III, Lineprinter, 2 Disk Drives.

The above programs will work on TRSDOS 1.2 and 1.3 for the Model III. NEWDOS, NEWDOS80, NEWDOS80 V2.0, LDOS and MULTIDOS for the Model I and III.


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December 10, 1981

80 Microcomputing
P.O. Box 981
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ATT: Wayne Green, Pub/Editor

Dear Mr. Green:

I would like to tell you about a most pleasant and refreshing experience with the purchase of Lynn's A/R System, advertised in your publication.

Not only did the system work at the first try, perhaps because the instructions are so easily understandable, but also because of the staggering number of options available within the program.

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Very truly yours,

Paul T. Hirschman
President

PTH/val

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As regards programs, send both a hard copy listing and a magnetic media version (preferably disk). The hard copy allows us to ascertain the quality of the programming at the time the article is reviewed and gives us a cross check to ensure we have an accurate load of what you sent. The disk or tape allows us to run the program and to make a camera-ready printout using our own *80 Micro* style. If you're a disk user, we'll love you even more if you send us a duplicate copy of the article on disk. This enables us to use the latest editing and typesetting techniques with the articles we accept. Nevertheless, we still need a printout of the article for review, so don't exclude it in favor of a tape or disk. A disk can be difficult to read at one thirty in the morning under the light of a table lamp and besides, I don't have 20/20 magnetic vision. Not only that, but if we had to run off a hard copy of every article submitted, we'd never have time to read any. Which leads me to another thing.

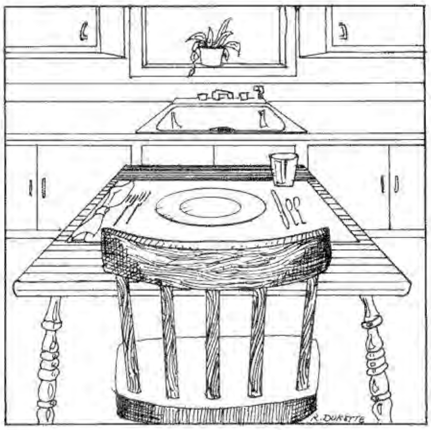
We sometimes get comments complaining about the anonymity of a rejection. Unfortunately, this is something that's fairly standard in the publishing industry, whether it be software, the written word, music or whatever. Any noteworthy publishing organization has to provide the courtesy of as fast a turnaround as possible and if every rejection (or acceptance for that matter) were accompanied by a critique of the work, it would take four times longer to process manuscripts. "So employ more people," you say. Are you prepared to pay more for the magazine to pay the extra salaries?

However, in some cases when an author has a hot idea but has executed it poorly we may give some direction to get a second chance at the idea. All this talk of rejections is depressing me—and all because I can't think of a topic for this month's column. Suffice it to say that hundreds of authors have received the happy news that we want to publish their stuff. It does give you a sense of pride and accomplishment to see your creation appear in print. And just think: people will read it in England, Australia, and even California. Evervone knows that each copy of the magazine in California is seen by four people; one to read it, and three to share the experience. (Sorry, I just couldn't resist it.) Someone even sent us a photo of himself reading *80 Micro* on the beach in St. Tropez in the South of France. People actually appear to prefer it to sunbathing. So now's the time to sharpen the electric pencil or load your favorite word processor and convince the world about your new applications, methods, theories or whatever you think is interesting.

Ah! The creative juices are beginning to flow. Now I'm getting a good idea for this month's column. How about if I covered. . . What? You mean I got this far already? But I only just started. I wanted to tell people about this genealogy package for the Model II, and what about that Model II Star Trek program? Great! I finally get the idea for the column and now it has to wait until next month. Maybe I should accept a few articles to make myself feel better. ■

News From KITCHEN TABLE SOFTWARE, INC.

by David Busch



In a stunning move likely to rock the microcomputing industry to its foundation, Kitchen Table Inc. has introduced a line of Mega Upgrades for the TLS-8E/ TRS-80 family of computers. These modifications are simple plug-in devices which literally turn any S80 computer into an entirely different machine.

The new products were unveiled at the 1982 Portage County (Ohio) Home Appliance Faire. Kitchen Table Inc. has chosen this forum for important new product introductions two years in a row. The fictitious company has found that as the only computer-related exhibitor, there is little risk of being upstaged by the competition.

I found the new Mega ROM to be the most interesting item. To install this innovative item, the user simply pries loose the Level II ROM in a TRS-80, or the Level XXIII ROM in the TLS-8E, and substitutes the Mega ROM in the sockets. The new chip causes the S80 computer to emulate one of a variety of other machines, depending on the ROM selected. I chose the IBM 370/ 145 Mega ROM.

I'll admit that gaining the equivalent of an IBM 370 mainframe for the $49.95 ROM price appears to be an overwhelming bargain on the surface, but there are some hidden drawbacks.

- NEWDOS80 and Drossdos 8E are not compatible with the Mega ROM's. Kitchen Table Inc. supplies a low-cost substitute with the new system, DOS/VSE. Although it lacks many of Drossdos 8E's features, it does have a nice Power spooler. This utility allowed me to leave my computer operating during my vacation, while it printed out 43,000 pages of text I had gotten a bit behind on.
- When used with the stock Z80 or Z79A microprocessors, the IBM 370 emulator is a bit slow. This is due to the slightly greater power of the 370 CPU when compared to the Z-series chips. The eight-bit microprocessor has to do a great deal of work to simulate the larger mainframe, and the bottom line is s-l-o-w operation. In benchmark testing, my TLS-370 required 48 hours to generate six random numbers between zero and 10. Some prompts can take more than 30 minutes to be printed on the screen. Telecommunication is possible at no more than one microbaud.
- There is no provision with the TLS-370 or TLS-4341 for cassette data files. While DOS/VSE allows tape storage, for some reason the proper commands make my CTR80A run at about 1000 RPM.

"In benchmark testing my TLS-370 required 48 hours to generate six random numbers."

- The vaunted capability of being able to attach IBM plug-compatible peripherals to a modified TLS-8E is not of much practical use. Kitchen Table Inc. supplies no cables, so you have to make up your own for the plugs to be compatible. Worse, the IBM peripherals are more expensive than those already available for S80 computers.

For example, it is probably a better idea for a satisfied TLS-8E user to stick with his current 100-character per second dot-matrix printer. Although an impressive 10,000 lines per minute non-impact printer is available, this unit costs more than $300,000. Most home computerists and many small business operators will not be prepared to make that kind of outlay.

With disk drives, the comparison is even more unfavorable. The IBM people haven't adapted the 5¼-inch minifloppy disk to their 4300 line, even though that format has been widely accepted as the standard of the industry! Instead, their mainframes (and the converted TLS-370 or TLS-4341) use some ridiculous disk pack device that resembles a trash compactor with an acrylic birthday cake inside.

Even more laughable, these peripherals are not very portable. Kitchen Table Inc. graciously offered to install the printer and two disk drives in my office to demonstrate the capabilities of the TLS-370. The printer alone took up most of the space in my living room. Imagine unhooking this gear and trying to take it to a user's group meeting!

If you decide to go this route, I'd recommend installing one of the Mega Upgrade CPU modifications described below. It makes little sense to have a 10,000 lines per minute printer when your computer takes three weeks to fill up its buffer.

Convert Your Computer to 16-Bit Power

Many of these problems can be solved with another Kitchen Table upgrade, the Mega Chip. This modification effectively turns the TLS-8E into a 16-bit or 32-bit minicomputer. Kitchen Table Inc.'s solution is ingenious. To convert the micro into a 16-bit computer, the user merely piggybacks an additional Z79A chip onto the one contained in the TLS-8E. The result: all 8-bit registers become 16-bit registers, and all two-byte registers can hold four bytes. Adding two more Z79A chips (this stack can be as much as three inches high) results in a 32-bit mini. An elegant idea—I wonder why no one thought of it sooner?

A KTI spokesperson pointed out the new 16 or 32-bit processor has the same instructions available in the 8-bit Z79A. That is because the microprocessor already includes more than 40 instructions (such as JIGGLE, PLOP, and GROK) which the designers didn't know how to use. Imaginative programmers may find an application for these instructions.

The next KTI Mega Upgrade is the Mega CHAR, a character generator which includes every known alphanumeric, graph-

Professional/Scientific

WORD PROCESSING

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

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(Actual QWERTY text above)

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QWERTY 3.0 requires a TRS-80 Model I or Model III, at least one disk drive, a copy of SCRIPSIT, and one of the printers specified below. When ordering, **please specify** which model computer, number of drives, and printer you use. For cautious buyers, we offer the manual (over 70 pages) for $10. When you decide to buy QWERTY, we will credit the full manual price.

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ic, scientific or imaginary symbol. With this mod installed it is possible to write in Russian Cyrillic, Greek, Japanese, Chinese, Sri Lankan and Martian. Symbols are included for types of calculus that haven't even been invented yet. Tiny Pacmen, flying saucers, and other images are included for games programmers. All of these may be printed in reverse video, as well.

Plastic key caps are supplied, each printed with all 73 characters that key can invoke. The printing was a little small and hard to read, but KTI also thoughtfully included an 11 × 14-inch sheet of acrylic plastic. This resembles the magnifiers used to enlarge fine text print for the far-sighted. Placed on a stand and suspended above the keyboard, the magnifier can be viewed by the user while typing. It is unlikely even the most proficient touch typist will learn the keyboard for 73 different character sets.

Mega CHAR has two drawbacks.

First, it requires 64K of memory. Although it is in ROM, the Z79A chip can address only 72 thousand memory locations, so only 8K of RAM can be used for programs with the character generator installed. I would have liked to see some sort of bank-switching technique used so only one character set is available at a time. I see little use for being able to mix the Pi symbol with a picture of Daffy Duck in the same program.

Second, by an oversight, the standard English character set was not included. When the Mega CHAR is installed, the user has no way of invoking the normal alphanumerics. A minor setback, however, if one happens to know Russian or Japanese—simply write programs or text in those languages.

Another new product was the Mega OCR, which turns any line printer into an optical character reader through the application of the little-known Reverse LPRINT command. This mod requires replacing the print head of your printer with an optical sensing device. The changeover can take as little as a few seconds if you own an Epson MX-series printer, or as long as two hours for a Kitchen Table printer. Removing the KTI printhead involves a blowtorch and a hacksaw, and is not recommended for the beginner. Instead, take your printer to any muffler shop and have it do the job.

Once the attachment is in place, simply feed a document into the printer, type REVERSE LPRINT (or REVERSE LLIST if it is a program listing). Your printer will now accept the document, reading each line and feeding it back to the computer. Because of the high intensity ultraviolet light, the original printing is bleached out and removed from the paper. It is quite amusing to watch the user feed documents into the printer, and remove blank sheets of paper from the other side.

I wouldn't have believed this possible had not KTI graciously showed me a motion picture of the system in use. (No prototypes were available for a hands-on demonstration.) I watched with awe as sheet after sheet of blank paper emerged from the printer, and carefully folded itself in the box behind. Kitchen Table Inc. had obviously assembled this demo film in haste, because I noticed it had been edited rather sloppily. The opening titles read "The End."

I was also unable to test Mega Mod PC, which is a color-conversion kit for the KTI Pockets Computer. Watch for an in-depth report on this product when it becomes readily available, or whenever I can figure out a useful application for this capability.

Other Products Foisted on Consumers

Some minor products were also introduced at the trade show, which was sparsely-attended due to its unfortunate scheduling on Easter Sunday. One deservedly-overlooked item in the Mega Upgrade line was a hardware modification that slows down the TLS-8E's clock speed to .1 megahertz. Once installed, the user can switch over to the slower speed by the command POKE 15360,256. Kitchen Table has dubbed the kit Slow POKE, and is marketing it as a way for inept Space Invaders players to finally win a game.

". . . the trade show . . . was sparsely attended due to its unfortunate scheduling on Easter Sunday."

Kitchen Table Inc. also showed ?Basic, which it describes as the first Basic Misinterpreter (see *80 Micro*, April 1982). The utility is designed for someone with a friend intolerably proficient at programming. ?Basic helps bring down haughty programmers a peg by introducing bugs and syntax errors without their knowledge. It also scrambles (or removes) helpful Remarks, changes variable names, and inserts Parody Errors.

When paired with Nonsense, a KTI-developed language without keywords, syntax, or operators, and BASBOL, which combines the worst features of BASIC and COBOL, Kitchen Table has assembled quite an arsenal of unusual languages. I've heard rumors from KTI PARQUE that several other high-level idioms are under development. These include Crosstalk and LITHP.

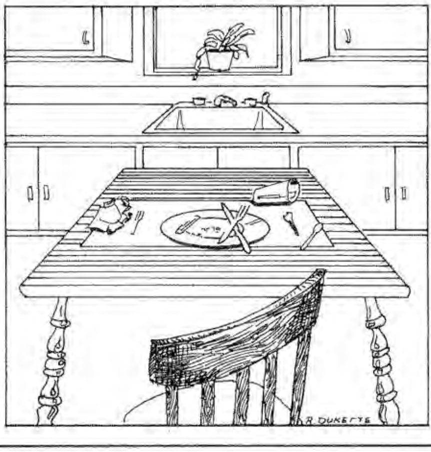
Kitchen Table is also reportedly working on a massive state-of-the-art mainframe computer, to be called the KLUDGE-1. This new computer will rely heavily on what KTI calls "reverse engineering." The company originally applied the reverse engineering concept to the design of its TLS-8E, when transistors and hard wiring were used in place of the "cheaper," less reliable integrated circuits.

With the development of the KLUDGE-1, this devolutionary trend has taken another step backward. Several pioneering techniques are being considered, including an intricate application of vacuum tubes in place of the transistors.

A KTI spokesperson explained vacuum tubes have not been popular in recent years because of a shortage of vacuum. He blamed the shortfall on the increased consumption of vacuum in the engines of downsized American cars. In addition, the overthrow of the government in Hooveria, chief supplier of vacuum to the free world, has led to a volatile market for the strategic non-gas.

However, Kitchen Table has filled the void in the supply lines, and located a reliable Asian source for full-time vacuum tube production.

Some of these products should be arriving at your local computer store about the time this issue of *80 Micro* hits the stands. I'd recommend making your purchases quickly, because Kitchen Table products never remain on the shelves long. Most are stocked for a week or two then shipped back. ■



From the man who wrote the book on it.

Data Communications—TRS-80 Style

Frank J. Derfler, Jr.
P.O. Box 691
Herndon, VA 22070

Ever wonder what modems and message systems are all about? In this article, Frank Derfler, "Dial-Up Directory" columnist for Microcomputing *magazine, presents an introduction to data communications. If you are interested in more information, Frank's latest book,* TRS-80 Data Communications, *is being released by Prentice-Hall books this summer.—Eds.*

When *80 Micro* asked me to write an article introducing computer communications, I considered several approaches. I thought about telling you of the new and exciting technologies and careers that are springing out of the marriage of communications and computers. This kind of approach would allow me to throw around words like Telematics, Compunications, and many others which have only been coined in the last two years.

I also thought about dealing with the fundamentals of communications: signaling, data alphabets, and data transfer. We could investigate ASCII, EBCDIC, RS-232C and handshaking protocols.

Finally, however, I had a blinding flash of insight (provided by a phone call from the editor) which told me to keep it simple. This article will describe the reasons *why* you might want to give your TRS-80 a data communications capability and *how* you can go about it.

Photo 1. The Lynx is a versatile and proven bus-decoding modem which operates with either the Model I or Model III. When used with a Model III, the address of the modem can be easily changed so it can be used in addition to or instead of an RS-232C port. If the standard port address is used, the Lynx operates with all types of TRS-80 terminal software. The Lynx provides complete auto-dial and auto-answer capabilities. It sells for about $300 with terminal and host software. The Lynx is available from computer stores and retailers.

Why Communicate?

There are two basic reasons why you would benefit from providing your TRS-80 with a serial port, modem and communications software: to exchange files and to receive information and messages.

I don't have to tell TRS-80 owners about the limitations of exchanging programs and files on cassette tape or floppy disk. Tapes require good recorder head alignment or some special equipment to ensure a reliable information transfer. The various DOS packages and disk arrangements can create great confusion when disks are used to transfer information.

There is one way to transfer programs and files that doesn't care what DOS you are using or even if you have a disk drive. Using a serial RS-232C port (or, as I'll describe later, a bus-decoding modem) to exchange data does away with disk, DOS and cassette compatibility problems. It also allows the transfer of data files (such as text files) between any other kind of computer and your TRS-80.

The second reason for providing your TRS-80 with a communications capability is to allow you to receive information and exchange messages over the information util-

> *"Using a serial RS-232 port to exchange data does away with disk, DOS and cassette compatibility problems."*

ities and electronic message systems available around the nation.

There are several information utilities available to private individuals. The three most common are The Source, CompuServe and the Dow Jones Information Service. The Source and CompuServe have very similar information features. These include the latest news stories from various wire services and media sources, discount shopping plans, stock prices and analysis, special interest newsletters, a real-time communications capability, and an electronic mail service. Both of these systems use mainframe computers to provide these services. Customers can also use the computing power of these systems to run large programs or to use computer languages not normally available on microcomputers.

The customers connect into the computers over data-communications carriers reached through their home telephones. A major consideration when selecting one of these systems to subscribe to is the availability of a communications carrier entry point within your local telephone calling area. The Source uses either Telenet or Tymnet to reach its customers. CompuServe uses its own carrier network or Tymnet. These carriers do not cover the same geographical areas. Many parts of the nation are not served at all. If there is no entry port within your local telephone call area, then the cost of a long-distance phone call must be added to the basic charge for the use of the information utility. This basic charge can run from $4.50 to $25 an hour (about $6 average) depending on the time of day and the way you enter the utility.

Each of these systems has features and faults. CompuServe stresses a menu-driven approach which is friendly to the new or infrequent user, but frustrating to the experienced user who wants to get to a service quickly. They have instituted a series of direct commands which improve the movement through the data bases for experienced users. The Source started with no menus. It stressed the direct command mode which provided great flexibility for experienced users, but which could leave beginners faced with mysterious and frustrating error messages. They have installed a menu system which is a big help to new users, but can be quickly bypassed when experience is gained. Both systems continue to add features and to try new formats to improve their services.

The Source and CompuServe offer stock quotes and various kinds of information. But if you have a special interest in investments, you might consider the Dow Jones Information System. The service provides news from the *Wall Street Journal*, *Barron's*, and the Dow Jones News Service. It has several very nice functions including

"The program download services allow users to withdraw programs from a library and capture them for their own use."

a data base dating back to 1979 which can be searched by words, phrases or dates. This service is more expensive than The Source and CompuServe, but for certain persons it is a good investment.

If you are interested in subscribing to one of these information utilities, check the list of manufacturers and suppliers for their address and phone number. Be sure to get the details about gaining access from your local area.

Electronic Message Systems

You may have heard a bewildering blizzard of buzzwords associated with microcomputer communications such as CBBS, ABBS, Forum 80, Connection 80 and the like. These names all refer to electronic message systems which are run by private clubs and individuals and are usually available to all callers with no charge. At last count, there were nearly 300 of these systems available throughout the United States and Canada and about six in Europe.

The first successful electronic message system in the country was the Computer Bulletin Board System (CBBS) developed in Chicago by Randy Suess and Ward Christensen. This started out as little more than an electronic replacement for the cork bulletin board maintained by the local computer club. It was a place where people could post notes and answer them. It was quickly followed by the Apple Bulletin Board System developed by Craig Vaughan and Bill Blue. Bill Abney wrote the software for the Forum 80 systems which use TRS-80 Models I or III as system hardware. Connection-80 is another system for the TRS-80 Model I available from B.T. Enterprises.

These systems' features have grown considerably since the first "tack it up" systems were brought on line. Modern message systems may include automatic sign-on for frequent users, automatic sorting of messages by name or subject, password protection of certain messages, sub-groups or conferences containing special interest information, and even program upload and download services.

The program download services allow users to withdraw programs from a library and capture them for their own use. Uploading allows users to add their own programs to the central library. Obviously, this provides a convenient way to exchange programs and files without worrying about disk formats and other incompatibilities.

If you are interested in a list of available message systems, you can write to Jim Cambron, P.O. Box 10005, Kansas City, MO 64111. Jim publishes the *On-Line Computer Telephone Directory*. It is impossible to keep a completely accurate directory of all of the available message systems (I tried!), but Jim has one of the best available. Be sure to include $2.85 for the latest issue.

So far, I have given you a very brief *why* of computer communications. There are many sophisticated uses for communications systems, but the broad generalizations of program transfer and information access cover most of the common uses. Now, let's see *how* you would go about giving your system this capability.

How?

There are three basic ingredients needed to convert your TRS-80 into a data communications terminal: a modem, a serial port, and terminal software. In some cases, the

Photo 2. The Microconnection modem comes in several different models. The most complex device attaches to the expansion port of a Model I and provides it with a modem and RS-232C capability. Other versions attach to existing RS-232C ports for more conventional operation. Microconnection prices start at about $200 and run to over $300. The Microperipheral Corporation maintains a bulletin-board service for their customers on CompuServe.

"A modem converts the electrical signals used inside your computer into sound so they can be sent over the telephone lines."

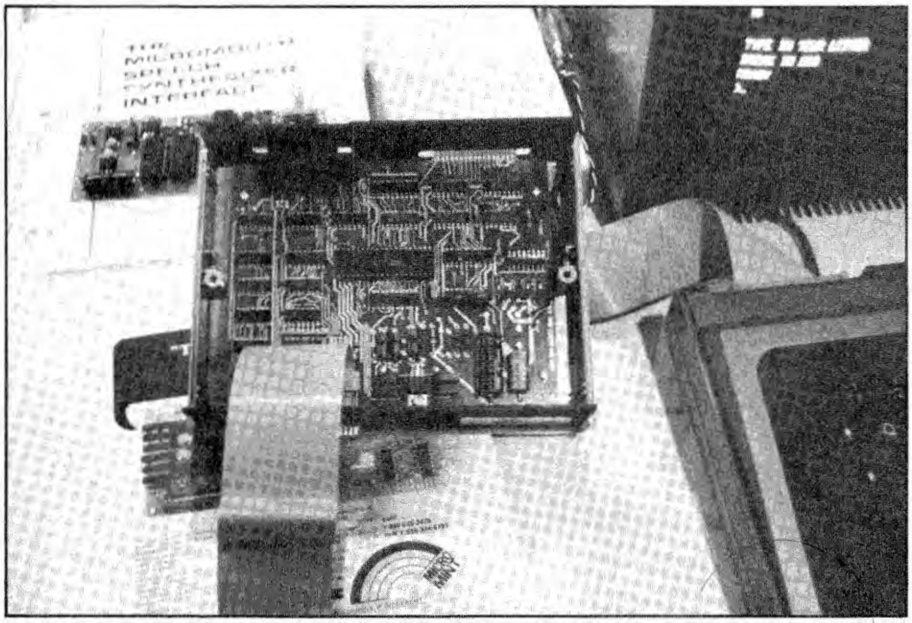


Photo 3. *COMM80 from Micromint is not a modem. It attaches to the expansion port of a Model I and provides the computer with a full RS-232C serial port capability without the use of an expansion interface or serial card. Optionally, it can be used with an expansion interface and serial card to provide another RS-232C port at a different data address for use with a printer, plotter or other serial device.*

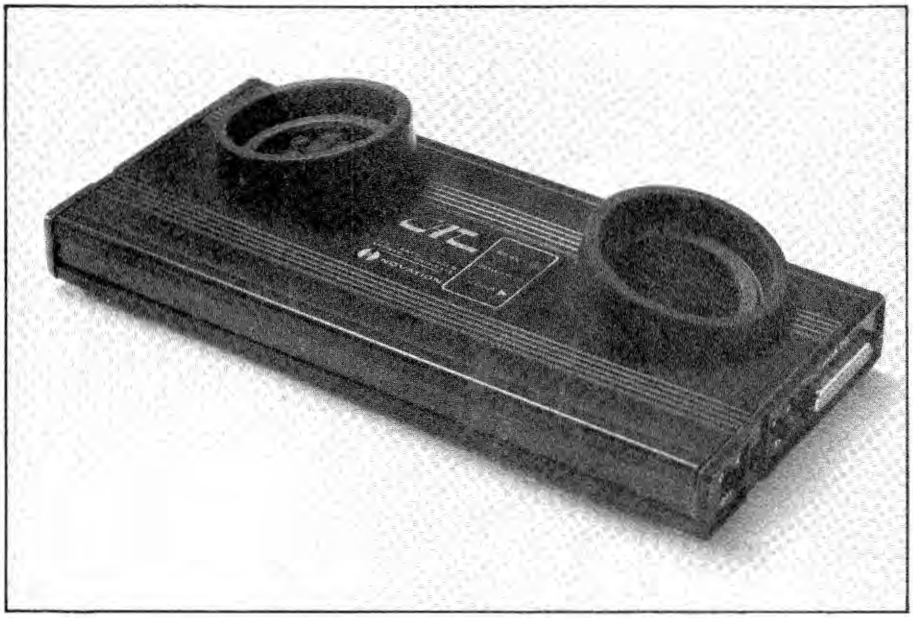


Photo 4. *The CAT modem from Novation has become a standard in the industry. It is certainly the most widely used acoustically coupled modem. Several different manufacturers, including Radio Shack, have marketed the CAT with their label. In operation, the telephone handset is placed in the rubber cups on the modem. All coupling to the phone line is done with sound. This method of coupling is handy for portable or temporary operation if loud outside noises are avoided. Decorator-style telephones with different handsets cannot be used with a CAT. The CAT modem is often available for under $150.*

serial port and modem may be combined into one unit.

The word "modem" comes from the combination of the words "modulator" and "demodulator." A modem converts the electrical signals used inside your computer into sound (modulator) so they can be sent over the telephone lines. It translates the received sounds into electrical signals your computer can use (demodulator). It hooks between the telephone line and your computer and translates between them.

Modems with several different features are available for TRS-80 systems. These features relate to both how the modem hooks to the telephone lines and how it connects to the computer. Let's look at the telephone end first.

A modem which connects directly to the telephone line with a wall plug is called a direct-connection modem. Another common kind of modem holds the telephone handset against a small speaker and receiver and

✓See List of Advertisers on page 386

"Connection to a serial port is as simple as plugging one end of the cable into the modem and the other end into the computer."

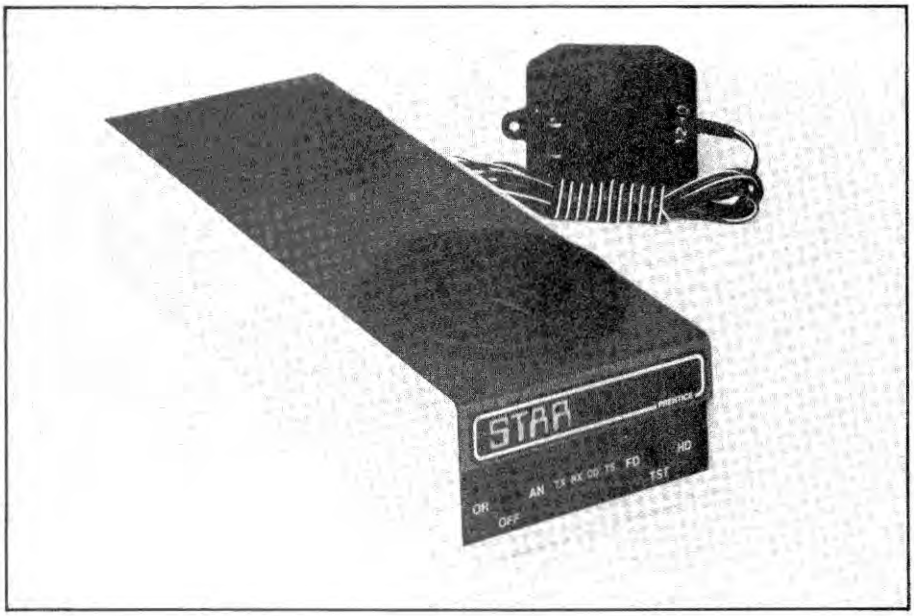


Photo 5. The D CAT is a direct-connection version of the CAT. It lists for about $200, but is available for about $170. An auto-answer option adds about $80. Both the CAT and D CAT require the computer to have an RS-232C serial port for interface. CAT modems are available from computer stores and retail dealers.

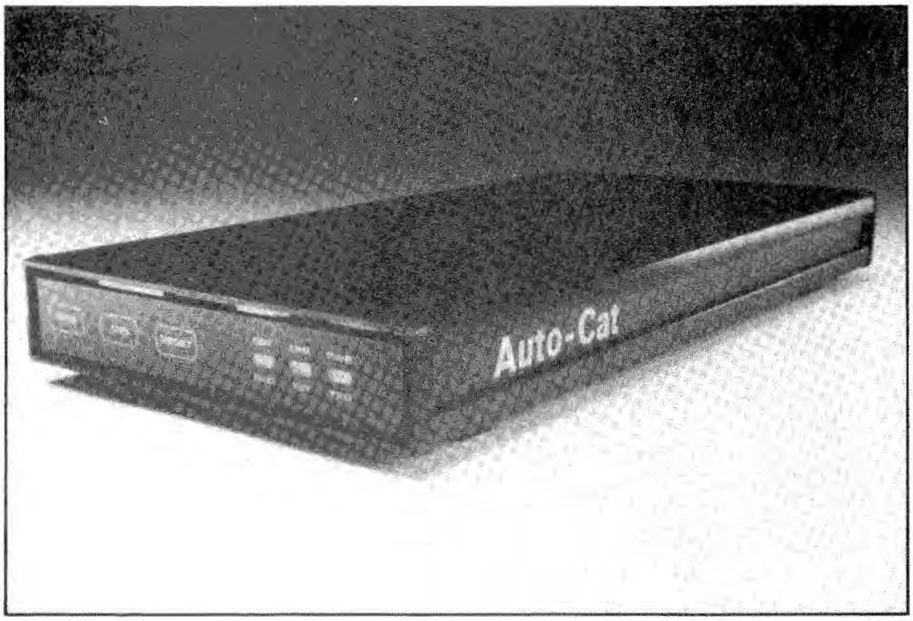


Photo 6. The Prentice Star modem has been providing some competition in the acoustically coupled market. It has deep cups to help suppress outside noise and four light-emitting diodes which provide a visual picture of the data flow. It is available from 80 Micro *advertisers such as The CPU Shop for $125.*

couples to the telephone line using sound. This is known as an acoustically coupled modem. Acoustically coupled modems are susceptible to interruption from loud local sounds, but they provide good portable operation and may be a bit less expensive than direct-connection devices. Direct-connection modems may have other optional features such as auto-dial and auto-answer.

On the computer side of the modem, the most common devices connect to the computer through the RS-232C serial port. This kind of port is optionally available on the Models I and III, but comes standard on the Color Computer and Model II. Connection to a serial port is as simple as plugging one end of the cable into the modem and the other end into the computer. The Model I needs an expansion interface to use the standard serial-port circuit card.

There are alternative ways to hook a modem to a Model I or III. The first way is to substitute some device for the serial card and expansion interface for the Model I which provides the RS-232C signaling, avoiding the cost of an expansion interface. One device which does this is the COMM80 from Micromint, Inc. COMM80 can be used on a Model I instead of a serial port and expansion interface. It provides an RS-232C port at any one of 16 data addresses. If you have a requirement for more than one RS-232C port you could stack up to 16 COMM80s on a Model I.

". . . the term direct connection refers to how they hook to the telephone lines."

A second way to connect to the computer without buying the serial port is through the use of a bus-decoding modem such as the Microconnection or Lynx. These modems are also called "in the bus" modems, or sometimes integrated modems. They are also called direct-connection modems for the wrong reason by people who don't realize that the term direct connection refers to how they hook to the telephone lines. Incidentally, all bus-decoding modems are direct connection.

A bus-decoding modem attaches directly to the data bus of the computer and changes the parallel data addressed to it on the bus into modem tones. No serial port card is required. In another operation mode, the bus-decoding modem can be attached to the data bus while a standard serial card serves a printer or other RS-232C device in a normal manner.

The choice of what kind of modem is right

"Dumb terminal software only allows the TRS-80 to display the received data and transmit characters typed on the keyboard out through the RS-232C port."

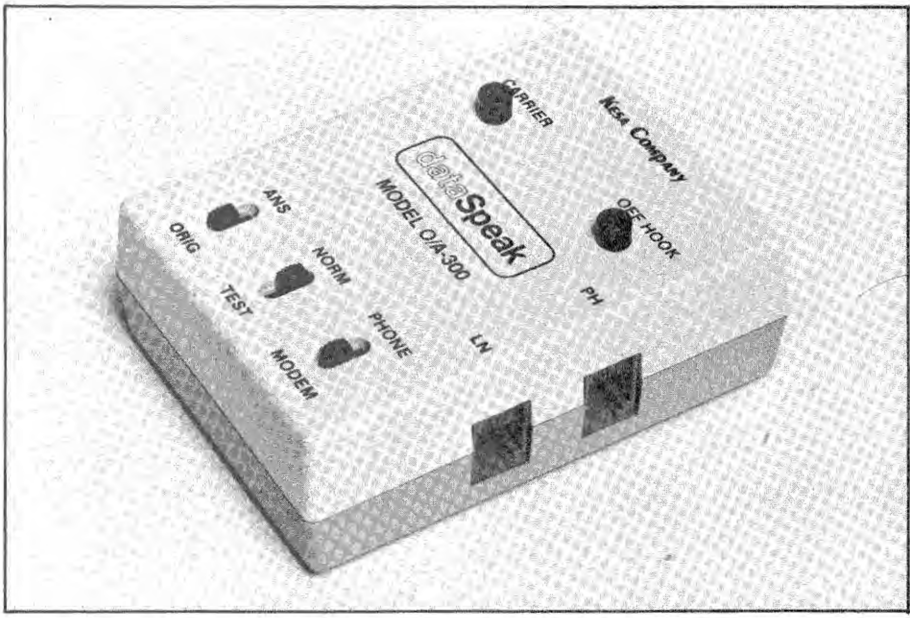


Photo 7. The Kesa Dataspeak modem is a new entry into the direct-connection modem field. This is an RS-232C direct-connection modem with two major features: size and price. This small modem sells for $129. The use of dual phone-line jacks allows the modem to be put in series with the telephone and avoids purchasing a separate dual connection for the telephone wall plug. This makes installation easier. Some direct-connection modems such as the Lynx and D CAT also have this feature, but many do not. The Dataspeak sells for $129 and is available from the Kesa Company and selected dealers.

for you depends upon your use, the system you have, and the price you can pay.

Software

The final critical portion of your communications system is the software which makes your computer look like a data-communications terminal to the remote system you are working with. There are two kinds of data communications terminal software: dumb and smart. There is no firm definition for these categories. Dealers and distributors define smart in different ways.

Essentially, dumb terminal software only allows the TRS-80 to display the received data and transmit characters typed on the keyboard out through the RS-232C port. It will not store or capture the data. When the received data scrolls off the screen, it is gone. A dumb terminal program usually provides the TRS-80 with the ability to transmit special characters called control codes which signal certain functions in the remote systems and printers. TRS-80s do not have keyboard keys for these codes, so the programs use combinations of keys such as the shift and up arrow to designate control characters. Some terminal programs provide a lowercase transmission capability for the TRS-80. A simple terminal program usually allows the operator to change certain transmission parameters. Most of this software is available on tape and will operate with microcomputers containing a minimum of RAM.

Radio Shack supplies a very simple dumb terminal program called Term with the Model I RS-232C card. They market several different videotext program sets which provide dumb terminal capabilities for the Model I or III, the Model II, or the Color Computer (catalog numbers 26-2200/1/2). These packages include membership and one free hour in CompuServe and the Dow Jones Information Service. They sell for $29.95. The programs come on cassette tape, but they are easily saved on disk. These videotext packages contain smooth running simple terminal programs which are a very good value.

The Microconnection and Lynx bus-decoding modems also come with simple and

✓See List of Advertisers on page 386

"A dumb terminal program could meet the needs of a data-communications user for years."

Photo 8. The Racal-Vadic Modemphone is a unique device which combines a modem and telephone into one unit. Installation and operation are simple and the combined package takes only the space of a regular telephone. The list price is between $250 and $350 depending on the options, but it is often discounted.

reliable terminal software. These programs are in an easy-to-use menu-driven format. The Emterm program which comes with the Lynx has some features, such as the ability to send and receive Basic programs, which might qualify it as pretty bright if not smart.

A dumb terminal program could meet the needs of a data-communications user for years. The simplicity of a dumb terminal is very appealing. There are some functions, however, which frequent data communications users find convenient and which call for a much more complex program. These functions include capturing programs and files as they come in through the data port and transmitting stored programs and files out the data port. The smart terminal functions also include transmitting frequently used strings of characters such as those found in passwords and sign-on codes by simply touching one or two keys.

The program capture and transmission functions provide an easy way to exchange software. But these functions also provide the ability to save items gained from the information utilities (such as stock histories) in text files and to prepare electronic mail messages for fast, accurate and economical transmission to a message system or information utility.

Omniterm

Omniterm is a very powerful program written and distributed by David Lindbergh. Instant Software's Super Terminal is a repackaged version of Omniterm. Omniterm is loaded with features and a full description would require a complete software review, but it has become the standard for TRS-80 terminal software. It provides full data-capture and data-transmission features. These include the ability to transmit

"It is much easier to formulate a reply when you can look back at the incoming mail to see what was said."

files in the line-by-line mode required by many message and mail systems. It has a buffered printer port so you can print the received data as it comes in.

The program allows the one-key transmission of a pre-stored sign-on code. This code and the special operating parameters for various remote systems can be stored in special command files. Unique features of the program include a received-text buffer which allows the user to review received data that has already scrolled off the screen and a graphic picture of a bell which appears on the screen whenever an attention bell signal is received from the remote system. The receive buffer review capability makes the program especially nice for the electronic mail users. It is much easier to formulate a reply when you can look back at the incoming mail to see what was said. Omniterm has a very nice menu display which makes it easy for both experienced and novice users to operate.

The documentation for Omniterm is excellent. The manual runs over 75 pages and includes a complete glossary, index and table of contents. The Omniterm program costs about $100.

There are several other smart terminal packages available for TRS-80 computers. One of the first on the market was the ST80 series written by Lance Micklus. These programs have several different levels of capa-

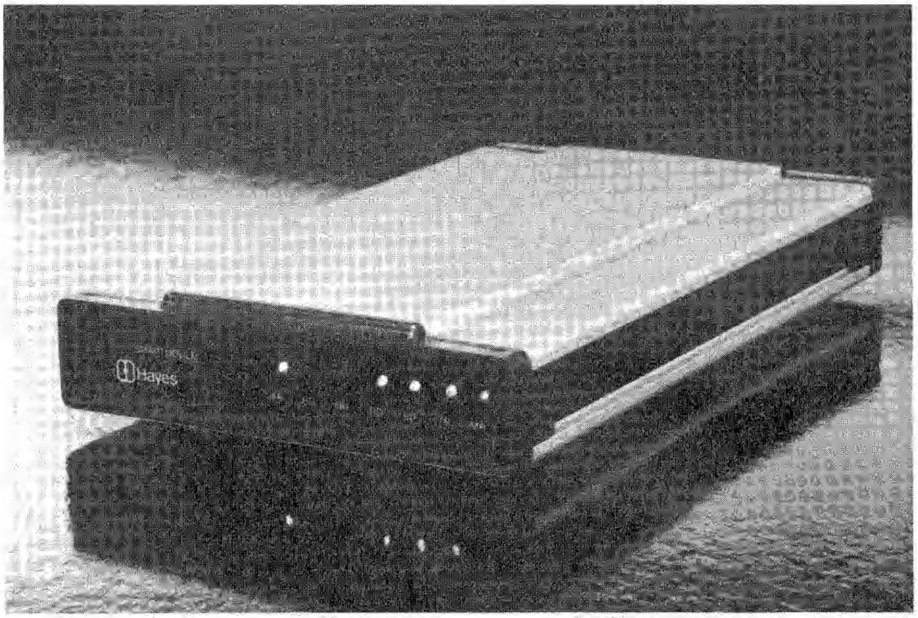


Photo 9. The Hayes Stack SmartModem is a new modem device which has leaped into popularity in the past year. It is called smart because it provides many capabilities that were provided by computer software and hardware in the past. In fact, this modem contains its own Z8 microprocessor and internal programming. The unit receives commands by monitoring the data line from the RS-232C serial port of the computer or terminal. It will auto-dial, auto-answer, provide for speaker monitoring of the data, and perform other functions on command. This very versatile modem lists for about $300, but it is often available at discounts of about $50.

✓See List of Advertisers on page 386

"In full duplex a host system echoes characters back to the remote terminal. In half duplex the terminal displays its own transmitted characters on the screen."

bilities. They are available from Lance Micklus or from the Small Business Systems Group.

Two smart terminal programs, Uniterm/80 and Modem80, are worthy of special mention because of their unique features.

Uniterm/80

Uniterm/80 was written by Pete Roberts and is distributed by Apparat, Inc. It is a powerful smart terminal with all of the features listed above for Omniterm except the bell and review buffer. Uniterm/80 has a unique capability to configure itself to the data-communications port being used by a Model I or III. When the program is initialized, it examines the data bus to determine if devices like the Microconnection or Lynx are available for use. Then it looks for the RS-232C standard port address. This capability provides great flexibility and it eliminates the need for specially addressed software to use devices like the Microconnection.

Uniterm/80 is designed to be used with Apparat's NEWDOS80 operating system, but it will function with other operating systems while retaining most of its features. The program has a good operating manual and sells for about $90.

Modem80

Modem80 is unique in that it provides the TRS-80 with a very accurate means of transferring files that was previously available only to users of the CP/M operating system. It has all of the features commonly associated with smart terminal software, but it also transfers files using a unique error-detection and correction format. This specially formatted file transfer can only be accomplished with another Modem80-equipped TRS-80 or with a CP/M system running a common program called Modem, but it still provides a unique and valuable capability. Non-format file transfer is also available.

Modem80 was written and is distributed by Leslie Mikesell. It is available for an amazingly low $39.95.

TRS-80 Message Systems

There are several message systems software packages available for the TRS-80 which allow your system to receive, store and transmit messages or information to anyone calling in. They range from simple and essentially free to very sophisticated and costing several hundred dollars. All of these software packages require an auto-answer modem.

A simple and free system comes as a utility with Les Mikesell's Modem80 program described above. Host1 turns any TRS-80 Model I or III into a remote operation system which allows callers to operate the host system to run, load or transfer data. Host1 doesn't have any sophisticated passwords or data protection, but it is a very effective utility program. A similar program, called Host, comes on a cassette with the Lynx modem.

The Small System Business Group sells a number of more sophisticated message programs with different capabilities. These include ST80 message programs written by Lance Micklus. ST80-X10 integrates the modem port with the computer operating system. It is a simple host program that is required for the operation of the other ST80 message system software. ST80-X10 sells for $50. ST80-PBB is an elementary bulletin-board system that operates from either disk or tape and sells for about $40. ST80-CC is a more sophisticated disk-based system selling for $100.

Computer Communications Terms

acoustic coupling: Coupling to the telephone line through the use of sound. The telephone handset is usually physically held over a small speaker and transmitter on the modem or data coupler.

answer: (see originate/answer below)

ASCII: American Standard Code for Information Interchange. A data alphabet which gives meaning to strings of 0s and 1s.

auto-answer: The modem automatically picks up the phone line when it rings and provides an answer tone to the calling party.

auto-dial: The modem automatically dials the telephone in response to a command from the terminal or microcomputer serving as a terminal.

baud: A measure of transmission speed. Three hundred baud is the most commonly used.

direct connection: Connected electrically to the telephone line.

duplex: Capable of transmitting and receiving at the same time. It also has to do with the echoing of characters from a host system. In full duplex a host system echoes characters back to the remote terminal. In half duplex the terminal displays its own transmitted characters on the screen. If you are receiving two or more characters, then something (your modem or terminal software) is in half duplex. Full duplex is the standard operating mode.

IEEE-488: An electrical signaling standard used in Commodore computers and commonly found in test equipment. Not compatable with the more common RS-232-C standard.

originate and answer: The two sets of tones used by a modem to communicate over a telephone line. Microcomputers serving as terminals operate in the originate mode. If two individuals are communicating together, one must be in the originate mode and the other must be in answer.

parity: A method of error detection and correction used in commercial and military data communications. Seldom used in microcomputer communications. Parity is usually set to off.

RS-232C: A standard method of voltage signaling. Voltages range between plus and minus 12 volts. A voltage change indicates a digital 0 or 1. These 0s and 1s are encoded by a data alphabet (see ASCII).

serial: Transmission of data in a serial stream as opposed to the parallel stream found on the computer's data bus.

word length: The number of bits used to transmit one character. Usually set to 7 in microcomputer communications.

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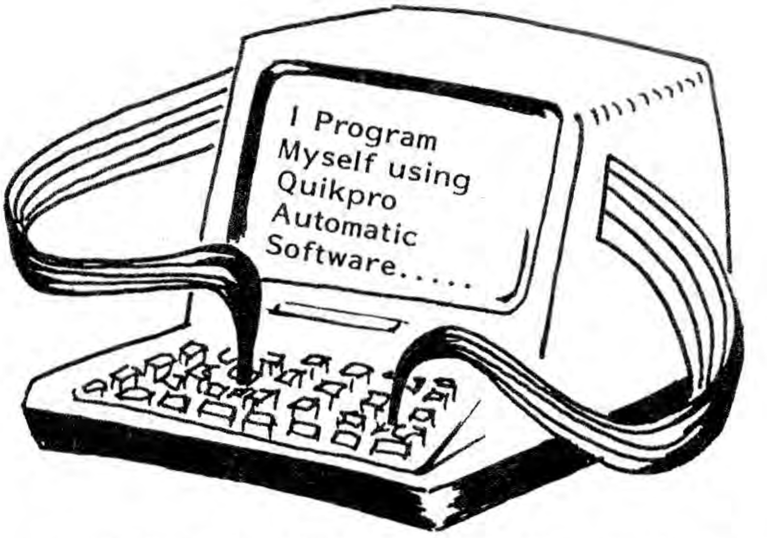

Your computer is fantastically fast...once it knows what to do. You probably realize that a computer is really the combination of hardware and software, working together smoothly, to give you what you want. Either one alone is useless. Software is really the key...the "mind" of a computer system. Every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

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

Until now, that meant you were forced to pay money for application software off the shelf, or if you could afford it, have it custom written for you, or, if you are qualified, do it yourself...spending endless hours figuring it out and writing it. Now, your computer can write individual application programs for you. These programs are each separate, unique software programs that run in standard Basic on your computer.

A company named FutureSoft has developed this exciting and long awaited remarkable working tool for you. There are two versions called *Quikpro+Plus* and standard *Quikpro*. Both of them create unique separate Basic programs for you...to do exactly, precisely, what you want to do. And listen to this...you create a new program in minutes instead of hours.

You can quickly generate a new program when you want it. You can generate thousands of different unique programs, each one standing alone as a complete program that runs in Basic. Best of all, *you* do not have to be a programmer to do it. The *Quikpro* software becomes your personal programmer, waiting to do your work for you any time of day or night you choose to use it.

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

All this is included in the ability/power of the program you create. You do it by simply answering questions that appear on your screen. Instantly, the *Quikpro* software instructs the computer to perform complex and error free instructional sequences. You get the immediate benefits of professionally written software for your application.

The resulting custom program is truly a separate Basic program. You can list it, you can modify it, you can actually see what makes it tick. You can even ask it to print out its own operating instruction manual so others can run it for you. Finally, you can really tap the speed and power of your computer the way you really want. You can create new programs for every use you have in Business, Science, Education, and Hobby areas. And you can start now.

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

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

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

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"Terminal software, a serial port, and a modem can open a new world of electronic information and information for business, education or pleasure."

The Connection-80 message system software for the TRS-80 is growing in popularity. It is available from B.T. Enterprises for about $200.

The top of the line in TRS-80 message systems is the Forum 80 software. This program package requires two disk drives in the Model I and three in the Model III. Check with the Small Business Systems Group for more details. It sells for $350.

Putting It All Together

Providing your microcomputer with a data communications capability gives you many good answers when someone asks, "but what do you do with a computer?" Adding some terminal software, a serial port, and a modem to your TRS-80 can open a new world of electronic information and information for business, education, or pleasure.■

Suppliers and Services

Communications Software Suppliers

Apparat, Inc.: Uniterm/80
4401 S. Tamarac Parkway
Denver, CO 80237
Toll Free (800) 525-7674

B.T. Enterprises: Connection-80
171 Hawkins Road
Centereach, NY 11720
(516) 981-8568

Instant Software: Super Terminal
Peterborough, NH 03458
(800) 258-5473

Lance Micklus, Inc.: ST80 Software
217 South Union Street
Burlington, VT 05401

Leslie Mikesell: Modem80
32466 SR541
Walhonding, OH 43843

Lindbergh Systems: Omniterm
41 Fairhill Road
Holden, MA 01520
(617) 852-0233

Radio Shack: Videotex Communications Packages
All stores and computer centers

Small Business Systems Group:
ST80 and Forum 80 Software
6 Carlisle Road
Westford, MA 01866
(617) 692-3800

Modem Hardware Companies

Emtrol Systems, Inc.: LYNX Modem
123 Locust Street
Lancaster, PA 17602
(717) 291-1116

Hayes Microcomputer Products:
Smartmodem
5835 Peachtree Corners East
Norcross, GA 30092

Kesa Company: Dataspeak modem
774 San Miguel Ave.
Sunnyvale, CA 94086
(408) 746-2738

Micro Mint: Comm80 RS-232C port
917 Midway
Woodmere, NY 11598
(800) 645-3479

Microperipheral Corporation: Microconnection modem
P.O. Box 529
Mercer Island, WA 98040
(206) 454-3303

Novation: The CAT modem
18664 Oxnard Street
Tarzana, CA 91356

Racal-Vadic: Modemphone and other modems
222 Caspian Drive
Sunnyvale, CA 94086

Radio Shack: Modem I and Modem II
All stores and computer centers.

Information Utilities

CompuServe
Personal Computing Division
5000 Arlington Centre Boulevard
Columbus, OH 43220

Dow Jones Information Services
PO Box 300
Princeton, NJ 08540
(800) 257-5114

Source Telecomputing Corporation
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Lost Colony

By David Feitelberg

You are the Economic Manager of the world's first space colony. The next support ship from Earth isn't due for another 15 years and you have instructions either to make things go better or get out of office in shame. You must assure the survival of this struggling space colony—it's all up to you. You'll be presented with the human, natural and industrial resources of the planet. You must allocate labor, explore new territories, decide on production quotas, determine pay scales and taxes for the most productivity —you're armed with maps and charts. 10 levels of difficulty. "Save the game" feature on disk.

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By William Godwin & Don Knowlton

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S-6

Make friends on CompuServe's CB simulator.

Breaker 19

David D. Busch
70060,137
"Charlie Chaplin"

Almost without fail, every time I run CompuServe's CB Simulator I see messages on the order of: "Hi there, I'm new! How do I work this, anyway?" Though help is available at the press of a few keys, most first-time users of this exciting time-sharing gabfest wander around aimlessly, trying to figure out what Talk is, or at worst, how to end the session.

I would like to provide a few tips and explain some of the more esoteric features. This discussion applies directly to CB Simulator Version 3(26). New features and commands are added at intervals, but the basics I will describe have remained stable for a long time.

Why CB?

There are many reasons why the CB Simulator has attracted so many participants. You may find sparkling conversation or downright sillyness at times. Somebody is likely to know somebody who can solve your most pressing problem. It is like electronic mail, but in real time. CB also resembles a wild, long-distance conference call, except that you type instead of talk. You can talk across the country for about eight cents a minute.

Using the CB is unlike using the telephone. Because you cannot hear the speaker's voice, you do not know if you are talking to a male or female, youngster or oldster.

Some people use CB to meet others, and eyeball meetings are common. More isolated types find that the simulator is their only direct contact with other computer hobbyists. Whatever the reason, CB is good, clean fun.

You Can Get There From Here

If you have used the CompuServe Information Service (CIS for short) you know that both menu-oriented functions (DISPLA) and Micronet Personal Computing are offered. From the menus, you can go directly to CB by typing GO CIS 39, which points to the page at which CB's entry point resides. From the Personal Computing area, you can get there by typing R CB.

Once you get hooked, you may want to run the DEFALT program and specify that every time you log in to CIS, you will go directly to CB after the current bulletins are displayed. DEFALT may be accessed by choosing menu option "Change Terminal Parameters" from the customer information page. DEFALT interactively leads you step by step through the options—you may also want to change to transmitting lowercase as well as upper if you have that capability in your machine. In DEFALT, you may also request that menu options within CB (and certain other special interest groups) *not* be displayed every time you are asked for a command. Do this only after you no longer need to be reminded which entry is needed for which feature.

Another option for the veteran user is to log in to the system by adding a handle. This name is then displayed under the user-status table within CB. The procedure is as follows: USER ID: 70060,137,C Chaplin.

You can enter more characters as a handle, but only 11 are displayed in the table (more on that later).

Once you enter CB, you are asked for a handle (if you have not logged in with one), and told the number of channels in use and the users tuned in to each. There are 36 channels available, but only a few are used at any given time. Here is a typical prompt:

```
(Channel) users tuned in
(10)4,(19)2,(33)4
Which channel:
```

Enter 10, and you are in business. Your screen will display a sometimes fast-moving series of quips and comments from the residents of that channel. The channel number, and handle of each speaker is displayed first:

```
(10,C Chaplin) Hello there. Anybody home?
(10,** Null **) Hi, CC. How are you?
```

As you can see, handles may include characters other than letters or numbers. Certain handles are reserved by CIS, and you should follow good taste. To change your handle, type /HANDLE, or /HAN for short. Commands can be abbreviated to three letters, and should be preceded by the slash character. The system will respond: What's your handle: Charlie Chaplin.

Your log-in handle will remain in the user table. I always sign in with the short version, and then change when I get into CB. What is the user table, you ask? When you type /USTAT, the system scrolls through a list of all users presently participating in the Multiplayer Host (see Table 1).

The actual USTAT table is usually much longer than this, with 20 or more users listed. Note that there are many blanks in the Account ID column; those users did not sign in with a handle. Anyone looking at this table can see at a glance who is using the system, what channels they are tuned into, their nodes (originating city), and user ID number. Some will not be using the CB.

Job	User ID	Prog.	Talk	Account ID	Node
5	70060,137	CB 10		C CHAPLIN	T01AKR
7	70000,000	DECWAR			T11SFA
15	70000,001	MPHOST		SUPERMAN	T03PIT
22	70000,002	TALK	any	ANONYMOUS	T02ATL
25	70000,03	CBIG			T04HOU

Table 1

They might be visiting CBIG (CB Interest Group), playing DECWAR, having a one-on-one talk, or just idling in command mode (MPHOST).

You may tune into any channel you wish by typing TUN xx, where xx is the channel number. To go from channel 10 to channel 19, simply type /TUN 19. How do you decide where to go? Most users watch what activity is going on in all the other channels by entering /STA. That command gives you the status of the other channels and how many are tuned in at the present time.

You may also monitor two additional channels. The messages for these appear on the screen simultaneously with those of the channel you are tuned to. To monitor, enter /MON 19, and so on up to the limit of two. To cancel this, type /UNMON 19. Then, /STA will mark your status by placing a pound sign next to the channel you are tuned to, and an asterisk next to one that is being monitored:

```
/STA
(10)6$,(19)12*,(21)3,(33)8
```

During busy times, your screen will rapidly fill with messages, and you must be quick to keep up with them. Here is a brief rundown on all the commands available in the release of CB Simulator in use at the time this article was prepared (we have already discussed /TUN, /MON, /UNMON, and /STA):

- /WHO—This returns the User ID number (called PPN in jargon, for Programmer Project Number) of the last speaker in the CB system. If you see a message from Charlie Chaplin, and want to know who he is, type /WHO, and you will see: Charlie Chaplin/70060,137. If you are not fast enough, however, you may see the PPN of some other talker on a different channel. Keep trying until you find out what you want to know. Getting the PPN allows contacting the user individually for a talk, to determine their node (out of curiosity) if their handle is not displayed in USTAT, or for sending EMAIL.
- /HAN—Change your handle.
- /SCR xyz—Scramble on key "xyz." This is used by individuals who wish to talk as a group, but privately. Only those who have typed in the /SCR command followed by the correct combination code can see or transmit these messages.
- /XCL xyz—You transmit unscrambled, so everyone may read what you enter, but you can receive scrambled transmissions.
- /UNS—Turn off scramble.
- /HELP—Display list of CB commands.
- /SQU abc—Squelch handle "abc." If a weird 12-year old gets on your favorite channel and tries to monopolize it, you can turn off that individual. Entering

See List of Advertisers on page 386

"Another evening, I had a cogent discussion of Taoism with a devotee."

/SQU IDIOT, means that all transmissions by the person with the handle Idiot are ignored by your system. Everyone else can see his ravings, however, until they apply /SQU on their own. The system works by PPN, so changing handles will not help; Idiot by any other name still remains invisible to your tired eyes.

- /TALK—go to two-person talk. This is a one-on-one private discussion, not using the public CB "airwaves."
- /SPCWAR—go to the SPACEWAR game.
- /EXIT—leave the CB program.

You may also exit CB by typing Control C. Once you leave, you will be presented with the Multi-Player Host menu, which looks something like this:

```
Welcome to the multi-player host.
Options:
0 help
1 list other users
2 run CB
3 run SPCWAR
4 talk to another job
5 return to primary computer
6 log off the system
7 CBIG (CB Interest Group)
8 run DECWARS
```

Option 1 gives you a look at USTAT. You may see a user (Job) you wish to talk to, or be told that a Job has requested to talk with anyone. You can enter Talk by responding Y to the "Do you wish to talk?" prompt (if asked), or by entering menu option 4.

In talk, you communicate directly with the other user, chatting or shooting the breeze as you wish. Exit this module by typing Control Z.

Enter option 2 and you are back in CB. Numbers 3 or 8 take you to one of two games available, while entering a 7 transports you to the strange world of CBIG, run by an interesting East Coaster named CHRISDOS, who reigns as SYSOP for the interest group. The games and CBIG are too complex to get into here. Each has their own extensive documentation.

You may also go back to the Micronet Personal Computing Area by entering 5 at the prompt, or log off the system entirely by inputting a 6.

What Can You Expect?

I like CB because it is so varied. I meet many talented and interesting people. One evening, I carried on a lengthy conversation with one user in Swedish, even though I don't speak the language. The pauses in the conversation (while waiting for answers to be typed) were sufficient to allow me to look up phrases in a Swedish dictionary I keep by my desk, and then compose answers from a ready-made phrase book.

As a writer, I keep many reference volumes in my office, and they come in handy. Another evening, I had a cogent discussion of Taoism with a devotee who did not know I was madly reading my encyclopedia to decipher his or her meaning between questions.

Other sessions have been silly. One night, in my guise as Charlie Chaplin, I insisted on pantomiming my communications by using character keys to denote various words or phrases. Another evening, the users of one channel dressed up as rabbits (by changing handles to things such as Ras Rabbit, or Charlie Chapbunny) and going hop hop for several minutes. It sounds weird, but it is a fun way to blow off steam, trying to think of cute ways of topping the other users.

When I was having trouble using a 1200-baud modem with a certain operating system, I inquired on CB, and discovered that one of the participants was an engineer with AT & T, knew modems *and* the DOS, and was well equipped to help me solve my problem. Other CBers have explained a sticky Assembly-language point to me, or advised on the relative worth of the latest software releases.

I use the Charlie Chaplin handle as well as Kitchen Table, Inc., and I am most frequently found on CB on weeknights after 11 p.m. Eastern Time. I hope to see many of you there. ■

You can't wrap fish in it, but...

Ohio Electronic News Experiment

Jay Chidsey
205 E. Adams St.
Green Springs, OH 44836

A fascinating experiment in electronic publishing has been underway in the small northwest Ohio county-seat town of Tiffin since February 1. "You can't wrap fish in it," noted *Editor and Publisher*, a major publishing industry magazine, but if the videotext *Advertiser-Tribune* were transferred to newsprint, with a normal complement of advertising, it would land on your doorstep with a thump much like that of a big-city daily. Currently offering over 650 32-character by 16-line video pages, the daily publication is equivalent to 150 paper pages of over 35,000 words.

Both *Advertiser-Tribune* Editor/Publisher Kaj (pronounced Kai) Spencer and Videotext Version Manager and Editor Sherry Skufca insist that the video version should not be thought of as an electronic twin of the print version. "We are doing everything we can to dispel the idea that we are an electronic newspaper," says Skufca. "We are an instant electronic information service. We don't have permanence, you can't browse through our pages, there is no room for long commentaries. We have no art or pictures." She adds, "A new Japanese camera system which captures pictures on disk rather than film could bring pictures to videotext systems soon, though."

Videotext Advertiser-Tribune *Assistant Editor Steve Dillon prepares a file for update on the two-disk Model II editing computer. To his left is the line printer which shares the output of the Compugraphic system data banks (the two tall cabinets seen beyond the Model II). Back to back with the editing computer is a four-disk Model II (the video version data bank), and next to that the eight-line Tandy Multiplexer. Out of camera range at right is a Videotex terminal used to check video output.*

Available at start-up only to Radio Shack Videotex terminal owners and to TRS-80 Color Computer owners who purchased Tandy terminal software, new software written by Gary Sams of Tiffin's Computer Club now permits access by TRS-80 Models I and III. No other computers or terminals are served thus far.

What makes this experiment so exciting to journalists and TRS-80 owners is that this is the first known attempt on the part of a small-town newspaper to integrate local and world news and national information bases into an information service for town and farm people. It is also one of the first such services to be initiated by the news publisher, as opposed to a big-city daily making its news available to an independent information provider.

Starting from a newspaper base offers a significant advantage. Local, area and state news is typed directly into Compugraphic computers in the paper's newsroom by print staff people, and national and world news comes in from United Press International (UPI) via satellite in Compugraphic form. So convenient is this computer base that most of the material intended only for the video version, such as school news or public service information, is typed in on Compugraphics in the newsroom by the video staff rather than being entered directly on the two-disk Model II editing computer. Skufca estimates that fully 95 percent of the content of the video version's data bank comes down the line from Compugraphic storage rather than from direct entry. Late-breaking world and local news, just-in sports scores, weather warnings and updates, and winter school closings are usually entered directly on the editing computer.

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". . . the economics of electronic publishing are radically different from those of print publishing."

The area news and UPI material is edited on the Compugraphics, and sent directly to the *Tribune*'s typesetting computer to be printed in cold-type columns for offset print reproduction. Sending it to the editing computer is not quite so simple. There is provision in the Compugraphic use codes for sending the characters to a line printer, and the video version makes use of this output. The Compugraphic sends a 43-character line, inserts a line feed, sends another 43 characters, and so on.

The two-and-a-half-person staff (two editors and one half-time newswriter) spend much of their time formatting the Compugraphic output to 32-character, 16-line units, and even inserting a Model II text-begins ASCII symbol for every page. After formatting, each item is assigned a menu designation and sent to a second Model II. This four-disk unit is the data bank. Though there is room for up to 2,700 pages, the *Tribune* now uses over 650. Of these, 170 or so are what Skufca calls floats—weekly items which stay on line until replaced. Cafeteria menus (for 22 schools), the Friday money fund report, and the weekly Chicago grain market summary are examples. There are 450 to 500 new pages every day, and as many as 200 of these are updated once or twice again during the course of each day.

To gain access to the data bank, the subscriber must have a Tandy Videotex terminal, or a TRS-80 Color Computer plus Tandy software and a modem, or a Model I or III plus an RS-232 and modem. (A Model I requires an Expansion Interface also.) The user loads a short software program (30 seconds at 500 baud) that asks which menu items are desired. The software also provides handshaking and protocols requested by the Tandy eight-line Multiplexer. The *Tribune* provides a Videotext Listings Guide (a menu) with over 100 entries from which the user may select.

During the set-up period, there was a problem with the Videotex software. It had been written by CompuServe and marketed by Tandy. The *Advertiser-Tribune* was startled to discover that Tandy Videotex would not connect a Tandy Color Computer or any TRS-80 with a Model II data bank. Consternation! Tandy modified the Videotex software to work with the Color Computer, and the *Tribune* commissioned connection software (free to subscribers) for Models I and III.

A 4K Videotex terminal or Color Computer owner can select no more than eight pages from the menu, but a 16K Model I or III owner can select up to 24 pages. Software on order will make up to 58 pages possible to TRS-80s with 32K memory. After selecting, the subscriber enters a password and an identification number and then dials the access telephone number with the modem on line. The subscriber's machine is now in contact with a Radio Shack Multiplexer.

The Multiplexer calls up the menu pages requested from the data bank computer at 9,600 baud, stores them in its 64K internal buffer, and sends them at 300 baud via telephone line. Once the information transfer is complete, the Multiplexer terminates the phone call, and the subscriber can use up and down arrows to scroll the information for reading, or he can print it.

How fast is information transfer? Skufca gave me the figure of eight pages in 40 seconds; one subscriber estimated two minutes for eight pages. Each character requires a start bit, eight character bits, and a stop bit; 10 in all. At the 300-baud transfer rate (300 bits per second), 30 characters are transmitted each second; I timed an eight-page NYSE (New York Stock Exchange) closing report at about two minutes' transfer time.

The Future

In thinking about a system like this, and about its potential for setting patterns for the future, it is important to recognize that the economics of electronic publishing are radically different from those of print publishing.

It costs money to print every page, and thus every column inch, of a print newspaper. Print editions can be squeezed for space; video versions aren't. It would be unthinkable for a print paper to carry the same story every day for a week: the weekly "What's New in Stocks?" or the "Friday Mutual Fund Report" for example. Rerunning an article doesn't cost the video version a dime. Fast-breaking print newspaper stories are no longer updated in extra editions by newsboys shouting "Huxtry, Huxtry" on city streets—not since radio and tv stole that show. The video version can steal some of it back with a Scripsit paragraph deletion and a direct rewrite insertion of late-breaking world or local news, weather warnings, winter school closings, and so forth.

There are long NYSE and AMEX and over-the-counter stock reports and farm price quotations which Spencer sees as being of great interest to area business and agricultural people, but which the print paper can't afford to publish every day. The video version, by contrast, carries 15 major stock and bond listings plus another dozen business commentary sections and 10 agriculture sections, many of them replaced or updated daily.

With a combination of Compugraphic-set news from the print paper newsroom and relatively inexpensive wire service feed in Compugraphic-ready form, the video version is two or three times the size of the 26-page newsprint version using 1/4 of its data bank capacity.

That is the good news for the electronic publisher: virtually unlimited space and inexpensive information. The bad news is that advertising, which is the financial backbone of printed newspaper publishing, will have to be rethought if the whole cost of the news and information offered by an electronic information service is not to be borne by the subscriber alone.

Print media thrust the advertising at the reader by putting it on the same page with the news and features. Television and radio intermixed it with the programs. Neither method works for a medium which is menu-driven, where the user can choose exactly what he or she wants to see.

Spencer calls the solution "Market Place." If advertising is to have a significant role in paying for the subscriber's use of the medium, then that subscriber must be persuaded to ask for the advertising. A half-time advertising sales person has joined the video staff, and the target is the sale of "yellow page ads." These are half-page ads listing the name, address, phone number, and services of a business, categorized by type of business. An advantage for advertisers is that new services or products, changes of address or phone number, can be made in seconds rather than in next year's phone book. Available now are video classified ads, with an option to list in both media for a few cents more.

Spencer is optimistic about the potential of charts and graphics in the video publication; Skufca is more restrained. The different TRS-80s and the Videotex terminal handle graphics input differently, she points out. What is a circle to one is a flattened oval to another. X–Y axis curves are affected in the same way. Bar graphs are no problem, but pie charts are somewhere beyond the next hill.

Spencer is also enthusiastic about the concept of on-demand publishing. Software is being written to determine which menu items are most frequently requested by subscribers. Despite the enormous amount of unused capacity, least requested items will be dropped. "We want to use our limited formatting time on the items people are looking at," Skufca explains.

The videotext *Advertiser-Tribune* is an experiment, one that is planned to run at least three years. It is an attempt to combine the electronic news services available to all news media with the local focus of a rural area and small circulation newspaper. Can a video news and information service survive in a small Ohio town, population

"The Tribune *expects to operate in the red for at least a couple of years on this project."*

20,000, print newspaper circulation 11,500?

Spencer and Skufca insist that the videotext version is not an electronic newspaper, and they are only too right. In its present form, the videotext *Advertiser-Tribune* is a data bank which offers much information not carried in the print edition plus short news items and summaries which have the effect of directing the subscriber to the print newspaper for the full story. It does have the potential, however, of becoming an electronic newspaper.

There are tens of thousands of kilobytes of unused space in the existing system; more than enough room for every word that now goes into the print newspaper. And every word is directly available in Compugraphic form. There is space to carry items in two sizes: a short version of only the lead paragraphs as well as a complete version of the story. There are at least three problems associated with a policy of full news coverage.

First, the 43-characters-per-line output of the Compugraphic is manually reformatted to the 32 character line required by TRS-80s. Carrying every story from the print version would greatly increase the time required for such formatting if it were to be done manually. There are at least two fixes for this output problem. New software could be created to transform the 43-character Compugraphic output to word-sensitive 32-character lines, or the Compugraphic itself could be set to output 32-character lines. Such an adjustment would interfere with the Compugraphic's feed to the typesetting computer, but if there is a time when all the type is set for the day's edition, the video version could still have the news first in the subscriber's home.

Second, the system is not interactive; it does not offer a menu on screen, accept user choices, and then deliver requested material all in one operation. The subscriber chooses from a printed menu (the Listings Guide) and requests items from that list. This is a tougher problem. Menu selection prior to connection is essential to the low flat-rate subscription which makes this service so attractive. Interactive connection would require time-on-line charging—a quite different kind of service.

Finally, it is difficult to escape the impression that newspaper people have a print bias. An electronic newspaper worth buying in its own right could be threatening to them. I'm convinced that print-oriented publishing people will have to recognize and work through this bias if a newspaper-based video news facility is ever to become popular, or profitable.

Is It Profitable?

The *Tribune* expects to operate in the red for at least a couple of years on this project. Projected three-year operating costs, according to best estimates, are around $140,000, of which $25,000 is up-front equipment cost (mainly two Model IIs with disks and a Radio Shack eight-line telephone Multiplexer). The rest goes for supplies and staff. Income will be from subscriptions at $6 per month, just about equal to newsprint edition price, and some (it is hoped) from advertisers.

Subscribers can call in 24 hours a day. The Multiplexer will handle up to four calls at once, and is expandable to eight. Subscribers outside Tiffin pay long-distance charges, but at off-peak hours these are

"The initial subscription response has been encouraging."

small, even for the subscriber in Seattle, Washington. From there, and after 11 p.m., a direct dial call costs 22 cents for the first minute and 16 cents for each additional minute of connection. Wherever you live in the continental U.S., you might want to check out this electronic service; just send $6 to *The Advertiser-Tribune*, Tiffin, OH 44883.

Spencer estimates, based on national data, that there are 200 to 300 home computers in the *Tribune*'s service area now. He projects subscriptions at 600 to 800 in the next three years, and the lower estimate would cover operating costs plus equipment amortization. The initial subscription response has been encouraging. After a month and a half into the experiment, there were 25 subscribers: two farmers, a few people monitoring the system with an eye to opening a similar information service, and about eight TRS-80 hobbyists and eight area businessmen.

The success of this experiment will depend upon several factors:

- There must be a significant increase in the number of computers (and terminals) owned by area people during the next three years. Industry estimates for new micro sales in 1982 are nearly three million. If this growth trend continues, and if Tandy holds its market share, that means a lot of new TRS-80s in use; many of them in the *Tribune*'s service area.
- The *Tribune* must add service to non-Tandy rigs. Software for the Model II, Apple, and IBM computers is now in the planning stage.
- A major barrier to many potential subscribers is the cost of the Expansion Interface, RS-232, and modem. The *Tribune* is hoping to develop software which will eliminate the need for any peripheral except a modem.
- The service must be worth subscribing to. A full-coverage news service will be possible if and when the *Tribune* gets software (it is under study) which will permit direct feed from Compugraphic to the editing computer without manual formatting. Since there is no practical space constraint, many UPI stories and features which the print version does not use could be added, once the formatting problem is solved. ■

See List of Advertisers on page 386

You've gawked at the result—now learn the technique.

Spiromania—Part II

Program Listing 1. Machine Code Routine

```
0600                           NAM SPIRALS
0600                           SETDP 0
0600                           ORG $7C00

7C00 BDB3ED        STRT        JSR $B3ED         ;USR ARG TO D
7C03 8E02D0                    LDX #360*2        ;#DEGS EVEN
7C06 C501                      BITB #1           ;EVEN ARG?
7C08 2703                      BEQ A@            ;IF SO
7C0A 8E0168                    LDX #180*2        ;#DEGS ODD
7C0D AF8C48        A@          STX <CIRC+1,PCR
7C10 9E8A                      LDX <$8A          ;CONSTANT ZERO

7C12 4F            STEP        CLRA              ;IGNORE MSB
7C13 3416                      PSHS A,B,X        ;LOBES/ANGLE
7C15 BD9FB5                    JSR $9FB5         ;D*X TO Y,U
7C18 1F30                      TFR U,D           ;RSLT TO D
7C1A 1700A1                    LBSR SIN1         ;SIN(LOBES*ANG)
7C1D 8600                      LDA #0            ;# TIMES
7C1F 2706                      BEQ B@            ;IF NONE
7C21 5A            A@          DECB              ;OR WHATEVER
7C22 12                        NOP
7C23 12                        NOP
7C24 4A                        DECA              ;DONE ALL?
7C25 26FA                      BNE A@            ;NO
7C27 3404          B@          PSHS B            ;SAVE RADIUS
7C29 8D32                      BSR XY            ;GET COORDS
7C2B 3261                      LEAS 1,S          ;RSTR STK
7C2D 2108                      BRN DOT           ;USE BRA FOR DOTS
```

Program continues

by Jake Commander
80 Micro *Technical Editor*

Eds. note: This is the second part of a two-part series on color graphics. Part one appeared in the May issue of 80 Microcomputing.

The machine code routine in Listing 1 works by performing the sine/cosine evaluations for a complete spyrographic loop. Each point is plotted at half-degree increments in order to increase the resolution of the final pattern. This is why the

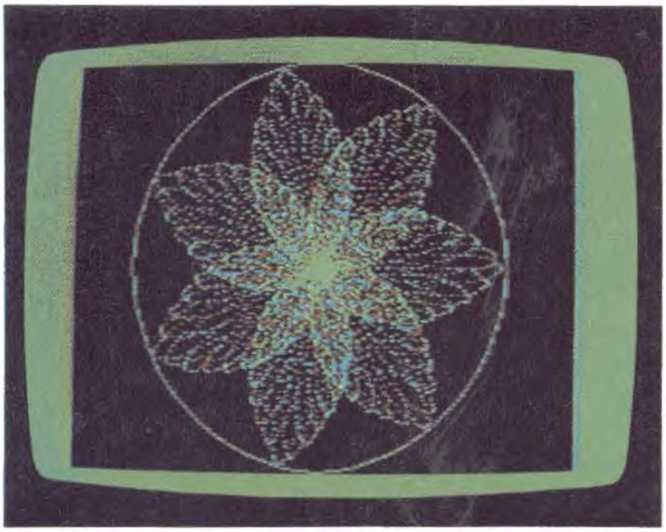


Photo 1

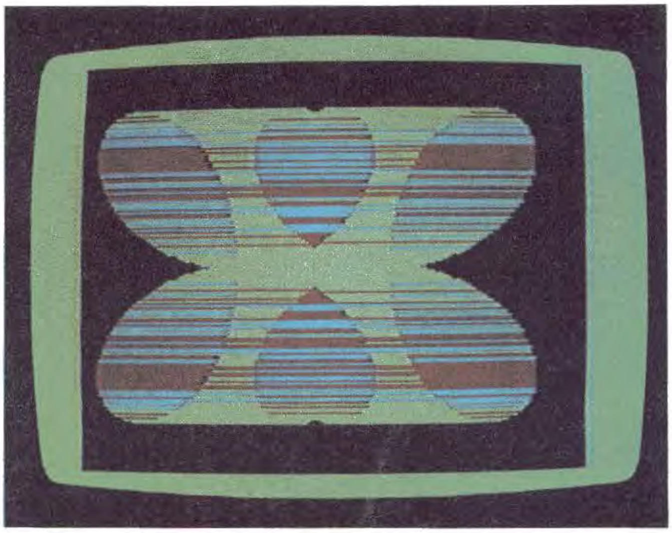


Photo 2. Hearts

". . . 256 lobes produces a delicate resemblance of a souffle prepared with too much milk."

table is 180 bytes long—one entry for each half-degree from zero to 89.5 degrees. Despite the fine resolution, dots soon appear with gaps between them at fast-changing portions of spirographs. This can be used to great effect to produce some nice interactions between apparently unrelated dots, but if it irks you (as it sometimes did me) I have provided an option that will join the dots using the line-draw routine in ROM. This is the same technique as the Circle command produces patterns with no gaps between the dots. Be aware that with some patterns, using lines tends to fill the screen too fast, detracting from otherwise more delicate possibilites. Let your own taste decide.

Machine Code Run-down

Here's how the machine code works with reference to the line numbers in the source listing:

Line 4 uses a ROM routine to pick up the number of lobes called for in parentheses in the USR call from Basic. This is returned in register D of the 6809. (Register D is registers A and B used together as a 16-bit pair.)

Lines 5–9 set up the number of degrees required to complete a spirographic loop. For patterns with odd numbers of lobes 180 degrees does the job, for even numbers 360 is required. Both these numbers are multiplied by two to facilitate plotting at half-degree increments. You should note that patterns using even numbers produce designs with twice the number of lobes as the number you input; 4 produces 8 lobes, and so on.

Line 10 initializes the plotted angle to zero. Advantage is taken of the fact that Color Basic uses RAM location $8A as a 16-bit zero constant. Change location $8B to a one and Basic gets all its sums wrong!

Line 11 ensures no more than 256 lobes are allowed. This is a more than adequate number, even with the highest resolution attainable. The maximum of 256 lobes produces a delicate resemblance of a souffle prepared with too much milk.

Lines 12–15 get the sine values of the number of lobes multiplied by the current plotting angle. This is the simulated circular motion of the small wheel inside the larger. The number returned determines how the radius changes as the pattern is spun through 360 degrees.

Lines 16–22 are for your self-indulgent pleasure. You can process the radius in register B with any code you like for your own

Program continued

```
0027 7C2F AE62                LDX 2,S          ;ANGLE
0028 7C31 260D                BNE C0           ;IF NOT 1ST
0029 7C33 97C4                STA <$C4         ;SETUP LINE STRT
0030 7C35 D7C6                STB <$C6         ;Y LINE STRT
0031 7C37 97BE        DOT     STA <$BE         ;X DOT COORD
0032 7C39 D7C0                STB <$C0         ;Y DOT COORD
0033 7C3B BD9374              JSR $9374        ;SET PIXEL
0034 7C3E 2013                BRA D0
0035 7C40 3406        C0      PSHS A,B         ;X,Y COORDS
0036 7C42 96C4                LDA <$C4         ;PREV LINE STRT
0037 7C44 D6C6                LDB <$C6         ;DITTO Y COORD
0038 7C46 97BE                STA <$BE         ;LINE STRT X
0039 7C48 D7C0                STB <$C0         ;LINE STRT Y
0040 7C4A 3506                PULS A,B
0041 7C4C 97C4                STA <$C4         ;LINE END X
0042 7C4E D7C6                STB <$C6         ;LINE END Y
0043 7C50 BD94A1              JSR $94A1        ;DRAW LINE
0044 7C53 3516        D0      PULS A,B,X       ;LOBES/ANGLE
0045 7C55 3001                LEAX 1,X         ;BUMP ANGLE
0046 7C57 8C02D0      CIRC    CMPX #360*2      ;DONE CIRCLE?
0047 7C5A 25B6                BCS STEP         ;NOT YET
0048 7C5C 39                  RTS

0049 7C5D EC65        XY      LDD 5,S          ;CRNT ANGLE
0050 7C5F 8D5A                BSR SIN          ;SIN TO B
0051 7C61 A662                LDA 2,S          ;RADIUS
0052 7C63 8D1B                BSR SRAD         ;GYRATE X
0053 7C65 8D38                BSR SCL          ;SCALE FOR VID
0054 7C67 CB20                ADDB #32         ;RSTR CENTER
0055 7C69 3404                PSHS B           ;SAVE X COORD
0056 7C6B EC66                LDD 6,S          ;CRNT ANGLE
0057 7C6D 8D49                BSR COS          ;COS TO B
0058 7C6F 53                  COMB             ;INVRT FOR VID
0059 7C70 A663                LDA 3,S          ;RADIUS
0060 7C72 8D0C                BSR SRAD         ;GYRATE Y
0061 7C74 8D29                BSR SCL          ;SCALE FOR VID
0062 7C76 CB00                ADDB #0          ;Y OFFSET
0063 7C78 C1C0                CMPB #192        ;> MAX?
0064 7C7A 2502                BCS A0           ;NO
0065 7C7C C0C0                SUBB #192        ;WRAP AROUND
0066 7C7E 3582        A0      PULS A,PC        ;GET X & RTS

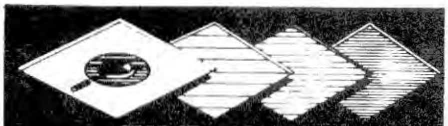
0067 7C80 3402        SRAD    PSHS A           ;RADIUS
0068 7C82 4D                  TSTA             ;>127?
0069 7C83 2B01                BMI A0           ;YES
0070 7C85 43                  COMA             ;MAKE > 127
0071 7C86 8080        A0      SUBA #128        ;GET 0-127
0072 7C88 3404                PSHS B           ;CRNT SIN/COS
0073 7C8A 5D                  TSTB             ;>127?
0074 7C8B 2B01                BMI B0           ;YES
0075 7C8D 53                  COMB             ;MAKE > 127
0076 7C8E C080        B0      SUBB #128        ;GET 0-127
0077 7C90 3D                  MUL              ;(7 BIT)
0078 7C91 58                  LSLB             ;GRAB
0079 7C92 49                  ROLA             ;EXTRA BIT
0080 7C93 8B80                ADDA #128
0081 7C95 1F89                TFR A,B          ;RSLT TO B
0082 7C97 3502                PULS A           ;CRNT SIN/COS
0083 7C99 A8E0                EORA ,S+         ;RADIUS SIGN
0084 7C9B 2A01                BPL C0           ;SIGNS SAME
0085 7C9D 53                  COMB             ;ELSE RVRSE RSLT
0086 7C9E 39          C0      RTS

0087 7C9F 86FF        SCL     LDA #255         ;SCALE FACTOR
0088 7CA1 8DDD                BSR SRAD         ;SCALE RADIUS
0089 7CA3 5D                  TSTB             ;=0?
0090 7CA4 2601                BNE A0           ;NO
0091 7CA6 5A                  DECB             ;ELSE -1
0092 7CA7 1F98        A0      TFR B,A
0093 7CA9 8403                ANDA #3          ;SAVE LO BITS
0094 7CAB 3402                PSHS A           ;TO STK
0095 7CAD 54                  LSRB             ;1/2
0096 7CAE 54                  LSRB             ;1/4
0097 7CAF 3404                PSHS B
0098 7CB1 EBE4                ADDB ,S          ;2/4
0099 7CB3 EBE0                ADDB ,S+         ;3/4
0100 7CB5 EBE0                ADDB ,S+         ;+ LO BITS
0101 7CB7 39                  RTS

                      *ENTRY D=ANGLE*2 (DEGS <=65536)
                      *EXIT  B=SIN.  0 - 255

0102 7CB8 C300B4      COS     ADDD #90*2       ;COSINE EP
0103 7CBB C30000      SIN     ADDD #0          ;ANGULAR OFFSET
0104 7CBE 3416        SIN1    PSHS A,B,X
```

Program continues



Program continued

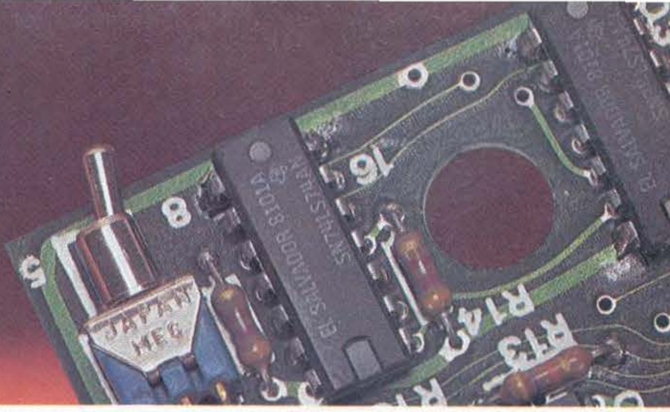
```
7CC0 830168   A@     SUBD #180*2      ;ANGLE>180?
7CC3 24FB            BCC A@           ;SUB TIL < 180
7CC5 C30168          ADDD #180*2      ;THEN READJST
7CC8 108300B4        CMPD #90*2       ;ANGLE > 90?
7CCC 2507            BCS B@           ;IF ANGLE < 90
7CCE 3406            PSHS A,B         ;ANGLE TO STK
7CD0 CC0168          LDD #180*2       ;180 DEGS
7CD3 A3E1            SUBD ,S++        ;MINUS ANGLE
7CD5 308C1C   B@     LEAX <SINTBL,PCR ;=> TBL
7CD8 3A              ABX              ;=> SIN VAL
7CD9 E684            LDB ,X           ;GET SIN VAL
7CDB 3510            PULS X           ;ORIGINAL ANGLE
7CDD 3404            PSHS B           ;HOLD SIN
7CDF 1F10            TFR X,D
7CE1 8302D0   C@     SUBD #360*2      ;ANGLE > 360?
7CE4 24FB            BCC C@           ;SUB TIL <360
7CE6 C302D0          ADDD #360*2      ;READJUST
7CE9 10830168        CMPD #180*2      ;ANGLE >180?
7CED 3504            PULS B           ;RSTR SIN
7CEF 2501            BCS D@           ;IF < 180
7CF1 53              COMB
7CF2 3590     D@     PULS X,PC        ;RSTR X & RTS

7CF4 80       SINTBL FCB 128
7CF5 81              FCB 129
7CF6 82              FCB 130
7CF7 83              FCB 131
7CF8 84              FCB 132
7CF9 86              FCB 134
7CFA 87              FCB 135
7CFB 88              FCB 136
7CFC 89              FCB 137
7CFD 8A              FCB 138
7CFE 8B              FCB 139
7CFF 8C              FCB 140
7D00 8D              FCB 141
7D01 8E              FCB 142
7D02 8F              FCB 143
7D03 91              FCB 145
7D04 92              FCB 146
7D05 93              FCB 147
7D06 94              FCB 148
7D07 95              FCB 149
7D08 96              FCB 150
7D09 97              FCB 151
7D0A 98              FCB 152
7D0B 99              FCB 153
7D0C 9A              FCB 154
7D0D 9B              FCB 155
7D0E 9D              FCB 157
7D0F 9E              FCB 158
7D10 9F              FCB 159
7D11 A0              FCB 160
7D12 A1              FCB 161
7D13 A2              FCB 162
7D14 A3              FCB 163
7D15 A4              FCB 164
7D16 A5              FCB 165
7D17 A6              FCB 166
7D18 A7              FCB 167
7D19 A8              FCB 168
7D1A A9              FCB 169
7D1B AA              FCB 170
7D1C AB              FCB 171
7D1D AC              FCB 172
7D1E AE              FCB 174
7D1F AF              FCB 175
7D20 B0              FCB 176
7D21 B1              FCB 177
7D22 B2              FCB 178
7D23 B3              FCB 179
7D24 B4              FCB 180
7D25 B5              FCB 181
7D26 B6              FCB 182
7D27 B7              FCB 183
7D28 B8              FCB 184
7D29 B9              FCB 185
7D2A BA              FCB 186
7D2B BB              FCB 187
7D2C BC              FCB 188
7D2D BD              FCB 189
7D2E BE              FCB 190
7D2F BF              FCB 191
7D30 C0              FCB 192
7D31 C0              FCB 192
7D32 C1              FCB 193
7D33 C2              FCB 194
7D34 C3              FCB 195
7D35 C4              FCB 196
7D36 C5              FCB 197
7D37 C6              FCB 198
7D38 C7              FCB 199
7D39 C8              FCB 200
7D3A C9              FCB 201
7D3B CA              FCB 202
7D3C CB              FCB 203
7D3D CC              FCB 204
7D3E CC              FCB 204
7D3F CD              FCB 205
7D40 CE              FCB 206
7D41 CF              FCB 207
7D42 D0              FCB 208
7D43 D1              FCB 209
```

Program continues

Reader Service for facing page ✓31→

THE SWITCH



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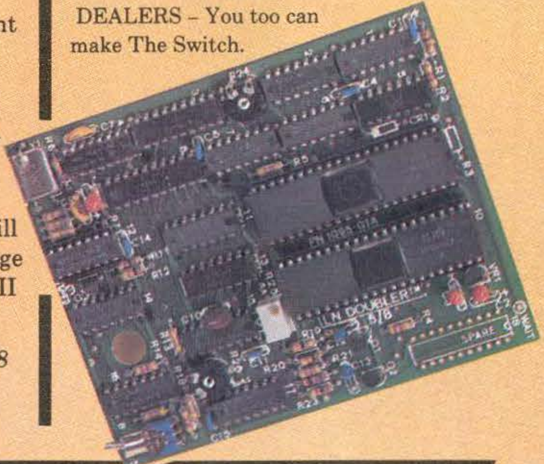

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*8" drive operation requires special cable, 8" double-density requires 3.55MHz CPU speed-up modification or LNW-80 4MHz computer.

Program continues

```
7D44 D2          FCB 210
7D45 D2          FCB 210
7D46 D3          FCB 211
7D47 D4          FCB 212
7D48 D5          FCB 213
7D49 D6          FCB 214
7D4A D7          FCB 215
7D4B D7          FCB 215
7D4C D8          FCB 216
7D4D D9          FCB 217
7D4E DA          FCB 218
7D4F DB          FCB 219
7D50 DB          FCB 219
7D51 DC          FCB 220
7D52 DD          FCB 221
7D53 DE          FCB 222
7D54 DE          FCB 222
7D55 DF          FCB 223
7D56 E0          FCB 224
7D57 E1          FCB 225
7D58 E1          FCB 225
7D59 E2          FCB 226
7D5A E3          FCB 227
7D5B E3          FCB 227
7D5C E4          FCB 228
7D5D E5          FCB 229
7D5E E5          FCB 229
7D5F E6          FCB 230
7D60 E7          FCB 231
7D61 E7          FCB 231
7D62 E8          FCB 232
7D63 E9          FCB 233
7D64 E9          FCB 233
7D65 EA          FCB 234
7D66 EB          FCB 235
7D67 EB          FCB 235
7D68 EC          FCB 236
7D69 EC          FCB 236
7D6A ED          FCB 237
7D6B ED          FCB 237
7D6C EE          FCB 238
7D6D EF          FCB 239
7D6E EF          FCB 239
7D6F F0          FCB 240
7D70 F0          FCB 240
7D71 F1          FCB 241
7D72 F1          FCB 241
7D73 F2          FCB 242
7D74 F2          FCB 242
7D75 F3          FCB 243
7D76 F3          FCB 243
7D77 F4          FCB 244
7D78 F4          FCB 244
7D79 F4          FCB 244
7D7A F5          FCB 245
7D7B F5          FCB 245
7D7C F6          FCB 246
7D7D F6          FCB 246
7D7E F7          FCB 247
7D7F F7          FCB 247
7D80 F7          FCB 247
7D81 F8          FCB 248
7D82 F8          FCB 248
7D83 F8          FCB 248
7D84 F9          FCB 249
7D85 F9          FCB 249
7D86 F9          FCB 249
7D87 FA          FCB 250
7D88 FA          FCB 250
7D89 FA          FCB 250
7D8A FB          FCB 251
7D8B FB          FCB 251
7D8C FB          FCB 251
7D8D FB          FCB 251
7D8E FC          FCB 252
7D8F FC          FCB 252
7D90 FC          FCB 252
7D91 FC          FCB 252
7D92 FD          FCB 253
7D93 FD          FCB 253
7D94 FD          FCB 253
7D95 FD          FCB 253
7D96 FD          FCB 253
7D97 FE          FCB 254
7D98 FE          FCB 254
7D99 FE          FCB 254
7D9A FE          FCB 254
7D9B FE          FCB 254
7D9C FE          FCB 254
7D9D FE          FCB 254
7D9E FF          FCB 255
7D9F FF          FCB 255
7DA0 FF          FCB 255
7DA1 FF          FCB 255
7DA2 FF          FCB 255
7DA3 FF          FCB 255
7DA4 FF          FCB 255
7DA5 FF          FCB 255
7DA6 FF          FCB 255
7DA7 FF          FCB 255
7DA8 FF          FCB 255
7DA9             END
```

"Lines 16–20 are for your experimental delight."

experimental delight. The code at this point is normally set up to bypass itself. If the byte at location $7C20 is changed to a value greater than zero your loop will be executed that number of times. I've tried shift and rotate opcodes to good effect.

Lines 23–25 calculate the actual X and Y coordinates of the pixel to be set using the current angle in conjunction with the calculated radius at that angle.

Lines 26–43 use the available ROM routines to either set the pixel or draw a line to that pixel. The option to draw a line or a dot is taken at line 26 with a "do branch always or do a branch never" instruction. This is set from within the accompanying Basic code.

Lines 46–48 continue the pixel-setting loop until a complete pattern is drawn. At that point a return is made to Basic.

Lines 49–66 comprise a subroutine to determine the X and Y coordinates, based on the current radius. The Y coordinate is closely watched to ensure it doesn't stray above 191. If it does, the routine wraps it back around to the top of the screen.

Lines 67–86 perform the task of multiplying a number (either the radius or a scaling factor) by a sine-cosine value, as given in my trig table. As sines in normal trigonometry take on values from minus one to plus one, and my table returns values from zero to 255, this routine ensures the calculations work out right with those non-trig values.

Lines 87–101 are a kludge which allow the current X or Y coordinate to be scaled down even after it's been through the required sine/cosine calculations. There are two reasons for needing a scaledown routine. It allows you to compress the X and Y coordinates so they fit squarely inside a 192 by 192 pixel grid. Anything above this would lose the pattern at the top and bottom of the screen. Also, the whole pattern may be repeated at a smaller scale to give the effect of patterns within patterns. You'll see an example or two of this in the photographs.

Lines 102–126 are the routine which extracts the sine or cosine value from the table according to a given angle. The routine determines which quadrant the angle lies in and alters the returned value as per the mirror-image idea previously discussed in Part 1 of this series.

Lines 127 onward are the sine values from zero to 89.5 degrees in half degree increments. Remember, the sine of zero degrees is zero, which I take to be the center of the screen on the X axis. Hence, I return a value of 128 for zero degrees and increase as the angle approaches 90 degrees. Let me

"Let me reiterate that this is the wrong way around for normal Y axis plotting."

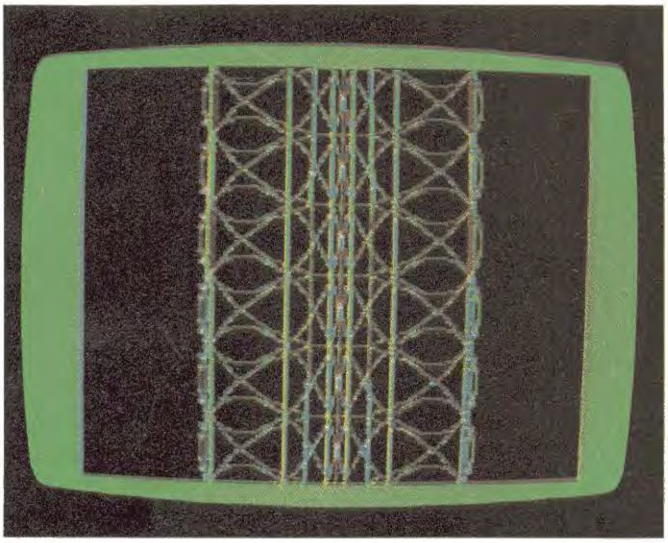

Photo 3

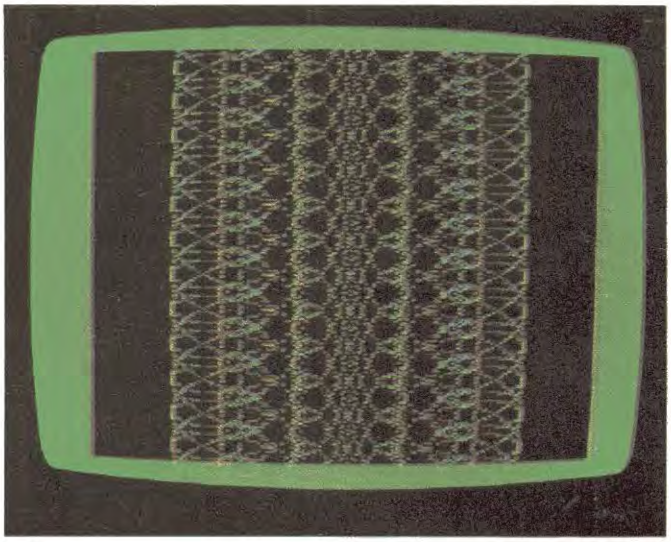

Photo 4

reiterate that this is the wrong way round for normal Y axis plotting. This is taken care of at line 58 in the source code.

Crunched Numbers

The machine code does the number-crunching required to do a fast single pattern. Once that's done, it returns to the Basic program. In the current setup it's the Basic program in Listing 2 that controls the parameters which are POKEd into the machine code program.

The Basic program decides what sort of spirograph will be drawn. Each time the pattern is drawn by the machine code, the Basic program can change one or more qualities of the spirograph and use the machine code to draw that variation, allowing layer upon layer to be put down with subtle or not so subtle changes. You also have the option to pause or break execution according to your artistic judgement during the times the Basic program is in control. Once the machine code starts it can't be stopped until it completes the loop.

One of the fascinations of this design process is watching the changes occur and observing as unexpected features come and go. The creation of heart shapes in Photo 2 is an example of this. The hearts magically appear out of nowhere and finally disappear like Valentine's day.

There's not much to explain regarding the workings of the Basic code, which simply asks for the required parameters and POKEs them into the machine code. If changes are required between patterns, the program ensures no invalid numbers are POKEd by monitoring sensitive values at

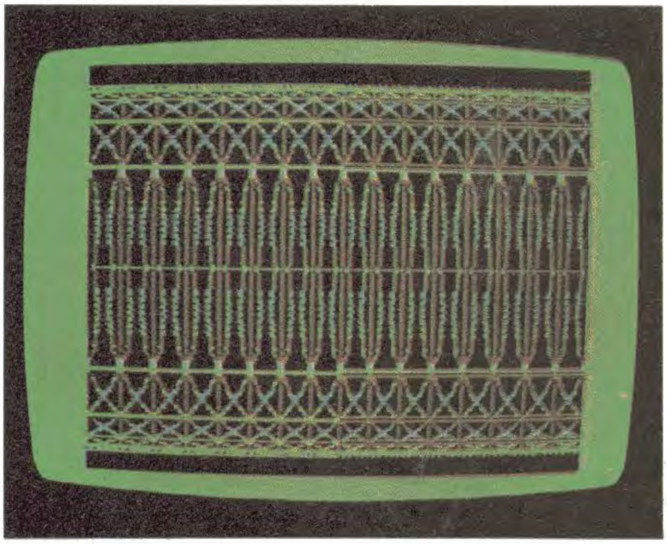

Photo 5

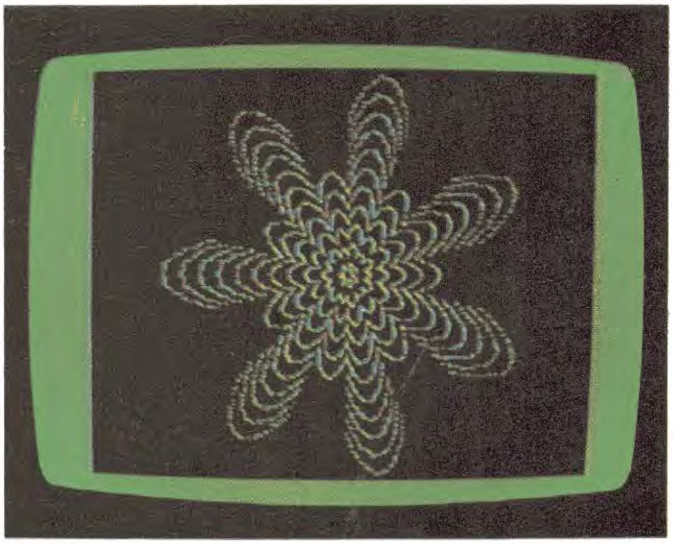

Photo 6

". . . in the highest resolution mode, when using black and buff, the television gets confused."

lines 360 to 420. Like the program in the March issue ("The Editor's Choice," page 78), this is meant to be an experimental setup—a computerized arts lab.

If you really try hard you can crash the program especially in the machine code phase. Take extra special care with the user-defined radius modifications. These are contained in the Basic program listing as a Remark statement; be sure you have some idea of what you're doing before you unlock them. If the program starts drawing circles over the ceiling or the cat, it's probably crashed. Some of the photographic examples—notably the butterfly shape—were obtained with the user radius modification, so you may get some ideas how to use this facility.

Here's an overview of some points of interest in the program: Line 20 protects the machine code routine at hex 7C00 and above, defines the entry point of the routine and sets a scale factor. This scale factor determines the size of the first drawn design; it's normally set at 255 (maximum) but you can change it to lesser numbers to create smaller patterns. A Remark statement follows, containing the user repeat factor and opcode to use for your experimental purposes. The X Step and Y Step entries change the center of each successive pattern by the number of pixels you choose. If you opt for no X Step, the spirograph will be drawn dead center; if you specify a step rate, it will be drawn starting at the left hand side. The Angular Offset entry allows you to lay each pattern down at a different rotational angle from the preceding one. This can be a positive or negative number of degrees, respectively achieving clockwise or counter-clockwise steps. The Scaledown factor lets you reduce the size of each spirograph until it disappears and then reappears inside out. This is input as a pixel value; e.g., an input of five reduces each successive radius by five pixels or its diameter by 10 pixels.

Those of you without an assembler will have to POKE in the machine code from a For. . . Next loop in Basic or from any 6809 machine code monitor. You should start POKEing from hex address $7C00. The bytes to POKE are found in column three of the source code listing. You can use a different origin if you like, as the code is written using the 6809's relocatable opcodes, but you'll need to change all the corresponding POKEs in the Basic program. Rather you than me.

Color Arty-Facts

In line 160 of the Basic program you'll see that I use PMODE 4,1 to get the highest possible resolution. This can be changed to PMODE 3 or less if you want to experiment, but the machine code doesn't take into account any mode other than 4. Nevertheless, it's worth a try; I've produced some interesting patterns this way although I always revert to PMODE 4.

Here's a thought: In PMODE 4 with Screen 1,1, there's supposed to be only two colors—black and buff. Where do all those blues and reds come from? I hate to say it, but I found the answer not from our friends at Radio Shack but from a piece of literature from Atari Inc. Those blue and red pixels are what's known as color artifacts; somewhat of a misnomer, considering that they're unintended. It appears that in the highest resolution mode, when using black and buff, the television receiver gets confused. The incoming video pixel information changes so fast and contains so much high-frequency content that the color receiver thinks it has something to decode other than a luminance signal. It mistakenly interprets this high-speed video transition as a chrominance signal and decodes it as such, producing a color which at a given pixel location is not under control of the computer.

This phenomenon occurs only during the video-voltage transition caused by a single pixel—once a number of pixels run into each other, the color decoder correctly recognizes the chrominance information and displays the buff color. However, by spacing single pixels at every other interval, the overworked decoder thinks the color is something other than what it should be. By setting pixels at even dot locations you'll get one color, at odd locations you'll get the other. By placing two together you get yellow, and as more are added, the color fades to buff.

Color artifacts are something we can definitely use to advantage. By spacing our patterns two pixels apart, the dots will stretch out into lines of a definite color. By starting the same pattern from an odd or even dot position, the colors will be different in each pattern. Also, by judicious mixing of black, blue, red, yellow and buff, many other colors can be obtained. That explains the myriads of colors appearing in some of my designs. Don't ask me to analyze each individual color in those patterns, though; some of the color combinations defy easy analysis. Suffice it to say that some bedazzling combinations of color can be conjured from a palette of black and buff.

Pep Talk

I have a feeling some readers may have

```
20 CLEAR50,&H7C00:DEFUSR=&H7C00:SC=255':UR=1:OC=87
40 INPUT"# LOBES";NL
60 INPUT"LINES OR DOTS (L,D)";LD$:IFLEFT$(LD$,1)="L"THENPOKE&H7C
2D,33ELSEIFLEFT$(LD$,1)<>"D"THEN60ELSEPOKE&H7C2D,32
80 INPUT"X STEP";XS:IFXS=0THENXO=32
100 INPUT"Y STEP";YS
120 INPUT"ANGULAR OFFSET";AO:AO=AO*2:IFAO<0THENAO=720+AO
140 INPUT"SCALEDOWN";SD
160 PMODE4,1:PCLS0:SCREEN1,1
180 POKE&HB5,255 'COLOR BYTE
200 POKE&HB6,0 'PMODE BYTE
220 POKE&H7C1E,UR:POKE&H7C21,OC 'USER DEFINED RADIUS MODIFICATIO
N
240 'POKE&H7C65,32:POKE&H7C66,0 'DISABLES X-AXIS SCALING.
 141 & 31 REENABLE IT.
260 IFAN>255THENPOKE&H7CBC,AN/256:POKE&H7CBD,AN-INT(AN/256)*256E
LSEPOKE&H7CBC,0:POKE&H7CBD,AN
280 POKE&H7C68,XO
300 POKE&H7C77,YO
320 POKE&H7CA0,SC
340 X=USR(NL)
360 XO=XO+XS:IFXO>255THENXO=XO-256
380 YO=YO+YS:IFYO>255THENYO=YO-256
400 AN=AN+AO:IFAN>65536THENAN=0
420 SC=SC-SD:IFSC<0THENSC=255
440 'UR=UR+1 'USER'S MOD
460 GOTO220
```

Program Listing 2. Basic Code

"I am acting under inspiration to take this one step further. . ."

dropped out on the way. To those of you that made it this far: congratulations! Those of you that skipped the heavy stuff just to get to the icing on the cake—shame on you, but enjoy it anyway. I've derived some pleasure from sharing my enthusiasm for a fascinating subject.

Now for the best part: entering the code and trying out some of those creations for yourself. Table 1 lists the parameters to use to recreate the designs we've published; to use the variables UR and OC, don't forget to remove the remark apostrophe in line 20 of the Basic code. Then enter the variables directly into the same line.

As far as I'm concerned, that's only the start. I'm acting under pure inspiration to take this one stage further to a Spiro command which would be executable from within a Basic program. The idea is to be able to create true spirographs of almost any shape and size by specifying the parameters from ordinary Basic variables.■

A tape of the source and object code with the Basic program including data to run these and other patterns is available from the author for $15: P.O. Box 495, Peterborough, NH 03458.

Photo#	Lobes	D/L	X Step	Y Step	Ang Offset	Scale Offset	Comments
1	7	D	0	0	5	10	Pause when retouches edge
2	2	L	2	0	0	0	39 loops
3	2	L	0	32	0	0	To completion
4	6	D	0	16	0	0	To completion (UR = 1:OC = 87)
5	2	L	16	0	0	0	To completion (UR = 3:OC = 87)
6	7	D	0	0	0	12	16 loops (UR = 2:OC = 87)
7	2	D	0	0	0	3	15 loops (UR = 90:OC = 90)

Table 1. Design Parameters

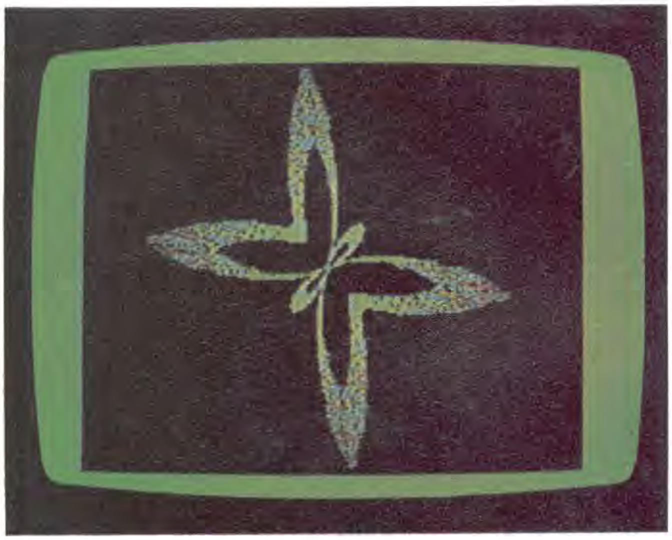

Photo 7

From Computerware in California.

Color Computer Utilities

Power Pack and Color Diagnostics, Editor and Assembler
Computerware
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Color Computer
$179.95 16K

Scott L. Norman
8 Doris Rd.
Framingham, MA 01701

Although Color Computer owners can be perfectly happy programming in Basic, eventually there comes the time to dig into the other possibilities offered by the machine. You may want to experiment with machine language, or perhaps with word processing. If so, you are going to need at least some of the elements of a programmer's tool kit—namely a monitor, editor and assembler; several of these have recently become available.

The Computerware system includes both hardware and software elements for the 16K version. Owners of 32K machines or disk systems need different versions.

The Power Pack and Monitor

The heart of the system is its hardware component: a plug-in cartridge called the Power Pack, containing a monitor program in 2K of ROM plus another 6K of static RAM (2716s and 2114s, respectively). The cartridge fits into the Color Computer's expansion ROM port. Since the machine scans this port immediately when turned on, it "wakes up" in the Monitor instead of in Basic; the prompt is MON: plus a non-flashing block cursor. There are commands to return you to Basic immediately so the Power Pack can be left plugged in all the time. Both ROM and RAM in the pack occupy locations out of the range normally addressed by Basic: ROM, $C000-$C7FF (49152-51199 decimal); RAM, $D000-$E7FF (53248-59391 decimal). RAM is available to Basic programs via POKE and PEEK commands and can also be used to hold protected machine-language programs if the proper loading address or offset is given. That is exactly what is done with the Color Editor. Like all monitors, the Color Monitor is a tool allowing the programmer to examine and change memory. This, augmented with additional commands, allows the Color Monitor to: have direct access to the 6809's registers, save and load binary cassette files, use the RS-232 port to communicate with another terminal or with a printer in an echo mode, and debug software by setting breakpoints for program execution.

The Commands

Color Monitor commands consist of a single alphabetic character possibly followed by one or more hex arguments. Simply typing R (without using Enter) produces a display of the contents of the 6809's registers, while a jump to a specified address requires typing J and the address. Blocks of memory can be initialized to a given value by using the I command: I<starting address> <final address> <value>.

Memory can be opened, examined and changed if desired by simply entering M and the address. You can then load memory by typing valid hex characters.

With these commands alone, you can enter your own hand-assembled machine-language programs or published programs. In the latter case, you would use the bytes in the second column of a standard Assembly-language program listing.

Here is a quick example. Let's start by initializing all of the Power Pack's RAM to 3F (software interrupt): I D000 E7FF 3F. The Monitor provides the spaces as it recognizes each valid entry. This particular initialization results in hash on the screen. Hitting Reset brings back the MON prompt, and we can enter a program starting at the bottom of Power Pack RAM with M D000.

Next begin typing the machine code; after every two bytes, the display scrolls up and shows the new address. When finished, the enter key brings you back to the Monitor. To execute the program, use J D000.

This is not the way to enter lengthy programs; use the Editor/Assembler for those. Nevertheless, I have found the Monitor very useful for quickly entering and testing short segments of debugged machine language. Its real value becomes evident when working with it over a period of time and using its commands to probe the operation and status of the 6809 and the Color Computer's memory.

The manual, while concise, offers a few *goodies*, such as a table of indirect addresses through which various Monitor routines can be accessed by the user. Presumably, these could even be called from Basic via the DEFUSR and USR(N) commands.

Color Diagnostics

The Color Diagnostics program is provided as a binary cassette file loading and auto-executing through the Monitor's L command. It is stored in low Power Pack RAM; you can reenter it from the Monitor by entering J D000, as long as the pertinent memory has not been written over.

The diagnostics are organized around a set of nested menus. You needn't perform the tests in any specific order and there are plenty of quit options allowing you to exit whenever you please. The major tests, in order of presentation on the master menu, are:

- (P) Power Pack—tests both ROM and RAM, via a secondary menu. The ROM test calculates a checksum on the Monitor and displays the result (97 for very early Color Computers, 52 for more recent models). If the RAM test is selected, a third-level menu comes up offering the options of rotating bit, convergence, and latency tests. Should an error occur in any of these, an appropriate diagnostic message is printed.
- (M) Memory—Test RAM in the Color Computer itself, just as for the Power Pack.
- (R) RS-232—Test the serial I/O Port if a shorting plug has been inserted.
- (J) Joysticks—Checks the left and right joysticks and their associated A/D circuitry using the secondary menu.
- (B) Basic ROMS—Test both standard and Extended Color Basic ROMs by calculating checksums (2B and 1D, respectively, for the 1.0 versions of the interpreters).
- (T) Tape—Tests the I/O capabilities of the cassette interface by recording and reading cassette file. If everything is satisfactory the screen briefly displays a complete alphanumeric and graphic character set, followed by the message "Cassette Tests Good."
- (S) Sound—Causes two musical scales to be sounded while displaying a piano keyboard graphic followed by the five-note *Close Encounters* theme with a similar display.

You may invoke menu selections at any point by entering the first character of the test name.

Color Editor

The next program in the hierarchy, the Color Editor, provides powerful commands for managing text: Assembly-language source code, Basic or English. The program searches for and changes strings of characters in one or many lines of text, and moves lines of text within a file, meaning it serves as an elementary word processor, as well.

The Editor (which shares a cassette with the Color Assembler) is also loaded with the Monitor's L command. It resides in the Power Pack RAM between D000 and E0B7. Autoexecution begins with the prompt EDT: plus a static cursor, identifying the command mode used for almost all operations except text entry. For this, use the input mode accessed by the command I from command mode.

The simplest way to become familiar with the Editor's use is to follow the manual's example and enter something. Hitting the I command gives you a machine-generated line number and colon for a prompt. In my version of the tape the first line number is 10, this may vary. Note that this is not a Basic line number. It just identifies each line of text to the Editor itself. A new identification number is generated each time you signal the end of a line by pressing Enter. In my tape the increment is also 10.

To illustrate the syntax for some of the most useful commands, use the Editor to write a simple Extended Color Basic Program—one which draws a high-resolution circle at the center of the screen. Remember that the Basic line numbers have to be entered as though the Editor were not involved. After entry, the display might look like this:

```
10: 100 PMODE 4,1:PCLS:SCREEN 1,1
20: 200 CIRCLE(128,96),50
30: 300 GOTO 300
40:
```

At this point, the Break key returns you to the command mode. To write this program to tape (as an ASCII file) enter:

CS "filename".

You can not run programs directly from the Editor.

Editing

Suppose you want to change the radius of the circle from 50 to 75 units, move to line 20 (use the identification numbers, not the Basic line numbers) by answering the EDT: prompt with 20. The syntax for changing the target string 50 to 75 is:

C/50/75/.

This works if there is only one occurrence of "50." As you might suspect, there are optional additions to this command letting you pick one out of

✓See List of Advertisers on page 386

many occurrences. You can also change a target string in each of a specified number of lines with a single command.

If you want to draw a smaller concentric circle, and have it appear first in the Basic program, the Editor requires that you specify the line after which you want to make an addition, so in this case our command is 10I. The result is a prompt of 11. You can now go ahead and enter, say, 11: 150 CIRCLE(128,96),25 before exiting by hitting Break. If you decide at this point that the new circle should be drawn after the old, merely use the Editor's Move command. In its most general form, it allows starting at any line and moving a specified group of lines to a position following another. For this example enter: 11MO #20 1 to start at line 11 and move one line to a position behind line 20. Remember to change the Basic line number, though.

This much of the Editor's capability may not seem too impressive. After all, Extended Color Basic has some powerful editing commands of its own, although they do not include the selective movement of lines of code. Remember though that the Editor can operate just as easily on any sort of input material. Its command suite comprises a total of 36 commands, which may be grouped into:

- Line display and movement commands for screen display or printouts. Lines may be referenced by number, scrolled to by use of the up and down-arrow keys, or searched for according to their contents.
- Line modification and replacement commands, including those for line movement, deletion and insertion.
- Pattern modification and replacement commands for editing strings within a line.
- Cassette commands for saving, loading or writing, which outputs a portion of a text file in memory to a cassette. All cassette files are in ASCII form, and the Editor chains files read in succession—no need for the POKEs and PEEKs used to chain standard tokenized Basic files.

There are also some miscellaneous commands, such as those used to clear the text area, renumber lines of text, turn off the line numbers for printing, exit to Basic or the Color Monitor.

This is the sort of control you need to enter Assembly-language programs of any length. Do not be too quick to downplay the Editor's usefulness to the Basic programmer. The ability to find every occurrence of a variable name, and perhaps change it, can be very handy.

As a Word Processor

All of the editing features work just as well with English text as they do with anything else. The people at Computerware are obviously aware of the appeal of plain language processing, and they have included a few commands which are especially useful for this kind of work. These make the Color Computer emulate a typewriter in some respects, and they add at least a measure of printer control for generating a pleasing output format.

Two of the most useful are the Tab and Bell commands. The former sets the column(s) to which the final text indents in response to the tab key (Shift-@), while the latter causes a tone to sound when the text being entered reaches a preset column. A line of text may be up to 107 characters long, depending on your printer. The Editor operates on physical lines, not logical lines, meaning a carriage return (Enter) is required whenever you reach the end of your printer's line length, even if your sentence isn't finished. You just pick up on the next line, as you would with a typewriter. The Tab command sets the indentation for the left margin, as well as for the start of paragraphs, subheadings, and so on. This means you must follow each Enter with a Shift-@ to align your left margins.

This sounds more complex than it is; let's run through an example: Start by defining the tab positions. Let's say you have an 80-column printer, so an average line should be 60 characters long and start at column 10.

Paragraphs should be indented an additional five spaces. The appropriate command is: TAB 10 15. You can set as many as 20 tab positions.

Next, set the bell. If a typical line is to end at column 70, we can get five spaces worth of warning with: BE 65.

The whole setup procedure is geared to the printed page format; the 32-column screen display width never comes into play.

You are now ready to enter text. The next command is I, as for the previous Basic example. The familiar Shift-0 command toggles you into a typewriter-like mode, in which lowercase is the normal output and you must press the shift key every time you want an uppercase character (until Shift-0 is entered again, of course). With this done, you can start typing. Hit Shift-@ twice to get to the indentation for your first paragraph; these are "logical tabs," meaning the cursor doesn't move in the input mode, but the final text will still look right. Type until the tone sounds and hit Enter. The Editor-assigned number for the next line comes up to prompt you. You have to remember to begin each line with the Shift-@ for the left margin if you are using it, though. If you would like the printout to be double spaced, the text must be padded with a blank line between each line of print by using two Enters in succession.

You can use any of the Color Editor's commands to refine the text, with the line numbers serving as location references. The up and down arrows help you scroll, and using them in conjunction with the shift key takes you to the top or bottom of the file from any position. This holds for printing, too. For clean print, you can toggle the line numbers off by responding to EDT: with LN. Then turn on your printer and enter: (Shift-up arrow)P(Shift-down arrow). You will get a printout of your entire text file. You can use leading and trailing line numbers instead of the arrows with the P command if you want only a partial printout.

This application of the Color Editor can be very useful even if it isn't a full-blown word processor. It will not automatically center or right-justify material, nor will it send control characters to a Printer. Its strengths lie in its editing capabilities, but at the very least it allows Color Computer owners to get a taste of electronic text manipulation.

Color Assembler

The final component of the Computerware Tool Kit is a resident two-pass assembler for the conversion of 6809 Assembly-language programs into machine language. It loads with the Monitor's L and occupies about 8K of Color Computer RAM—specifically, from $0600 to $2600. Full 139 Motorola-defined mnemonics are supported, as are several directives and pseudo-ops. The former are commands which do not produce object code upon assembly, but rather alter the action of the Assembler itself. Examples are: END, which terminates the reading of the input file; EQU, used to define labels; and OPT, which allows the source code to set various assembler controls for program listing, pagination, and so on. Pseudo-ops, on the other hand, are used to generate numeric or string constants, they cause the generation of object code, although they themselves are not part of the 6809 instruction set.

The manual, 18 pages plus appendices, presents complete syntax listings for both directives and pseudo-ops. There are several options for most of them. The convention followed in their printed description is that requires spaces, arguments, and so on are enclosed in angular brackets, options in square brackets. Thus the proper syntax for the END directive is:

<space(s)> END [<(space(s)> <expression>].

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All this says is than when typing in the directive as part of an Assembly-language program, lead off with at least one space before typing END. If you wish to add an optional expression (which in the case of this directive is interpreted as the transfer address), then the expression must be separated from END by one or more spaces.

It is quite possible to write (or at least copy) Assembly-language programs without using many of the options available. The Assembler manual contains as an appendix a short program which accepts a character string from the keyboard and prints it, reversed, on the screen.

To make a useful machine language program out of it, first load the Color Editor and use it to enter and correct the Assembly language using the syntax listings in the Assembler manual. You needn't set a lot of tabs to get a neatly aligned listing at this point. The Assembler takes care of that. Just remember to insert a leading space if a line doesn't have a label field. When the program has been entered and corrected, use the Editor's CS command to save it to tape.

Now you must load the Assembler. Unfortunately both the Editor and Assembler cannot be co-resident in memory. When the Assembler autoexecutes, it presents a list of eight assembly-time options, their default status, and a prompt of ASM: plus a flashing cursor. The options control screen display and printer listing; some of them interact with and override options listed in the Assembly-language source code just created. For the sample program, the manual recommends just one option be used: Wait, which causes the display of Assembler output to pause whenever the screen fills. This is set by entering +W in response to the ASM: prompt.

Once you press Enter, the option list changes to reflect your input, and you receive a prompt to position the tape (the source code) for pass 1. Pressing Enter when the tape and recorder are set causes the source file to be read. After this happens, the Assembler builds the symbol table (instantaneously, for the short sample program) and prompts you to position the tape for pass 2. This means rewinding the source tape to the beginning and reading it again. This time the source code is actually converted to object code, stored in a memory buffer, and a prompt of "paused. . ." is displayed. Assuming the List option has not been disabled, hitting any key which produces a printable character now results in a listing on the screen. The listing resembles the full format we are used to seeing in published machine-language programs, except that every line is split into two. The lower member of each pair is our source code; the upper consists of a hex address and the corresponding machine-language expression produced by the Assembler.

This is in the completely tabbed form familiar from published listings. The "paused. . ." prompt is again displayed at the bottom of the screen, indicating that any printing key will cause a display page advance. When you get to the end of the program listing, the Assembler sorts and prints the symbol table generated in pass 1. It then (hopefully) informs you that no errors occurred and prompts you to position a blank tape for pass 3. Set things up to record, and press Enter. The machine-language program is now recorded as a binary file compatible with the Color Monitor's L command (although not with Basic's CLOADM). After recording, the Assembler returns immediately to command mode. Entering M takes you back to the Monitor, and you are set to load and run.

The necessity of making a tape of the machine code before running (the inability to assemble directly to memory) is the result of a conscious choice by the program's authors. Paul Searby of Computerware said this derives from their desire to permit the Assembly-language programmer the maximum freedom in locating a program in memory.

There are many options available to the programmer, and careful study of the manual is necessary to gain an understanding of such things as the way assembly-time errors are handled. Even then, you will need other material to become an Assembly-language programmer; the manual makes no pretense at being an introductory course.

Summing Up

At the outset you will be dealing with the "tyranny of modes." You must get used to flipping back and forth between, say, the Monitor and the input and command modes of the Editor. This can be especially daunting to the inexperienced user. Even after becoming accustomed to the idea it can be humbling to find yourself entering a syntactically correct command that happens to be jibberish for the prompt you have just received. It shouldn't dampen anyone's enthusiasm for these programs, though.

In the same vein, the manuals can be cumbersome. If you're not accustomed to juggling several computer manuals on your knee while working out a problem, I suggest taking things nice and easy. Start with the diagnostics program to make sure that everything is okay with your computer and Power Pack. Now read the Power Pack/Monitor manual, especially the summary and descriptions of the commands. Use the Monitor to look around in memory, and enter some hex characters by hand. Become familiar with the processes of changing memory contents and jumping to arbitrary starting points. Again, if you are not yet familiar with Assembly language, you will not be able to take advantage of most of these capabilities; you may, however, begin to get a feeling for how the operation of the system works.

As I have tried to indicate, a Basic program provides a pretty good vehicle for exploring the Editor's capabilities. Try playing with the search and change capabilities in particular. If you have a printer, you will probably want to exercise the Editor on text.

The Assembler should be last on your list. You can exercise it by keying in the sample program from the manual; in fact, entering just the machine-code portion is an interesting way to become comfortable with the Monitor. Go through the complete editing and assembly process described above. Now you are set to dig into a reference book and get into Assembly-language programming.

As far as the operational aspects are concerned, the use of opposite sides of one cassette for the Editor and Assembler is inconvenient. You have to remove this cassette after loading the Editor in order to record your edited source code anyway. Nevertheless, it is annoying to have to fully rewind side 2 of the tape to get to the Assembler when you are ready for it. My own preference would be to have the Editor and Assembler recorded sequentially on one side of a cassette, with a modest gap between them.

The Power Pack is useful for storing various utilities in protected memory when running Basic programs in main memory. The 6K of fast RAM represents a fair portion of the cost of the 16K Tool Kit.

Costs and Options

There are cassette versions of the Monitor, Editor and Assembler which run in 32K machines without the Power Pack, and they cost $29.95 each including the Monitor source listing ($15 separately). In fact you can also buy a combined 32K Editor/Assembler package for $49.95. This makes the Computerware products much more competitive. The Diagnostics package isn't available in a 32K version.

Paul Searby has indicated that owners of 16K Power Pack versions can return their Editor/Assembler cassette and receive versions upgraded to run in 32K for a modest fee. In the 32K Power Pack configuration, you can have the Editor and Assembler resident simultaneously. Check with Computerware for details.

Computerware seems to be serious about extending their support of the Color Computer and making it possible for serious owners to learn much more about their machines. ■

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The introduction of a compiler for a major language, always a landmark event in the world of microcomputers, was never more so than in the case of PL/I, considered by many the ultimate programming language. Digital Research, the people who brought you CP/M, have compressed this huge, mainframe-oriented monster to fit into the world of the 8080. After experimenting with this extraordinary new compiler for several months, I can give you my first impressions.

Why PL/I, anyway? When the language appeared in the mid-1960s, the answer was clear. The advantages of high-level programming languages were beginning to become apparent. Fortran was poorly adapted to non-scientific data processing, however, while Cobol, the only high-level business-oriented language, was clumsy and incredibly verbose. The time seemed ripe for a well-organized language which could replace both. PL/I inherited its structure from Fortran (with some additions from Algol), and its capabilities combined those of Fortran and Cobol. It was intended to be the universal programming language. There is very little you cannot do in PL/I.

Even today, few other languages can match the combination of features PL/I brings to the user. A software review of a compiler inevitably ends up being a review of the language; since PL/I is not widely known among micro users, I will summarize its features and show how they differ from those of other languages. I will compare PL/I mostly with Basic (still the most widely-used micro language) and with Fortran (probably the best-known compiled language).

PL/I Summary

Like Basic, PL/I provides numeric and character-string data types. Unlike most Basics, however, the numeric types include both fixed and floating-point numbers. Some enhanced Basics provide an integer data type as well. In PL/I the fixed-point numbers may be in binary or decimal. Decimal numbers were included for business data processing; they need not be integers and can have (in PL/I-80) as many as 30 significant figures. (Numbers used in accounting may have as many as 10 significant figures; compare this to the seven offered by most floating-point numbers.) In addition to character strings, PL/I offers bit-string data; both types may be manipulated by operators similar to Basic's MID$ and related functions. Fortran also offers fixed and floating-point numbers, but no decimal data type; the new standard, Fortran-77, offers character-string data as well.

PL/I offers multidimensional data arrays, the same as any high-level programming language. In addition, the user can set up hierarchical arrangements of data, called *structures*. (It would be more accurate to call them trees.) A typical structure looks a little like the outlines we used to write in school:

```
1 CUSTOMER,
   2 NAME,
   2 ADDRESS,
      3 STREET,
      3 CITY,
   2 ORDER;
```

The different levels of a structure can be of different data types; any level of a structure can be an array; and you can even have arrays of structures. In operating on structures, instructions can refer to the whole structure or to any desired level. Business data processing particularly requires the ability to gather various types and sizes of data into a single entity this way, in contrast to scientific computation, which seldom needs any structure more complicated than an array.

PL/I was one of the first languages to offer the If...Then...Else for conditional branching, replacing the clumsy GOTO branching necessary in the Fortran of that time. (Fortran-77 now has an If...Then...Else structure which I find even handier to use than PL/I's.) For looping, PL/I offers a powerful and flexible Do statement with a choice of control by an index (as in a Basic For...Next loop) or with a While clause or both.

In addition, PL/I has a super control structure known as a *block*. PL/I programs are normally written as a set of nested blocks. The keywords Begin and End delimit each block. There are several advantages to this organization; the chief one is that data arrays inside blocks can have variable dimensions. For example, you can write

```
GET LIST (A, B);            /*Read A and B from terminal  */
BEGIN;
      DCL X(A, B), Y(B);    /*Dimensions of X and Y arrays*/
      ...
END;
```

In this example, the dimensions of the arrays X and Y are not known until run time; at that point, A and B are read, and storage for X and Y is dynamically allocated. This means you never allocate any more storage than you will really need.

Like Fortran, PL/I is a compiled language instead of an interpreted one. Any pro-

> *"PL/I remains a particularly hard language to master."*

gramming language has to be translated into machine language sooner or later. In interpreted languages like Basic, translation is put off until the last possible moment. At run time, each line of a Basic program is translated "on the fly" as it is executed. The translation process, which must be repeated every time you run the program, slows down the program's execution; in simple programs the slowdown is negligible and users are willing to accept the speed penalty in exchange for the ability to run their programs immediately. In a compiled language, translation is a separate step, usually followed by loading, which is yet another step. These extra steps take time, and you may have to wait some minutes before you can run your program. Those minutes seem like an eternity, but when your translated program runs, it goes at maximum speed. In very large production programs compiled languages are preferred, because compilation need be done only once while the final program may be run hundreds of times.

Compiled languages allow the user to break his program down into subroutines which are separately compiled and stored in the user's files. He can then include these in new programs as needed during the loading step. Most serious programmers accumulate a library of useful subroutines on which they can draw; this custom has been memorialized in Kernighan and Plauger's classic *Software Tools,* which describes the formation and contents of such a library.

PL/I programs can also be recursive. A recursive subroutine is one that can call itself. Recursion lets you write very complicated procedures in a compact and easily understood form. (You can write a Quicksort routine in less than half a page of code.) Many powerful algorithms are recursive, and it turns out that recursive programs are particularly easy to analyze and to prove correct. Unfortunately, most of this is unknown outside of the classroom; programmers do not generally look for recursive solutions, because the languages they use will not support recursion. PL/I was the first programming language to offer recursion as a matter of course. You can make any program recursive simply by adding the keyword Recursive at the beginning.

Complexity and Size

These represent the other side of the coin. The design of any extremely powerful language brings up a problem: great power makes for great complexity. For example, a language with many data types means for converting from one to another, together with rules for when these conversions are done automatically and when they must be specifically requested by the user. If the designers don't take care to keep this kind of complexity under control, the language will be impossibly hard to use. PL/I's designers have attacked this problem in a number of ways, but chiefly by *subsetting.*

A subset of a language is a simpler version derived by omitting some of its features. PL/I has several standard subsets (PL/I-80 is based on Subset G), and it has been made informally subsettable by providing defaults for unspecified features. Subsets enable the programmer to ignore features he isn't interested in using; defaults are designed to make these ignored features invisible.

In spite of these efforts, PL/I remains a particularly hard language to master. There are more rules to learn than in most other languages, and PL/I is particularly unforgiving of infractions. The interactions of the various data types are complicated; the language permits you to do things which are poor programming practice (more than one statement per line, for example); and occasionally one of those supposedly invisible features surfaces to cause hard-to-trace program quirks.

The complexity is reflected in the software, too. PL/I compilers are *big.* PL/I-80's compiler consists of the basic .COM file and no fewer than three overlays loaded in various phases of the compilation. Using overlays avoids placing the whole compiler in memory at once; without them, the compiler would need around 90K of memory. PL/I programs also need to be supported by large run-time libraries. When you load a compiled program, the loader searches a run-time library for the supporting routines it needs. In the end, your original program is apt to be only a small fraction of what gets loaded into the machine at run time. (I will have more to say about this later.) Library routines are needed not only for built-in functions like square roots and exponentials, but also for utilities to handle PL/I's three different kinds of input/output and to convert among all those data types. PL/I-80's run-time library is 44K bytes long; by contrast, Microsoft's Fortran library is a mere 24K bytes. (To be fair, however, PL/I-80's runtime diagnostics—clearly worded, and with a traceback to the main program—are immeasurably superior to Fortran-80's.)

PL/I-80

The list price for PL/I-80 is $500; for this you get two disks (one containing the PL/I compiler and supporting software, the other containing a generous collection of illustrative programs), and four volumes of documentation. Three of these manuals are for PL/I-80; the fourth describes the loader program, LINK-80. The PL/I manuals include a

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"PL/I-80 seems an uncomfortable mixture of unmatched capabilities and maddening drawbacks."

108-page Language Manual, a 180-page Applications Guide, and a 30-page Command Summary pamphlet.

The language has a few extensions to the standard Subset G, and a few omissions. Most of the omissions are unimportant; I will comment on the two serious ones below. The most important extension is a badly-needed unformatted I/O mode for reading and writing variable-length ASCII records. PL/I-80, like Microsoft's Fortran-80, accepts source programs written with lowercase letters. I don't know why this trivial detail should make such a difference, but it does. I think it does more for program readability than indenting; once you have seen one lowercase listing, you will want to convert your whole library.

The documentation is conscientious, but not entirely successful. Some language features are described in the Language Manual and some in the Applications Guide, and it is not entirely clear how they decided which things would go where. As usual, none of the manuals has an index, so it can mean a major search to get the answer to a simple question.

If you do not know PL/I already, you will never learn it from these manuals. You aren't expected to use the manuals as textbooks, however; a separate leaflet provides an annotated bibliography of recommended PL/I textbooks. The best introduction to PL/I-80 is the set of illustrative programs (60 of them) on the second disk. The first thing you should do is run off copies of all the programs on this disk and put them into a looseleaf binder; otherwise you will be apt to head straight for the manuals for your information and ignore the sample programs.

There are two licensing agreements, one non-commercial and one commercial. The non-commercial license gives you the right to do anything but sell executable PL/I programs. Once you start selling those, you are a software vendor and are required to sign the commercial licensing agreement, which includes provision for royalty payments to Digital Research. This is not as unreasonable as it may sound. A large part of an executable program will be supporting routines drawn from PL/I-80's run-time library; this means you will be selling your customer some of Digital Research's software along with your own. It's easy enough to get around the commercial license: simply get your client to buy his own copy of PL/I-80 (which he may want to do anyway) and sell him only your source programs and support services. Still, that commercial license comes as a jolt, since none of the ads for PL/I-80 prepare you for it. To sweeten the pot somewhat, Digital Research has announced an ambitious Independent Software Vendor (ISV) support program, to include seminars, technical support, and assistance in marketing and documentation. Potential vendors should consider carefully the tradeoff between the royalty payments and the equivalent cash value of the ISV program.

Omissions

My reservations do not concern the licensing policy, but rather the language itself. In the process of adapting PL/I to the 8080, they have dropped two features which, in my experience, are essential for any serious programming in PL/I. PL/I-80 omits the capability of dynamically dimensioning arrays by putting them inside a Begin. . . End block. Hence one of the main advantages of PL/I's block-structure capability is wiped out. Blocks are still useful for controlling the scope of a variable (i.e., the portions of a program in which its identity is known), but I feel this is a minor benefit.

The other omission is similar: Array dimensions in subroutines must be determined at compile time. This is a disastrous decision, because it means no subroutine intended to process arrays or character strings can ever be truly general-purpose. If you have written a sorting routine, for example, you cannot simply load it with any program that may need it—you have to edit it and tailor its arrays to match those of your calling program, then re-compile it and load that particular version with the program that calls it. Thus accumulating a library of software tools becomes an almost hopeless undertaking. The fact that this blunder has been committed in other languages as well (notably standard Pascal) is no excuse: PL/I, you will recall, was to be the ultimate language.

An obscure feature of PL/I lets you get around this problem, within limits. PL/I has a data type known as a *pointer*. If you pass pointers to your subroutines, then, with a certain amount of ingenuity and care, you can con PL/I-80 into letting you handle arrays and strings of arbitrary size. I've tried it; it works; but it's tricky and you end up with programs which are unlike any PL/I programs normally encountered in the outside world. I might add that many PL/I textbooks say little or nothing about pointers. Even Digital Research's manuals, which are reasonably thorough, are frustratingly sketchy on the subject of pointers. The manuals are not intended to take the place of a PL/I textbook, of course, but in this case I think they could have made an exception.

I have a few other, less important grumbles. Comments are delimited in PL/I by the symbols /* and */. In PL/C, a popular teaching version of PL/I, comments are also delimited by a carriage return. This means that if you forget or misprint a */ the end of the line will terminate your comment anyway. In full PL/I, a missing */ can turn the rest of your program into one big comment. This kind of easy error is not the mark of a well-designed language; Digital Research should have followed PL/C's policy, standard or no standard.

PL/I-80 takes significantly longer to compile and load than Microsoft's Fortran. The compilation time seems well-spent; at run time, PL/I-80 programs go like the wind. It is remarkable how fast they can go, since the compiler doesn't offer you a choice between 8080 and Z80 machine code. Executable programs are significantly larger than I would have expected. In the course of evaluating the compiler, I programmed a computer game in PL/I. The source listing is one and a half pages long; the .COM file is 14K bytes long. The same game, programmed in Microsoft's Fortran-80, took 10K bytes. This difference may only apply to relatively short programs, but it is typical of my experience with Fortran-80 and PL/I-80. I find it hard to reconcile with Digital Research's claim in recent ads that PL/I-80 gives you "small, fast programs." Fast, yes, but not small.

My own feelings about PL/I-80 are mixed. Like PL/I itself, it seems an uncomfortable mixture of unmatched capabilities and maddening drawbacks. It seems unrealistic to do any kind of serious business programming in any language but PL/I. (Yes, you can use Basic, but the fact that you can get by on Basic doesn't make it the language of choice.) The availability of PL/I on microprocessors is thus an incredible boon.

Many potential users are surely going to be put off by the royalty requirements, which I predict will prevent widespread adoption of the language. But the inability to use adjustable dimensions in subroutines and blocks is going to cramp the style of many experienced PL/I programmers, and this may prove a more serious impediment than the licensing problem. For myself, these restrictions make the language virtually useless. As long as they remain, I think PL/I will fare as poorly in the micro world as it has among mainframes—which is a shame, because we *need* a language like this.

Personally, I am going to limp along with Fortran IV, which, with all its faults, at least permits me to program like an adult, and hope that Microsoft will give us Fortran-77 one of these days. Don't take my judgement as final, however. If you write business software of any kind, you owe it to yourself to get Digital Research's publicity, buy a set of manuals, and make your own decision. ■

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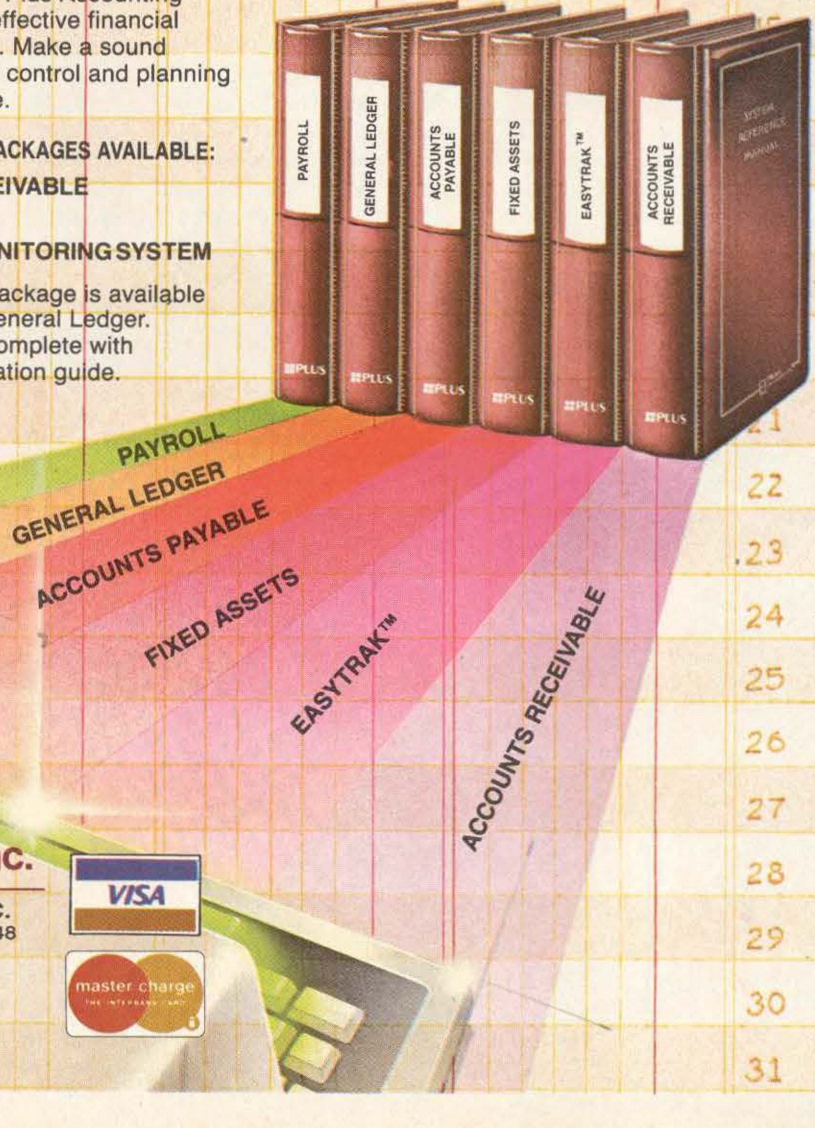

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Hardware

Most modems convert audio tones to RS-232 compatible digital signals and vice versa. The telephone line (or radio link) can handle the tones, but what about those RS-232 signals? These signals represent a logic 1 if the level is somewhere between minus five volts and minus 12 volts and a logic 0 if the level is between plus five volts and plus 12 volts. The signal levels were designed so that it is easy to distinguish between zero and one.

The lowest voltage that can be output from the cassette is zero volts and the maximum signal is around one volt (Cassout). If you apply a signal to Cassin the computer expects to see a two volt AC(. .) signal. We are not even close to matching those RS-232 specifications. The solution is to convert the RS-232 input to a two volt AC signal and the one volt output swing to an RS-232 output. Figure 1 shows how to do it.

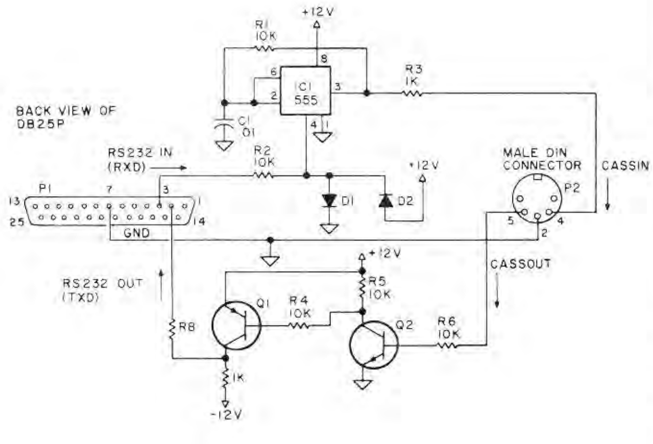

Figure 1

The first step in this project is to buy the parts from your local electronics retailer. The most difficult part to obtain (and the most expensive) will be the DB 25P connector for the modem. If you cannot find one you can build the interface inside the modem. This allows easy access to the necessary supply voltages. Otherwise you will need an external supply for plus 12 volts and minus 12 volts. A typical supply is shown in Fig. 2. The voltage levels are not critical.

You can build the project on a piece of perf-board and, if you are not building it into the modem, enclose it along with the power supply in a small plastic utility box. A power switch and indicator are mounted on top and three cords exit from the various sides: an AC line cord, a modem connector cord (with the DB25P plug) and a cord terminating in a DIN connector for the cassette port. The specific details are up to you. If you are new at building from a schematic diagram, get some help. Accidentally applying 117VAC to the cassette port is not the preferred method of hands-on learning.

This circuit translates between RS-232 signals and cassette port signals. RS-232 signals into the interface switch an oscillator on and off; a high level input (logic 0) turns the oscillator on while a low level input (logic 1) keeps it turned off. The oscillator operates at a high frequency (around 10 kHz with the components shown) to allow quick response from the TRS-80 Cassin hardware. In the opposite direction, Q1 and Q2 translate a low signal from Cassout to an RS-232 logic 1 (minus 12 volts). A high signal from the same source results in an RS-232 logic 0 (plus 12 volts) at the output. This interface works where others do not because it drives Cassin with an AC signal. You are assured of good signal transfer to the computer.

Software

Data exits and enters the modem in serial form (one bit at a time). Most micros shuffle data in parallel form (eight bits at a time). Serial interface adapters (such as Radio Shack's RS-232 interface) contain a device called a UART (Universal Asynchronous Receiver/Transmitter) that does this serial to parallel conversion so that the computer always sees data in

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Model I
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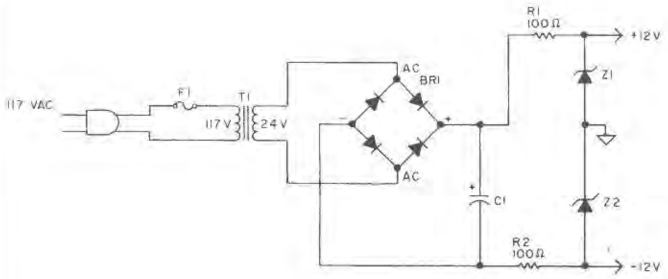

Figure 2

parallel form. You should be able to program the computer to do this conversion by itself. Your computer already does this when it reads and writes cassette tapes but the format is not compatible with standard data communications. So I wrote a new routine.

I needed two routines: one to transmit serially and one to receive. The transmitting one was the easiest. This is the subroutine Send shown in the listing at line 2600 (Program Listing 1).

When transmitting data serially, timing is critical. The start bit (always logic 0), seven data bits, a parity bit, and the stop bit (always logic 1) must each be present sequentially for a brief period of time. At the standard data rate of 300 baud, this time works out to 3.3 milliseconds (0.0033 seconds). Subroutine DLY at line 2930 waits the prescribed time. The send routine takes the data in the A register and sets the seventh bit high. Next, a logic 0 (the start bit) is sent to the output port and the routine waits for 3.3 ms. Then the data in the A register is sent to the output port one bit at a time (bit 0 first) with a 3.3 ms wait between each bit. When the entire byte has been transmitted, the routine sends a logic 1 (the stop bit) to the output port, waits the 3.3 ms and then returns. Ten bits have been sent to the port (from there through the adapter to the modem) consuming 33 ms of time and transmitting one byte. Note that while the computer sends the byte it spends most of its time waiting and does nothing else. While writing the receive routine I found that I had to use some of that wasted time to handle other functions.

The receive routine takes the one-bit-at-a-time serial data and assembles it into the eight-bit bytes the computer is used to handling. The first complication occurs because the computer never knows when the next serial character will start. The first part of the receive routine detects the start pulse that signifies data will follow. The RECV routine at line 630 is continually called when in receive mode. It checks to see if the input port has been set by the oscillator signal from the interface (oscillator on is equal to logical 0). If there has been no input, the routine returns. If the port has been set the routine resets the port (and waits 1.2 ms) and checks it again in case noise caused a false indication of a start. If once again the port is set, this means (probably) that it was a true start pulse and the routine continues on to input the data.

The RECV routine gets the data by waiting until it thinks it is in the middle of the data pulse and then resetting and then reading the input port (CKPORT at line 880). Logic 0 data sets the port; logic 1 data leaves the port reset. The program checks the input seven times and stores the results of those checks into a single byte which is then sent off to the display routine.

As originally written, this program would input data until it had a complete character and would then send it to the CRT display routine in the Level II ROM. This worked well until the screen was full and the display driver had to make room for another line. The display driver then scrolled the display. The time it took to scroll the display caused problems. There are about 6.6 ms (count 3.3 ms each for the parity bit and the stop bit) between the time the RECV routine inputs the last data bit and the time for the start of the next character (at 300 baud). The minimum software scroll time of the display is about 12 ms. When the computer returns from the display routine, the next character is about half gone. This garbles the first character (and often additional characters) of the next line. I could not use a scrolling display. I had to find some way to organize the screen display that took less than 6.6 ms.

I developed a display format that uses half the screen. As each line ends, it clears the line exactly eight lines away from it. Display starts at the top of the screen and works its way to the bottom where it wraps around to the top again. At any given time there are a maximum of nine lines displayed and the rest are cleared. Routine CRT1 at line 4260 in the listing does this. CRT1 is a stand-alone display driver which recognizes carriage

Hex/ASCII/HHC			* Hex/ASCII/HHC			* Hex/ASCII/HHC			* Hex/ASCII/HHC		
00	NUL	@@	20	SP	B@	40	@	D@	60		F@
01	SOH	@A	21	!	BA	41	A	DA	61	a	FA
02	STX	@B	22	"	BB	42	B	DB	62	b	FB
03	ETX	@C	23	#	BC	43	C	DC	63	c	FC
04	EOT	@D	24	$	BD	44	D	DD	64	d	FD
05	ENG	@E	25	%	BE	45	E	DE	65	e	FE
06	ACK	@F	26	&	BF	46	F	DF	66	f	FF
07	BEL	@G	27	'	BG	47	G	DG	67	g	FG
08	BS	@H	28	(	BH	48	H	DH	68	h	FH
09	HT	@I	29	)	BI	49	I	DI	69	i	FI
0A	LF	@J	2A	*	BJ	4A	J	DJ	6A	j	FJ
0B	VT	@K	2B	+	BK	4B	K	DK	6B	k	FK
0C	FF	@L	2C	,	BL	4C	L	DL	6C	l	FL
0D	CR	@M	2D	-	BM	4D	M	DM	6D	m	FM
0E	SO	@N	2E	.	BN	4E	N	DN	6E	n	FN
0F	SI	@O	2F	/	BO	4F	O	DO	6F	o	FO
10	DLE	A@	30	0	C@	50	P	E@	70	p	G@
11	DC1	AA	31	1	CA	51	Q	EA	71	q	GA
12	DC2	AB	32	2	CB	52	R	EB	72	r	GB
13	DC3	AC	33	3	CC	53	S	EC	73	s	GC
14	DC4	AD	34	4	CD	54	T	ED	74	t	GD
15	NAK	AE	35	5	CE	55	U	EE	75	u	GE
16	SYN	AF	36	6	CF	56	V	EF	76	v	GF
17	ETB	AG	37	7	CG	57	W	EG	77	w	GG
18	CAN	AH	38	8	CH	58	X	EH	78	x	GH
19	EM	AI	39	9	CI	59	Y	EI	79	y	GI
1A	SUB	AJ	3A	:	CJ	5A	Z	EJ	7A	z	GJ
1B	ESC	AK	3B	;	CK	5B		EK	7B		GK
1C	FS	AL	3C	<	CL	5C		EL	7C		GL
1D	GS	AM	3D	=	CM	5D		EM	7D		GM
1E	RS	AN	3E	>	CN	5E		EN	7E		GN
1F	VS	AO	3F	?	CO	5F		EO	7F	DEL	GO

Table 1. Hex to ASCII to Hart's Hex code conversion table

Shift I:	Input Basic program.
Shift O:	Output Basic program.
Shift M:	Change keyboard mode from line to character and vice versa (half to full duplex).
Shift S:	Transmit sign-on message.
Shift E:	Enable buffer. Whatever was previously there is lost.
Shift C:	Close buffer. Further entry is ended.
Shift B:	Display Buffer. If the printer is enabled the buffer contents will print on it. Pressing the space bar will pause the display. Press Enter to continue; Clear to abort.
Shift P:	Same as Shift B except for non-standard printers.
Up arrow:	Clear screen.
Shift left arrow:	Clear line.
Shift down arrow:	Control character shift.
Transmit mode:	Load a Basic program in the usual way and type LLIST to transmit. Return to Uterm by entering Name.
Receive mode:	Immediate return to Uterm (no program received) press Clear. After program is received, press Clear. Wait for program to list on screen and then save it in the usual way. Return to Uterm by entering NAME.

Table 2

✓See List of Advertisers on page 386

```
47 REM DE HD ID CE @B ID CE @B AD @B DE ED CE DE M@
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@@   @@   @@   @@   @@   @@   @@   @@
```

Figure 3

return and back space control codes and displays all printable characters. All display updating occurs during the wait for the end of the received stop pulse and actually takes little more than one millisecond (out of the 6.6 ms available).

Now we have a system that transfers data from the modem to the CRT screen and from the keyboard to the modem. Additional features make the system more useful and easier to operate.

Transmitting features include:

- Automatic sign-on. By pressing one key you can send your name or number to the receiving system.
- While the Break key is pressed, a continuous low tone comes from the modem. This interrupts the current process.
- Character transmission mode sends a character when a key is pressed. Line transmission mode waits for the return (Enter) key and then transmits the entire line in a burst. Line mode allows editing, character mode gives quick response.
- The repeat line mode allows for testing. This mode repeats a typed line until instructed to stop.
- You can transmit a Basic program to a distant terminal or computer.
- You can transmit all ASCII control characters by holding down the shift and down arrow and pressing the appropriate alphabetic key.

Receiving features include:

- You can input a Basic file. This option organizes an incoming program so you can store it on tape or disk or run it immediately. This mode operates automatically with some Forum-80 download systems.

- Full or half duplex mode works in conjunction with line or character mode. When in character mode, Uterm operates in full duplex as long as you type less than 15 characters per second. If you type faster you will lose received characters. If you are in line mode, half duplex operation is the rule (you will be receiving or transmitting but not at the same time).
- You can enter all data appearing on the screen into the buffer. You can direct the buffer output to a printer (almost any type) as well as the screen.

Routine KEYS1 (line 960) checks keyboard input and modem input. KEYS (line 1060) is the same but is used for line mode output. A keyboard input character is checked to see if it is for control (starts at KEYLP and ends at LNE—line 2240). If it is not a control character, the routine checks to see if it can be printed. If so, the character is sent to the screen and, depending on the output mode, to the Send routine.

If you are using a special printer driver load it before Uterm. Set memory size to protect the driver; Uterm will locate itself just below. (You need the Basic loader to get this benefit.)

Once the program is loaded and running, you should have a blank screen with an underline cursor at the top. The program is ready to receive and the keyboard is in character mode. With your modem connected through the interface (and everything turned on), you should hear a tone from the modem. You may have to put the modem into test before the tone comes on since some modems keep the tone turned off until a proper tone is received. With the modem set to produce a tone, press any key. You should hear a short twitter from the modem speaker. Pressing Break causes the tone to drop in frequency and stay there until the key is released. Whistle or talk at the modem microphone (the cup where the telephone earpiece rests). Random characters will appear on the screen. Now press Shift M and type a line. The characters you typed will appear on the screen. Pressing Enter at the end of the line transmits that line (listen to the modem). When it has finished the line, the cursor will drop down to the next display line.

Testing and Using Uterm

Since Uterm uses Basic routines to load and save programs, it is easiest to load as a Basic program. The program in Program Listing 2 loads Uterm at the top of unprotected memory and resets memory size to protect itself. Enter the program. The Remark statements at the end contain the data for Uterm. Use REM at the beginning of each, not the apostrophe. The spaces between the letter groups are optional (the loader can read them with or without spaces but people have a harder time without them). Do not leave a space after any of the X or S characters. If you have access to a system with download capability and know someone who can run it, the program is available on the Medford Forum-80 (503-535-6883). Either way you get the program. Run it and follow the instructions. Save the modified program and run it. If there is a data error, the program will let you know approximately where it is. If everything goes right, you will be in Uterm.

When operating with a disk system, do exactly the same. The only exception is that if you load Uterm from a CMD file, you must do so *after* loading Basic. Some systems will not allow this so the Basic loader program may be the only way to go. If you can load in this sequence, remember to protect memory before loading Basic. I tested this program using TRSDOS, NEWDOS and NEWDOS80. There should be no problem with any of the other operating systems except where the system uses the reserved word Name for something else. That use will be modified temporarily while you are using Uterm.

You may have noticed a changing graphics block at the top right of the screen. Just before Uterm transmits a character, it is displayed in that location. That way I know the program is working. It is a graphics character and not an alphanu-

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meric ASCII character because the most significant bit is set to one. In the ASCII code chart in the Level II manual characters coded above 127 (i.e. have the most significant bit set to one) are graphics characters— at least as far as the TRS-80 is concerned.

If you have had problems getting this far, some troubleshooting is in order. If the graphics block changes as each character is typed, the software is probably OK. Check the interface and the modem. If nothing works go over the Data statements in the Uterm loader. A problem here is unlikely since the loader does a checksum as it is working. If there are bad data, it will tell you so.

117VAC: The stuff that comes out of a wall socket. Be careful.

Answer: The opposite of Originate; see Originate.

ASCII: A standard code for exchanging and storing information. The code contains upper and lowercase letters, numbers, punctuation, and control characters.

Baud: As commonly used (not always correctly) it refers to bits per second. That's close enough.

Bit: The smallest piece of binary (2 possible states) information. It can represent either on or off, 1 or 0, pink or blue. By combining many of these bits, more than 2 things can be represented. For example, seven bits can be used to define 128 ASCII characters.

CBBS: Computer Bulletin Board System. They have many names but their main function is to hold messages. There is usually no charge for this service.

Download: A fancy term for 'Let me send this here program to you over the wire'. It doesn't have to be a program but can be a data file or poetry.

Duplex, half or full: Has nothing to do with apartments for rent. Full duplex refers to the ability to communicate in two directions at once. This fact is used by terminal to computer communication as an automatic verification method. When you type a letter on your keyboard, it is sent by your modem through the phone line and received by the computer's modem. From there the computer retransmits it through its modem again, through the phone line, and finally the character is picked up by your modem and terminal and displayed on your screen. If it is correct on your screen, you know the computer got it right. Half duplex (one direction at a time) doesn't allow this echo so anything appearing on your screen has to come directly from your system.

File: A group of data stored together in a computer, on tape, or on a disk for a common purpose. The file can contain a program, a list of painless dentists or poetry.

Hardware: Anything you can't send over the phone (from Douglas Hofstader's book *Godel Escher Bach*).

Modem: A contraction of MOdulator/DEModulator. Used to condition digital signals so they can be sent and received over the phone. A modem itself cannot be sent over the phone so it is hardware.

Originate: See answer. Well, originate and answer refer to different sets of tones used for data communication. The party originating the communication transmits on the low frequency set and receives on the high frequency set of tones. He is therefore in originate mode. The answering party transmits on the high frequency set of tones and receives on the low frequency set. Believe it or not, he is in the answer mode. This is not a hard and fast rule but at least if one guy is in originate the other fellow must be in answer.

Parallel: Refers to simultaneous transfer of several bits of information. If you have eight wires connected from your computer to the printer you can send one bit over each wire at the same time. Usually faster than serial transfer.

RS-232: A standard specification for electrically interconnecting computer peripherals using serial data transfer. The specification refers to voltage levels and connector pin designation. It has nothing to do with parallel to serial converters or modems except for the interconnection.

Selectric: A trademark of IBM for their ball printhead typing mechanism. Besides being used in nearly every office in the country, many were used as computer terminal printers. Well, now those printers are obsolete and I have one. Recommended only for the very dedicated or masochistic. They do print well.

Serial: One part at a time. This is similar to a soap opera except when transmitting data serially, you eventually get your message across. The serial rate of 300 Baud transfers information at 300 bits per second. Remember: One wire and one bit at a time.

Software: Anything that can be sent over the telephone. (I once again paraphrase Hofstader).

The Source: a computer service accessible by telephone providing information, computer languages, and communication. There is a small hourly charge for this system.

Terminal: A hardware system that can send and receive digital information over a communication link. The usual form (currently) is a video screen and a keyboard that is manually operated. A terminal becomes "smart" when it can perform some of its functions automatically.

UART: A type of Integrated Circuit. The letters stand for Universal Asynchronous Receiver/Transmitter. Translated, that means it converts serial data to parallel data and vice-versa.

Upload: The opposite of download. The sender is the one "uploading".

UTERM: A terminal program for the TRS-80 that provides for a wide variety of functions while eliminating the need for a UART.

Table 3. Glossary

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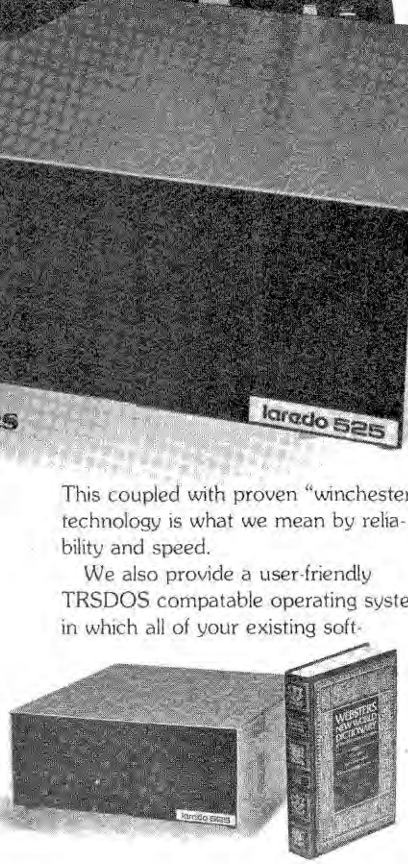

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laredo systems inc.

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✓53 TRS-80 and TRSDOS are trademarks of Radio Shack a Tandy Co.

Once you are this far, test the rest of the features. Press Shift M. Type in a line or so of text (you are now in line mode). Before you press Enter to end the line, press Shift R. After you press Enter, the line will keep repeating until you press Clear. Now press Shift I. This is the Basic program input (receiving) mode. Several lines of text will appear on the screen. To exit without receiving anything press Clear. You should be back in Uterm (blank screen with cursor). Notice that when in the Shift I mode the keyboard is dead. The keyboard's function has been transferred to the modem. Only Clear will set it free.

The next item to try is the Basic transmitting function. Press Shift O. More text will appear. Load a Basic program and then LLIST it (like you were going to dump it to the printer). The program will then list slowly (at about 30 characters/second) on the screen and the modem should be doing some more twittering. When the list is finished you will still be in Basic. You could send the program again (LLIST) or play a few games. Or you could return to Uterm. Do this by typing Name.

Try the buffer. Get to line mode (press Shift M if necessary) and then type Shift E (Enable buffer). Everything that appears on the screen will be placed into the buffer. To close the buffer press Shift C. If you want to check the contents of the buffer, press Shift B. If you have a printer, now you have a chance to use it. Almost any sort of printer will work in this mode, even those that require a software driver. Just be sure the driver is installed before you load Uterm and that the printer is enabled. (Technical note: The printer is deemed to be enabled if 37E8H, bit 7 and 6 are read low. This will be taken care of automatically if you have a standard Radio Shack compatible printer. If you have some other type, print the buffer by pressing Shift P. Use Shift P *only* when the printer is ready to go. To do otherwise hangs the program. Shift P bypasses the bit 7 check and allows non-RS printers to work. If the printer is not enabled (selected), the buffer will list on the screen. You can stop the buffer display by pressing the space bar. Pressing Enter resumes the display where it left off and pressing Clear (after you have pressed space bar) aborts the list and puts you back in the terminal program. You can review the buffer as many times as you wish (Shift B) but the contents will be lost if you go to Basic input mode or enable the buffer again (Shift E).

Next try the auto sign-on function. Press Shift S. The screen will show:

```
BOB;HART;MEDFORD,OREGON;Y
```

This is my check-in message for Forum-80 bulletin board systems. Change it to your own name. Line 290 of the loader program contains the sign-on message. Using the table of Hart's Hex codes (Table 1) you can replace each code as necessary. For example, to insert the message, "THIS IS A TEST(carriage return)", the Remark statement would look like that shown in Fig. 3.

There must be at least one @ @ at the end of the message. The @ @ (0 byte) tells the message handler where to stop. Without it, you could transmit a large portion of the machine code of Uterm (which would not make much sense in this form). There must be *exactly* 40 (forty) items in this Remark statement. The SAN at the end of the line is the checksum. You can omit it.

Try the system on-line and get a friend to help you out. It helps if he or she has a modem/terminal. Call the friend and place one of the modems in answer mode and the other in originate mode. Half duplex will be necessary on both ends since very few terminals and computers disguised as terminals echo everything they receive (this one is no exception). After you have verified that you are receiving each other's carrier (tone) try typing a few messages back and forth. If that is successful, try the Basic program receiving and transmitting modes. You know already that your transmitting mode works so the one that should be tested is the receiver (also known as download function). Tell your partner to send a program and then press Shift I. You will see the program as it is received. When it stops coming, press Clear. The program will list again. The computer translates the full text of the program into its internal short hand form. When it finishes that (or stops for some other reason), it should say Ready and display the prompt (>). If the listing stops but will not display Ready, press Enter. If it does not stop and starts listing garbage, press up arrow and then Enter. At this point you can edit, save (on cassette or disk) run, or ignore the received program. When you are finished with the program enter Name. Presto. You are back in Uterm again.

The program receive function will work automatically if sent the proper codes. If the RECV subroutine detects a DC2 character (12 hex) it will jump to program receive mode just as if you pressed Shift I. At the end of the program, if the sender transmits a DC4 (14 hex) it will be as if you pressed the clear key. The only thing left is for the computer to display Ready and for you to save the program.

Table 2 lists the commands in the various modes of Uterm.

The best way to become familiar with the system is to use it. Uterm is a simple and inexpensive way to get started in computer communications. Leave messages anywhere in the country at any time on computer bulletin boards; access large files of information from computer services; try at-home computer banking and instant new program update. All presage greater events in this field. Experiment all you can (all your phone bill allows). When you are up and running, leave a message on the Medford Forum-80. The number again is 503-535-6883. The system is on line 24 hours a day. ■

Bob Hart is a field service representative for a medical imaging company.

Program Listing 1

```
                ; *** UTERM   VERSION 1.5 ***
                ; ORIGINALLY INSPIRED BY STEPHEN GIBSON'S
                ; "MICKEY GETS NEW EARS" , KB MICROCOMPUTING MAY '80
                ;  LAST REVISED 8/09/81  BY BOB HART
                ;
                ;
F800                        ORG     0F800H  ;48K
0002            LOW         EQU     2H      ;RS232 0
0001            HI          EQU     1H      ;RS232 1
0010            T0          EQU     16D     ;.3MS
0051            T1          EQU     81D     ;1.2 MS
0087            T2          EQU     135D    ;1.97MS
00C5            T3          EQU     197D    ;3.0MS
00E1            TBIT        EQU     225D    ;3.3 MS BIT TIME
0033            CRT         EQU     33H
002B            KBD         EQU     2BH
0221            PORT        EQU     221H    ;I/O PORT DRIVER
4020            CSRPOS      EQU     4020H   ;CURSOR POSITION
                ;
FB00 42         SIGNON      DEFM    'BOB;HART;MEDFORD,OREGON;Y'
FB19 0D00                   DEFW    000DH           ;C.R. AND DELIMITER
0014                        DEFS    20              ;20 MORE BYTES RESERV
ED
FB2F 0000       OLDLP       DEFW    0               ;STORAGE FOR LP VECTO
R
                ;
FB31            BEGIN       EQU     $
FB31 2A2640                 LD      HL,(4026H)      ;GET PRINTER VECTOR
FB34 222FFB                 LD      (OLDLP),HL      ;SAVE IT
FB37 3EC3                   LD      A,0C3H          ;PATCH NAME VECTOR
FB39 328E41                 LD      (418EH),A
FB3C 2142FB                 LD      HL,NAME
FB3F 228F41                 LD      (418FH),HL
FB42            NAME        EQU     $               ;RE-ENTRY POINT
FB42 2A2FFB                 LD      HL,(OLDLP)      ;RESTORE PRINTER VECT
OR
FB45 222640                 LD      (4026H),HL
FB48 F3                     DI
FB49 DD214EFD               LD      IX,MODE;INDEX FOR POINTERS
FB4D DD360001               LD      (IX+0),1        ;CHARACTER SEND MODE
                                                    ;NON-REPEAT,NO PRINTE
R,
                                                    ;NO BUFFER
FB51 CDC901                 CALL    01C9H   ;CLEAR SCREEN
FB54 CD63FB                 CALL    RESET   ;INITIALIZE OUTPUT
FB57 CD0DFD                 CALL    BUFST   ;INITIALIZE BUFFER
FB5A DDCB0096               RES     2,(IX+0);KEEP BUFFER OFF
FB5E CD5FFD     GETCP       CALL    GETCRS  ;GET CURSOR POSITION
FB61 1844                   JR      KEYSI   ;ENTER MAIN LOOP
                ;
                ;
FB63 210200     RESET       LD      HL,LOW  ;MARK
FB66 CD2102                 CALL    PORT    ;SEND IT
FB69 C9                     RET
                ;
                ;
                ;****     MAIN RECEIVER ROUTINE    ****
FB6A            RECV        EQU     $       ;SERIAL TO PARALLEL
FB6A 010007                 LD      BC,700H;B=7,C=0
FB6D CD9CFB                 CALL    CKPORT  ;LOOKING FOR START BIT
FB70 C8                     RET     Z       ;RETURN IF NO START
```

Program Listing 1 Continues

✓See List of Advertisers on page 386

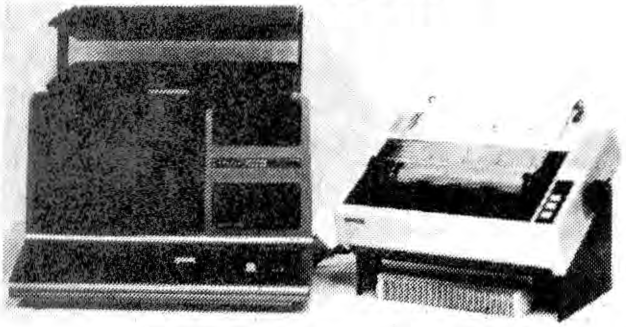
Program Listing 1 Continued

```
FB71 CD40FD    00670          CALL    DLY12    ;1.2 MS
FB74 CD9CFB    00680          CALL    CKPORT   ;IS IS REALLY START?
FB77 C8        00690          RET     Z        ;GO BACK IF FALSE ALARM
FB78 CD36FD    00700 LPBIT    CALL    DLY30    ;WAIT 3.0 MS
FB7B CD9CFB    00710          CALL    CKPORT   ;CHECK INPUT
FB7E D3E9      00720          OUT (0E9H),A     ;TEST PULSE
FB80 B1        00730          OR      C        ;ADD OLD BITS
FB81 0F        00740          RRCA             ;SHIFT ALL BITS RIGHT
FB82 4F        00750          LD      C,A      ;SAVE   BITS
FB83 10F3      00760          DJNZ    LPBIT    ;REPEAT FOR ALL DATA BITS (7
IMES)
FB85 CD36FD    00770          CALL    DLY30    ;SKIP PARITY
FB88 CD9CFB    00780 PSKIP    CALL    CKPORT
FB8B 20FB      00790          JR      NZ,PSKIP        ;CKECK UNTIL MARK
FB8D 79        00800          LD      A,C      ;GET BYTE
FB8E 2F        00810          CPL              ;INVERT (MARK NOW=1)
FB8F E67F      00820          AND     7FH      ;STRIP MSB
FB91 FE60      00830          CP      60H      ;LOWER CASE?
FB93 FA98FB    00840          JP      M,TUBE   ;NO
FB96 E65F      00850          AND     5FH      ;CONVERT TO UC
FB98 CD4EFF    00860 TUBE     CALL    CRT1     ;WRITE
FB9B C9        00870          RET              ;LOOP AGAIN
FB9C CD63FB    00880 CKPORT   CALL    RESET    ;RESET PORT LATCH
FB9F CD3BFD    00890          CALL    DLY5     ;WAIT .3 MS
FBA2 DBFF      00900          IN      A,(0FFH);CHECK PORT
FBA4 E680      00910          AND     80H      ;MASK ALL BUT MSB
FBA6 C9        00920          RET
               00930 ;
               00940 ;
               00950 ;***      KEYBOARD SCAN ROUTINE    ***
FBA7 CD70FD    00960 KEYS1    CALL    BREAK
FBAA CD2B00    00970          CALL    KBD
FBAD B7        00980          OR      A        ;SET FLAGS
FBAE 200A      00990          JR      NZ,KIN   ;IF INPUT
FBB0 CD6AFB    01000          CALL    RECV     ;NO KEYS, CHECK RECEIVER
FBB3 FE12      01010          CP      12H      ;DC2
FBB5 CA7EFD    01020          JP      Z,MODE1 ;RECEIVE PROGRAM MODE
FBB8 18ED      01030          JR      KEYS1    ;AND KEEP LOOPING
FBBA CD5FFD    01040 KIN      CALL    GETCRS   ;CURSOR POSITION
FBBD 1809      01050          JR      KEYLP    ;OTHERWISE
FBBF           01060 KEYS     EQU     $        ;READ KEYBOARD AND SEND
FBBF CD70FD    01070          CALL    BREAK
FBC2 CD2B00    01080          CALL    KBD
FBC5 B7        01090          OR      A        ;ANY CHARACTER
FBC6 28F7      01100          JR      Z,KEYS   ;LOOP ON KEYBOARD
FBC8 E67F      01110 KEYLP    AND     7FH      ;MASK MSB
FBCA FE5B      01120 TESTIN   CP      91       ;UP ARROW?(CLEAR SCREEN)
FBCC CA42FB    01130          JP      Z,NAME   ;CLR SCREEN
FBCF FE18      01140          CP      24       ;SHIFT LEFT ARROW?(CLR LINE)
FBD1 2006      01150          JR      NZ,CTRL ;SKIP IF NOT
FBD3 CD54FD    01160          CALL    CLRLIN   ;CLEAR LINE
FBD6 C35EFB    01170          JP      GETCP    ;NEW CURSOR POSITION
FBD9 FE1A      01180 CTRL     CP      26       ;SHIFT DOWN ARROW?(CNTRL KEY)

FBDB 2003      01190          JR      NZ,CRTST         ;NO
FBDD AF        01200          XOR     A
FBDE 1846      01210          JR      LDCRT1           ;CONTINUE
FBE0 FE0D      01220 CRTST    CP      0DH      ;CR?
FBE2 200C      01230          JR      NZ,SICK ;IF NOT SKIP
FBE4 DDCB0046  01240          BIT     0,(IX+0)         ;CHECK MODE
FBE8 CAC1FC    01250          JP      Z,ETX
FBEB CD04FD    01260          CALL    SEND     ;SEND IT
FBEE 18B7      01270          JR      KEYS1    ;AND LOOP
FBF0 FE69      01280 SICK     CP      69H      ;SHIFT I?(BASIC INPUT)
FBF2 CA7EFD    01290          JP      Z,MODE1 ;REC PROGRAM MODE
FBF5 FE6F      01300          CP      6FH      ;SHIFT O?(BASIC OUTPUT)
FBF7 CA06FE    01310          JP      Z,MODE2 ;XMIT PROGRAM MODE
FBFA FE6D      01320          CP      6DH      ;SHIFT M?(XMIT MODE)
FBFC 2008      01330          JR      NZ,SPCK ;NO, SKIP
FBFE DD7E00    01340          LD      A,(IX+0)         ;MODE
FC01 EE01      01350          XOR     1        ;TOGGLE BIT 0
FC03 DD7700    01360          LD      (IX+0),A;PUT IT BACK
FC06 AF        01370          XOR     A        ;ZERO ACCUM
FC07 181D      01380          JR      LDCRT1   ;CONTINUE
FC09 FE70      01390 SPCK     CP      70H      ;SHIFT-P? (PRINT BUFFER)
FC0B 2006      01400          JR      NZ,SECK ;NO--SKIP
FC0D DDCB00CE  01410          SET     1,(IX+0);ENABLE PRINT
FC11 1826      01420          JR      SBC0     ;GO TO BUFFER ROUTINE
FC13 FE65      01430 SECK     CP      65H      ;SHIFT E?(ENTER BUFFER)
FC15 2006      01440          JR      NZ,SCCK ;NO- SKIP
FC17 CDBDFD    01450          CALL    BUFST    ;INIT BUFFER
FC1A AF        01460          XOR     A
FC1B 1809      01470          JR      LDCRT1   ;CONTINUE
FC1D FE63      01480 SCCK     CP      63H      ;SHIFT C?(CLOSE BUFFER)
FC1F 2007      01490          JR      NZ,SBCK ;NO- SKIP
FC21 DDCB0096  01500          RES     2,(IX+0);TURN OFF BUFFER
FC25 AF        01510          XOR     A
FC26 185E      01520 LDCRT1   JR      LDCRT2   ;CONTINUE
FC28 FE62      01530 SBCK     CP      62H      ;SHIFT B? (DISPLAY BUFFER)
FC2A 205C      01540          JR      NZ,SSCK; I KEEP TELLING YOU- NO!
FC2C CDD105    01550          CALL    05D1H    ;CHECK FOR PRINT READY
FC2F DDCB00CE  01570          SET     1,(IX+0);ENABLE PRINTER
FC33 2804      01580          JR      Z,SBC0   ;SKIP IF PRINTER READY
FC35 DDCB008E  01590          RES     1,(IX+0);ELSE DISABLE PRINTER
FC39 CDC901    01600 SBC0     CALL    01C9H    ;CLEAR SCREEN
FC3C D9        01610          EXX              ;ALT REG
FC3D EB        01620          EX      DE,HL    ;PUT BUFEND IN DE
FC3E DD6604    01630          LD      H,(IX+4); GET START
FC41 DD6E03    01640          LD      L,(IX+3)
FC44 DF        01650 SBC1     RST     24       ;END OF BUFFER?
FC45 2835      01660          JR      Z,SBC3   ;JUMP IF END
FC47 7E        01670          LD      A,(HL)   ;ELSE GET CHARACTER
FC48 010003    01680          LD      BC,0300H;SET DISPLAY SLOWDOWN DELAY
FC4B F5        01690          PUSH    AF
FC4C D9        01700          EXX              ;NORM REGISTERS
FC4D CD3300    01710          CALL    CRT      ;DISPLAY IT
FC50 DDCB004E  01720          BIT     1,(IX+0);PRINTER?
FC54 280A      01730          JR      Z,SBC2   ;SKIP IF NOT
FC56 F1        01740          POP     AF       ;RESTORE CHAR
FC57 F5        01750          PUSH    AF
               01755 ;BASIC ROM PRINTER DRIVER
FC58 CD3B00    01760          CALL    3BH      ;PRINT CHAR
FC5B D9        01780          EXX              ;ALT REGS
FC5C 010100    01790          LD      BC,1     ;MIN DELAY FOR PRINTER
FC5F D9        01800          EXX              ;NORM REGS
FC60 F1        01810 SBC2     POP     AF
FC61 D9        01820          EXX              ;ALT REGS AGAIN
FC62 CD6000    01830          CALL    060H     ;DELAY (14.66 US * BC)
FC65 3A4038    01840          LD      A,(3840H);CHECK KEYBOARD
FC68 CB7F      01850          BIT     7,A      ;TEST FOR SPACE BAR
FC6A 280D      01860          JR      Z,SBC4   ;NO, DONT PAUSE
FC6C 3A4038    01870 SBC5     LD      A,(3840H);KEYBOARD
FC6F CB47      01880          BIT     0,A      ;ENTER KEY?
FC71 2006      01890          JR      NZ,SBC4 ;YES--CONTINUE ON
FC73 CB4F      01900          BIT     1,A      ;CLEAR KEY?
FC75 2005      01910          JR      NZ,SBC3 ;YES--ABORT LISTING
FC77 18F3      01920          JR      SBC5     ;PAUSE LOOP
```

Program Listing 1 Continues

NEW SPACE AGE PRINTER STANDS



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Wabash has come out with three new high quality disks, a new 80 track double density, a new 80 track double density on two sides, and a new flippy disk that can be read on both sides by a normal disk drive.

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SUPER DIRECTORY

– Automatic density recognition –
– Automatic track count recognition –
– Automatic dos recognition –
– The Best Directory On The Market! –

This will be the standard which all other Directores are judged. It will read any normal type of diskette Mod I or III, Multi Dos, Ldos, Dos Plus, and Trs Dos. Double Density, Single Density, 35, 40 or 80 track drives.

A machine language program that is easy to use, but at the same time has all the features you will ever need. Display to screen or to printer. Displays by program, or disk, or subject. Super fast sort. Scrolling displays. ect.

You can even add a line to help tell what the program is about.
Example:
SARGON/CMD 146G GREAT CHESS GAME
SARGON/CMD is name of program read off of disk. 146 is you reference number for this disk G is added later designating game. "GREAT CHESS GAME" is added later as a descriptor file.

Super Directory **$39.90**
Super Directory with 10 Wabash Disks **$59.80**

SPECIAL OFFER - with each directory ordered you will receive 10% discount on any disks ordered.
If you use a model I please specify if you want a double density version. (You must have a doubler to use the double density version.)

SUPERMETER

The biggest problem in loading tapes has been the volume control. Prerecorded tapes are produced at differing volume levels. Now finally, a device to let you set the correct volume levels for loading any tape. You will now load any tape the FIRST time. **SUPERMETER** plugs in (no cutting or soldering) between your tape recorder and the computer and lets you set the volume to the level that your computer wants.

SUPERMETER $29.00

FAMILY TREE

Excellent family genelogy program works on both the model I and III. Written expecially for the person just getting into genelogy. It has over 250 pages of instructions on how to research your family tree, how to get information, and how to put it into the program. The computer program is easy to follow and gives both printouts and screen listings of your family tree. It will even give you a listing of all your living relatives birthdays.

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Small Business Programs

CHECKING ACCOUNT Mod. I or III, 48k disk $39.00
Excellent check writing program for small business. Prints checks on printer, sorts into 32 catagories for bookeeper and IRS.

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Hayes Smart Modem

We at Computer Shack think this is the best modem on the market. We include a file transfer and communications program at no charge with each purchase of the Smart Modem.

Programs and modem only **$259.00**

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If you have a EPSON Printer you need EP-Set. A series of programs that help you use all the features of the Epson printer. One merges with a basic program to help drive the printer. One is a machine language subroutine to give you keyboard access to the printer. (example type control c to get the compressed mode. Control E to get emphised characters). Use EP-SET to set the line spacing, character modes, strike modes etc. Throw your manual away. Happiness is here with EP-SET.

Disk or Tape 18.95

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Z BASIC
The only Compiler we will recommend.
Disk & Tape together $94.95
Disk $84.95
Tape $74.95

MYSOS EDAS 35
Our favorite editor assembler **$74.95**

SUPER UTILITY PLUS **$44.95**
POWER DRAW **$34.95**

V.F.U.
By Vernon Hestor, valuable File Utility, Purge-Execute-Copy by file or disk.
Specify Operating System **$19.95**

TAPE COPY II **$12.95**
Only $5.00 with any other utility.

MULTI DOS

We sell them all --- We recommend and use **MULTI DOS** --- Don't let its low price fool you. It'll do everything the others will and quite a few things they can't.

MULTIDOS has the BEST BASIC -- it's the EASIEST to use and its the FASTEST system around. Why pay twice as much for a operating system that's complicated and hard to use.

Multi Dos is not a cheap copy of other operating system's it is a new Dos specially written for the average TRS-80 user. Listed below are some of the features that Multi Dos has that most of the other dos's don't have. This list has 34 things that would be commonly used by most people. 20 are exclusively Multi Dos.

Repeat's last dos command, Multiple dos command, Hi Speed boot, nested Do file, software powerup, hi speed debug, executable debug, alphabetized directory, forms command, totals free, keyboard attributes, topmen, auto-multiple density recognation, copy only if sufficient space,graphics driver, single step basic, zero arreys, delete arrays, sort routing, used variables and their values displayed, transfer to level II, fing, intelligent global editor, string packer, line splitter, line merger, renumber to line 0, renumber packed strings, lists graphics, automatic high speed, won't hang if no printer, repeating keys, menu driven copy to file, screen dump graphics to printer.

These are the features that other dos's are spending thousands of dollars and hundreds of hours trying to copy (this is a quote from another companys ad that has 6 of the 34 features listed above).

$79.00

SPECIALS

MULTI DOS with Aerocomp Doubler $209.00
MULTI DOS with Super Directory $99.00
MULTI DOS with Super D & Doubler $229.00
DOS PLUS 3.4 .... $129.00
L DOS $119.00
AEROCOMP DOUBLER $139.00
The operating systems that are given out free with the doublers for $149 and $159 dollars are not comparable with all of the features of Multi Dos.

COMPUTER SHACK

1691 Eason ● Pontiac, Michigan 48054 **(313) 673-2224**

ORDERING INSTRUCTIONS:

MC and VISA OK please add $2.00 for Shipping in U.S.A. Also to help us send you the best possible version include the type of computer you have, your operating system if disk and if you have a doubler in the model I.

DEALERS... We are distributors for all items in this ad except for the games Scarfman, Laser Defense, Fortress, and Alien Defense. Write for our catalog and price list.

✓109

✓See List of Advertisers on page 386

Program Listing 1 Continued

```
FC79 23           SBC4    INC     HL       ;POINT TO NEXT BUFF CHAR
FC7A 18C8                 JR      SBC1     ;GO FOR NEXT CHARACTER
FC7C EB           SBC3    EX      DE,HL    ;PUT CURRENT END BACK IN HL
FC7D 112FFB               LD      DE,BEGIN-2
FC80 D9                   EXX              ;NORM REGS
FC81 AF                   XOR     A
FC82 DDCB00C6     CHSET   SET     0,(IX+0);CHARACTER MODE
FC86 1827         LDCRT2  JR      LDCRT    ;RETURN TO TERM
FC88 FE73         SSCK    CP      73H      ;SHIFT S?(SIGN-ON)
FC8A 2014                 JR      NZ,SRCK ;SKIP IF NOT SHIFT S
FC8C 2100FB               LD      HL,SIGNON
FC8F 7E           LP3     LD      A,(HL)  ;GET CHAR
FC90 B7                   OR      A
FC91 28EF                 JR      Z,CHSET ;QUIT IF NULL BYTE
FC93 23                   INC     HL
FC94 E5                   PUSH    HL
FC95 F5                   PUSH    AF
FC96 CD04FD               CALL    SEND
FC99 F1                   POP     AF
FC9A CD4EFF               CALL    CRT1
FC9D E1                   POP     HL
FC9E 18EF                 JR      LP3
FCA0 FE72         SRCK    CP      72H      ;SHIFT R?(REPEAT LINE)
FCA2 DDCB009E             RES     3,(IX+0);CLR REPEAT FLAG
FCA6 2007                 JR      NZ,LDCRT
FCA8 DDCB00DE             SET     3,(IX+0);SET REPEAT FLAG
FCAC C3BFFB               JP      KEYS
FCAF DDCB0046     LDCRT   BIT     0,(IX+0)
FCB3 2806                 JR      Z,LNE    ;JUMP IF LINE MODE
FCB5 CD04FD               CALL    SEND     ;ELSE SEND IMMEDIATELY
FCB8 C3A7FB               JP      KEYS1    ;LOOP BACK TO RECV
FCBB CD4EFF       LNE     CALL    CRT1     ;DISPLAY IF IN LINE MODE
FCBE C3BFFB               JP      KEYS     ;LOOP
                  ;***  LINE MODE SCAN ROUTINE ***
FCC1 2A2040       ETX     LD      HL,(CSRPOS);LOAD CURSOR POSITION
FCC4 AF                   XOR     A        ;CLEAR CARRY
FCC5 DD5602               LD      D,(IX+2);START
FCC8 DD5E01               LD      E,(IX+1)
FCCB ED52                 SBC     HL,DE    ;# OF BYTES
FCCD 7C                   LD      A,H
FCCE E603                 AND     3H       ;LEN <400H
FCD0 67                   LD      H,A
FCD1 EB                   EX      DE,HL    ;BYTE COUNT IN DE
FCD2 DD6602               LD      H,(IX+2);START OF LINE
FCD5 DD6E01               LD      L,(IX+1)
FCD8 7A           TSTCT   LD      A,D
FCD9 B3                   OR      E
FCDA 280C                 JR      Z,SNDCR1;IF BYTE COUNT=0
FCDC 7E                   LD      A,(HL)  ;CHARACTER TO SEND
FCDD 23                   INC     HL       ;POINT TO NEXT CHAR
FCDE E5                   PUSH    HL       ;SAVE POINTER
FCDF D5                   PUSH    DE       ;SAVE COUNT
FCE0 CD04FD               CALL    SEND     ;TRANSMIT CHARACTER
FCE3 D1                   POP     DE
FCE4 E1                   POP     HL
FCE5 1B                   DEC     DE       ;DECREMENT COUNT
FCE6 18F0                 JR      TSTCT    ;GET NEXT CHARACTER
FCE8 DDCB005E     SNDCR1  BIT     3,(IX+0);TEST REPEAT FLAG
FCEC 2809                 JR      Z,SENDCR;IF NO REPEAT, JUMP
FCEE 3A4038               LD      A,(3840H)
FCF1 FE02                 CP      2        ;IS IT CLEAR?
FCF3 2802                 JR      Z,SENDCR
FCF5 18CA                 JR      ETX      ;REPEAT LINE
FCF7 3E0D         SENDCR  LD      A,0DH    ;CR
FCF9 CD04FD               CALL    SEND
FCFC 3E0D                 LD      A,0DH    ;CR
FCFE CD4EFF               CALL    CRT1     ;DISPLAY
FD01 C3A7FB               JP      KEYS1
                  ;***   TRANSMIT ROUTINE  PARALLEL TO SERIAL   ***
FD04 B7           SEND    OR      A
FD05 C8                   RET     Z        ;DONT SEND NULL CHAR
FD06 F680                 OR      80H      ;ADD MSB
FD08 37                   SCF              ;STOP BIT (SET CARRY)
FD09 F5                   PUSH    AF       ;SAVE
FD0A 323F3C               LD      (3C3FH),A
FD0D 210100               LD      HL,HI    ;SPACE
FD10 CD2102               CALL    PORT     ;OUTPUT IT
FD13 CD45FD               CALL    DLY      ;ONE BIT TIME
FD16 0608                 LD      B,8H     ;8 BITS + STOP
FD18 F1           BITO    POP     AF       ;GET BYTE
FD19 1F                   RRA              ;SHIFT BIT TO CARRY
FD1A F5                   PUSH    AF       ;SAVE WHAT'S LEFT
FD1B 3005                 JR      NC,ZERO ;CARRY=0
FD1D 210200               LD      HL,LOW   ;CARRY=1;MARK
FD20 1803                 JR      OUT      ;TRANSMIT IT
FD22 210100       ZERO    LD      HL,HI    ;SPACE
FD25 CD2102       OUT     CALL    PORT     ;WRITE IT
FD28 CD45FD               CALL    DLY      ;ONE BIT TIME
FD2B 05                   DEC     B        ;COUNT DOWN
FD2C 20EA                 JR      NZ,BITO ;LOOP IF NOT DONE
FD2E F1                   POP     AF       ;HOUSEKEEPING
FD2F CD45FD               CALL    DLY
FD32 CD45FD               CALL    DLY
FD35 C9                   RET
                  ;
                  ;
FD36 21C500       DLY30   LD      HL,T3    ;3.0 MS
FD39 180D                 JR      LOOP
FD3B 211000       DLY5    LD      HL,T0    ;SET FOR .5 MS
FD3E 1808                 JR      LOOP     ;DO IT
FD40 215100       DLY12   LD      HL,T1    ;SET FOR 1.2 MS
FD43 1803                 JR      LOOP     ;DO IT
FD45 21E100       DLY     LD      HL,TBIT ;BIT TIME
FD48 2B           LOOP    DEC     HL       ;COUNT
FD49 7C                   LD      A,H      ;MSB
FD4A B5                   OR      L        ;LSB
FD4B 20FB                 JR      NZ,LOOP ;IF NOT DONE
FD4D C9                   RET              ;NOW DONE
                  ;
0006              MODE    DEFS    6        ;RESERVED FOR POINTERS
FD54 3E1D         CLRLIN  LD      A,29     ;CURSOR TO BEGIN OF LINE
FD56 CD3300               CALL    CRT
FD59 3E1E                 LD      A,30     ;CLEAR TO EOL
FD5B CD3300               CALL    CRT
FD5E C9                   RET
                  ;
                  ;
FD5F F5           GETCRS  PUSH    AF       ;SAVE INPUT
FD60 3E0E                 LD      A,0EH    ;TURN ON CURSOR
FD62 CD3300               CALL    CRT
FD65 F1                   POP     AF       ;RESTORE
FD66 2A2040               LD      HL,(CSRPOS);GET CURSOR POSITION
FD69 DD7402               LD      (IX+2),H         ;START POSITION
FD6C DD7501               LD      (IX+1),L
FD6F C9                   RET
                  ;
                  ;
                  ;
```

Program Listing 1 Continues

Program Listing 1 Continued

```
FD70 3A4038     BREAK   LD      A,(3840H)
FD73 FE04               CP      4       ;CHECK BREAK KEY
FD75 C0                 RET     NZ      ;GO BACK IF NOT
FD76 210100             LD      HL,HI
FD79 CD2102             CALL    PORT    ;OUTPUT SPACE
FD7C 18F2               JR      BREAK   ;LOOP
                ;
                ;***    BASIC PROGRAM RECEIVING MODE    ***
FD7E D9         MODE1   EXX                     ;ALTERNATE REGS
FD7F ED4B1640           LD      BC,(4016H);SAVE KBD VECTOR
FD83 D9                 EXX                     ;NORM REGS AGAIN
FD84 21E5FD             LD      HL,KEYNEW;NEW KEYBOARD VECTOR
FD87 221640             LD      (4016H),HL;CHANGE VECTOR
FD8A CD4A1B             CALL    1B4AH   ;EXECUTE NEW
FD8D 218EFE             LD      HL,PROMT
FD90 CDA728             CALL    28A7H   ;DISPLAY PROMPT
FD93 CDBDFD             CALL    BUFST   ;INIT BUFFER POINTERS
FD96 CD6AFB     LP1     CALL    RECV    ;GET CHAR (BUFFER ENTRY IN 'C
RT1')
FD99 280A               JR      Z,LP2   ;IF NO INPUT
FD9B FE14               CP      14H     ;DC4 CLOSES BUFFER
FD9D 280D               JR      Z,QUIT
FD9F DDCB0056           BIT     2,(IX+0);BUFFER STILL OPEN?
FDA3 2807               JR      Z,QUIT  ;JUMP IF CLOSED
FDA5 3A4038     LP2     LD      A,(3840H)
FDA8 FE02               CP      2       ;IS IT CLEAR?
FDAA 20EA               JR      NZ,LP1  ;NOPE
FDAC D9         QUIT    EXX             ;ALT REGS
FDAD DD5E03             LD      E,(IX+3)        ;GET START
FDB0 DD5604             LD      D,(IX+4)
FDB3 DF                 RST     24      ;CHECK FOR =
FDB4 2028               JR      NZ,BUFNE        ;SKIP IF BUFFER NOT E
MPTY
FDB6 CD01FE             CALL    REST1   ;ELSE RESTORE KBD VECTOR
FDB9 D9                 EXX             ;NORM REGS
FDBA C342FB             JP      NAME    ;RETURN TO TERM
FDBD D9         BUFST   EXX             ;ALT REGS
FDBE 2AA440             LD      HL,(40A4H)      ;START OF BASIC TEXT
FDC1 110001             LD      DE,100H         ;BREATHING SPACE
FDC4 19                 ADD     HL,DE           ;START OF BUFFER
FDC5 DD7404             LD      (IX+4),H        ;SAVE START
FDC8 DD7503             LD      (IX+3),L
FDCB 112FFB             LD      DE,BEGIN-2      ;BUFFER END
FDCE D9                 EXX                     ;NORM REGS
FDCF DDCB00D6           SET     2,(IX+0)        ;OPEN BUFFER
FDD3 C9                 RET
FDD4 77         BUFENT  LD      (HL),A          ;SAVE CHAR
FDD5 23                 INC     HL              ;BUMP BUFFER POINTER
FDD6 7D                 LD      A,L             ;ACTIVITY INDICATOR
FDD7 F680               OR      80H             ;CONVT TO GRAPHIC
FDD9 323E3C             LD      (3C3EH),A       ;TO SCREEN
FDDC DF                 RST     24              ;DE=HL?
FDDD C9                 RET
FDDE 360D       BUFNE   LD      (HL),0DH        ;PUT IN TERMINATOR
FDE0 EB                 EX      DE,HL           ;END IN DE',START IN H
L'
FDE1 D9                 EXX                     ;NORM REGS
FDE2 C37200             JP      72H             ;RETURN TO BASIC
FDE5 D9         KEYNEW  EXX             ;ALT REGS
FDE6 7E         KEYGT   LD      A,(HL)          ;GET CHAR
FDE7 FE0A               CP      0AH             ;LF?
FDE9 2003               JR      NZ,CHOK         ;SKIP IF NOT
FDEB 23                 INC     HL              ;GO TO NEXT CHAR
FDEC 18F8               JR      KEYGT           ;AND GET IT
FDEE F5         CHOK    PUSH    AF
FDEF DF                 RST     24              ;END?
FDF0 23                 INC     HL
FDF1 CC01FE             CALL    Z,REST1         ;IF END
FDF4 2808               JR      Z,RSTOR         ;SKIP IF END
FDF6 3A4038             LD      A,(3840H)
FDF9 FE08               CP      8               ;Z?
FDFB CC01FE             CALL    Z,REST1
FDFE F1         RSTOR   POP     AF              ;RESTORE CHARACTER
FDFF D9                 EXX                     ;NORM REGS
FE00 C9                 RET                     ;BACK AND CONTINUE
FE01 ED431640   REST1   LD      (4016H),BC      ;GET OLD KBD VECTOR
FE05 C9                 RET
                ;
                ;***    BASIC PROGRAM TRANSMITTING MODE    ***
FE06 2115FE     MODE2   LD      HL,NEWLP;NEW VECTOR
FE09 222640             LD      (4026H),HL
FE0C 211FFE             LD      HL,PROMPT;PROMPT ADDR
FE0F CDA728             CALL    28A7H   ;DISPLAY IT
FE12 C37200             JP      0072H   ;JUMP TO BASIC
                ;
                ;
FE15 79         NEWLP   LD      A,C     ;CHARACTER IN A
FE16 F5                 PUSH    AF
FE17 CD3300             CALL    CRT
FE1A F1                 POP     AF
FE1B CD04FD             CALL    SEND
FE1E C9                 RET
                ;
                ;***    SCREEN PROMPTS    ***
FE1F 1C         PROMPT  DEFB    1CH     ;HOME UP
FE20 1F                 DEFB    1FH     ;CLEAR SCREEN
FE21 0D0D               DEFW    0D0DH   ;2 CR
FE23 4C                 DEFM    'LOAD PROGRAM TO BE TRANSMITTED'
FE41 0D0D               DEFW    0D0DH   ;CR
FE43 57                 DEFM    'WHEN FINISHED, TYPE  LLIST'
FE5D 0D0D               DEFW    0D0DH
FE5F 52                 DEFM    'RETURN TO TERMINAL PROGRAM BY TYPING
  <NAME>.
FE8C 0D00               DEFW    0DH     ;STRING TERMINATOR
FE8E 1C1F       PROMT   DEFW    1F1CH   ;HOME UP & CLEAR SCREEN
FE90 54                 DEFM    'THE PROGRAM WILL LIST ON THE SCREEN A
S IT IS RECEIVED.'
FEC6 0D0D               DEFW    0D0DH   ;2 CR
FEC8 57                 DEFM    'WHEN IT STOPS, PRESS CLEAR.  THE PRO
GRAM WILL LIST AGAIN.'
FF01 0D0D               DEFW    0D0DH
FF03 53                 DEFM    'SAVE THE PROGRAM AND THEN RETURN TO T
HE TERM PROGRAM'
FF37 0D                 DEFB    0DH
FF38 42                 DEFM    'BY ENTERING  <NAME>.
FF4C 0D00               DEFW    0DH             ;TERMINATOR
                ;
                ;***    NON SCROLLING VIDEO DISPLAY DRIVER    ***
FF4E B7         CRT1    OR      A
FF4F C8                 RET     Z               ;DON'T DISPLAY NULL B
YTE
FF50 F5                 PUSH    AF              ;SAVE CHAR
FF51 DDCB0056           BIT     2,(IX+0)        ;BUFFER?
FF55 2817               JR      Z,CRT3          ;NOPE AGAIN
FF57 FE0D               CP      0DH             ;CR?
FF59 2808               JR      Z,CRT2          ;YES-ENTER IN BUFF
FF5B FE0A               CP      0AH             ;LF?
```

Program Listing 1 Continues

✓See List of Advertisers on page 386

Program Listing 1 Continued

```
FF5D 2804     04340          JR      Z,CRT2          ;YES-ENTER IN BUFF
FF5F FE20     04350          CP      20H             ;PRINTABLE
FF61 380B     04360          JR      C,CRT3          ;NO-TRY DISPLAYING IT

FF63 D9       04370 CRT2     EXX                     ;GET BUFFER POINTERS
FF64 CDD4FD   04380          CALL    BUFENT          ;ENTER CHAR IN BUFFER

FF67 2004     04390          JR      NZ,NFUL         ;Z IF FULL
FF69 DDCB0096 04400          RES     2,(IX+0)        ;SHUT OFF BUFFER
FF6D D9       04410 NFUL     EXX
FF6E F1       04420 CRT3     POP     AF              ;RESTORE CHAR
FF6F FE0D     04430          CP      13              ;CR?
FF71 2842     04440          JR      Z,CR
FF73 FE08     04450          CP      8         ;BACK ARROW?
FF75 2827     04460          JR      Z,BS
FF77 FE20     04470          CP      32              ;PRINTABLE?
FF79 D8       04480          RET     C               ;NO--RETURN
FF7A 2A2040   04490          LD      HL,(CSRPOS)     ;SCREEN LOCATION
FF7D 77       04500          LD      (HL),A
FF7E 23       04510          INC     HL              ;BUMP CURSOR
FF7F 222040   04520          LD      (CSRPOS),HL     ;SAVE NEW LOCATION
FF82 7D       04530          LD      A,L
FF83 E63F     04540          AND     3FH             ;BEGINNING OF LINE?
FF85 CC8AFF   04550          CALL    Z,ERASE
FF88 1839     04560          JR      LSTPOS
FF8A 7D       04570 ERASE    LD      A,L             ;CURS TO END OF PREV.
 LINE
FF8B E6C0     04580          AND     0C0H
FF8D 6F       04590          LD      L,A
FF8E 2B       04600          DEC     HL
FF8F 7C       04610          LD      A,H             ;SET LINE TO ERASE
FF90 EE02     04620          XOR     2
FF92 67       04630          LD      H,A
FF93 3620     04640          LD      (HL),20H        ;ERASE LINE
FF95 E5       04650          PUSH    HL
FF96 D1       04660          POP     DE
FF97 1B       04670          DEC     DE
FF98 013F00   04680          LD      BC,63
FF9B EDB8     04690          LDDR
FF9D C9       04700          RET
FF9E CDAEFF   04710 BS       CALL    CSR
FFA1 2B       04720          DEC     HL
FFA2 7C       04730          LD      A,H
FFA3 FE3B     04740          CP      3BH
FFA5 2003     04750          JR      NZ,NOTOP
FFA7 21FF3F   04760          LD      HL,3FFFH
FFAA E5       04770 NOTOP    PUSH    HL
FFAB E1       04780          POP     HL        ;RESTORE CURSOR POS
FFAC 1820     04790          JR      SAVCSR
FFAE 3E20     04800 CSR      LD      A,32      ;SPACE
FFB0 2A2040   04810          LD      HL,(CSRPOS)
FFB3 77       04820          LD      (HL),A
FFB4 C9       04830          RET
FFB5 CDAEFF   04840 CR       CALL    CSR
FFB8 7D       04850          LD      A,L             ;CURSOR TO BEGIN OF N
EXT LINE
FFB9 F63F     04860          OR      3FH
FFBB 6F       04870          LD      L,A
FFBC 23       04880          INC     HL
FFBD 222040   04890          LD      (CSRPOS),HL     ;SAVE NEW POSITION
FFC0 CD8AFF   04900          CALL    ERASE
FFC3 2A2040   04910 LSTPOS   LD      HL,(CSRPOS)     ;GET POSITION
FFC6 7C       04920          LD      A,H
FFC7 FE40     04930          CP      40H             ;END OF FRAME?
FFC9 2003     04940          JR      NZ,SAVCSR
FFCB 21003C   04950          LD      HL,3C00H        ;SET TO TOP
FFCE 3E5F     04960 SAVCSR   LD      A,95            ;CURSOR
FFD0 77       04970          LD      (HL),A
FFD1 222040   04980          LD      (CSRPOS),HL
FFD4 C9       04990 LAST     RET
FB31          05000          END     BEGIN
00000 TOTAL ERRORS
05346  TEXT AREA BYTES LEFT
BEGIN  FB31 00340   01960 03590 05000
BITO   FD18 02700   02800
BREAK  FD70 03190   00960 01070 03240
BS     FF9E 04710   04460
BUFENT FDD4 03630   04380
BUFNE  FDDE 03700   03490
BUFST  FDBD 03530   00510 01450 03350
CHOK   FDEE 03800   03770
CHSET  FC82 01990   02060
CKPORT FB9C 00880   00650 00680 00710 00780
CLRLIN FD54 03010   01160
CR     FFB5 04840   04440
CRT    0033 00240   01710 03020 03040 03100 04040
CRT1   FF4E 04260   00860 02120 02240 02580
CRT2   FF63 04370   04320 04340
CRT3   FF6E 04420   04300 04360
CRTST  FBE0 01220   01190
CSR    FFAE 04800   04710 04840
CSRPOS 4020 00270   02260 03120 04490 04520 04810 04890 04910
                    04980
CTRL   FBD9 01180   01150
DLY    FD45 02930   02680 02780 02820 02830
DLY12  FD40 02910   00670
DLY30  FD36 02870   00700 00770
DLY5   FD38 02890   00890
ERASE  FF8A 04570   04550 04900
ETX    FCC1 02260   01250 02540
GETCP  FB5E 00530   01170
GETCRS FD5F 03080   00530 01040
HI     0001 00180   02660 02760 03220
KBD    002B 00250   00970 01080
KEYGT  FDE6 03750   03790
KEYLP  FBC8 01110   01050
KEYNEW FDE5 03740   03300
KEYS   FBBF 01060   01100 02190 02250
KEYS1  FBA7 00960   00540 01030 01270 02230 02590
KIN    FBBA 01040   00990
LAST   FFD4 04990
LDCRT  FCAF 02200   02000 02170
LDCRT1 FC26 01520   01210 01380 01470
LDCRT2 FC86 02000   01520
LNE    FCBB 02240   02210
LOOP   FD48 02940   02880 02900 02920 02970
LOW    0002 00170   00570 02740
LP1    FD96 03360   03440
LP2    FDA5 03420   03370
LP3    FC8F 02040   02140
LPBIT  FB78 00700   00760
LSTPOS FFC3 04910   04560
MODE   FD4E 03000   00450
MODE1  FD7E 03270   01020 01290
MODE2  FE06 03950   01310
NAME   FB42 00410   00390 01130 03520
NEWLP  FE15 04020   03950
```

Program Listing 1 Continues

✓See List of Advertisers on page 386

Program Listing 1 Continued

```
NFUL    FF6D 04410    04390
NOTOP   FFAA 04770    04750
OLDLP   FB2F 00320    00360 00420
OUT     FD25 02770    02750
PORT    0221 00260    00580 02670 02770 03230
PROMPT  FE1F 04080    03970
PROMT   FE8E 04170    03330
PSKIP   FB68 00780    00790
QUIT    FDAC 03450    03390 03410
RECV    FB6A 00630    01000 03360
RESET   FB63 00570    00500 00880
REST1   FE01 03910    03500 03830 03870
RSTOR   FDFE 03880    03840
SAVCSR  FFCE 04960    04790 04940
SBC0    FC39 01600    01420 01580
SBC1    FC44 01650    01940
SBC2    FC60 01810    01730
SBC3    FC7C 01950    01660 01910
SBC4    FC79 01930    01860 01890
SBC5    FC6C 01870    01920
SBCK    FC28 01530    01490
SCCK    FC1D 01480    01440
SECK    FC13 01430    01400
SEND    FD04 02600    01260 02100 02220 02440 02560 04060
SENDCR  FCF7 02550    02500 02530
SICK    FBF0 01280    01250
SIGNON  FB00 00290    02030
SNDCR1  FCE8 02490    02390
SPCK    FC09 01390    01330
SRCK    FCA0 02150    02020
SSCK    FC88 02010    01540
T0      0010 00190    02890
T1      0051 00200    02910
T2      0087 00210
T3      00C5 00220    02870
TBIT    00E1 00230    02930
TESTIN  FBCA 01120
TSTCT   FCD8 02370    02480
TUBE    FB98 00860    00840
ZERO    FD22 02760    02730
```

Program Listing 2

```
1 'UTERM TERMINAL PROGRAM LOADER   AND
2 'QUICKLOAD RELOCATING LOADER BY  BOB HART
3 ' LAST REVISION 8/1/81
10 CLS:
   Z1=PEEK(16562)*256+PEEK(16561):
   PRINT"OLD MEM=";Z1
20 Z1=Z1- 1237:
   POKE16562,INT(Z1/256):
   POKE16561,(Z1-INT(Z1/256)*256):
   CLEAR 125
30 A$=".................................................................
      ...................................................."
40 Z1=PEEK(16562)*256+PEEK(16561):
   PRINT"NEW MEM=";Z1
50 Z2=Z1+ 49
60 Z3=PEEK(VARPTR(A$)+1)+256*PEEK(VARPTR(A$)+2)
70 FORX=Z3TOZ3+116:
   READY:
   POKEX,Y:
   CK=(CK+Y)AND255:
   NEXT
80 IFCK=135THENPRINT"LOADER CHECKSUM OK....DELETE LINES 70-100 AND 200-2
      70.
DO NOT DELETE LINE 280!  REMOVE (') FROM EITHER LINE 170 OR 180."ELSE100

90 PRINT"SAVE THIS PROGRAM.  AFTER SAVE RUN AGAIN.":
   STOP
100 PRINT"LOADER CHECKSUM ERROR.  PROGRAM LOAD DISCONTINUED.":
   STOP
110 MO=Z1-( 64256)
120 IFMO<0THENMO=65536+MO
130 POKEZ3+3,INT(MO/256):
   POKEZ3+2,MO-(INT(MO/256)*256)
140 POKEZ3+6,INT(Z1/256):
   POKEZ3+5,Z1-(INT(Z1/256)*256)
150 POKEZ3+29,INT(Z2/256):
   POKEZ3+28,Z2-(INT(Z2/256)*256)
160 READ Z
170 'POKE 16526,Z3-(INT(Z3/256)*256):
   POKE16527,INT(Z3/256):
   X=USR(0):
   'REMOVE INITIAL REM FOR LV II ONLY
180 'DEFUSR0=Z3:
   X=USR(0):
   'DELETE INITIAL REM FOR DOS ONLY
190 PRINT"BAD REM DATA AT LINE";X:
   END
200 DATA 217,1,1,1,17,1,1,217,42,255,64,43,35,126,254,32
210 DATA 40,250,183,32,24,6,1,35,126,35,182,202,1,1,35,94
220 DATA 35,86,35,126,183,40,230,254,147,32,247,35,126,254
230 DATA 32,40,250,254,88,40,16,254,83,40,47,35,237,111,126
240 DATA 217,18,19,217,128,71,24,199,35,126,35,237,111,126
250 DATA 217,111,217,128,71,35,126,254,32,40,250,35,237,111
260 DATA 126,217,103,9,235,115,35,114,35,235,217,128,71,24
270 DATA 164,35,126,35,237,111,126,184,40,155,235,195,154,10
280 DATA 10
290 REM BD OD BD KC HD AD BE DE KC MD ED DD FD OD BE DD LB OD BE ED GD O
      D ND KC IE M@ @@ @@ HG @@ HG @@ HG @@ HG @@ HG @@ HG @@ SAN
300 REM HG @@ HG @@ HG @@ HG @@ @@ JB FB @D BB XOB KO NC CL BC NH AD AB
      XBD KO BB OH AD JB XOB KO BB FB @D CO MM AB XND MO SGB
310 REM MM FC @@ A@ ML IL A@ ML XCF KO ML XMK MO MM KL @@ FI ML XOE MO H
      A DD AB B@ @@ ML AB B@ IL A@ @@ G@ ML XLI KO HL SAC
320 REM ML X@D MO ML XLI KO HL ML XFC MO ML XLI KO CM IN AK O@ OD @A CO
      ML XFC MO ML XLI KO @B KO IG OB FN OG NO @F SCE
330 REM JO XHI KO FN OE ML XND OO IL ML XCF KO ML XKC MO KM OO FN @H IL
      ML X@G MO ML KB @@ GK @B J@ ML XJF KO NO BA SDD
340 REM JL XNG MO HA MN ML XOE MO HA I@ ML X@G MO ML KB @@ GK HB GO FN O
      G NO KE JL XBD KO NO HA @B F@ ML XDE MO CL XNE KO SHM
350 REM NO JA @B C@ OJ HA FD NO M@ @B L@ MM KL @@ FD JL XAL LO ML XD@ MO
      HA GK NO IF JL XNG MO NO OF JL XF@ NO NO MF @B SD@
```

Program Listing 2 Continues

Program Listing 2 Continued

```
360 REM K@ MM NG @@ NN A@ MM GG @@ OJ HA MA NO @G @B F@ MM KL @@ NL HA F
        B NO EF @B F@ ML XMK MO OJ HA I@ NO CF @B G@ MM KL @@ SFN
370 REM FI OJ HA NE NO BF @B LE ML AM E@ MM KL @@ NL HB D@ MM KL @@ NH M
        L IL A@ IM KN MM FF D@ MM NF C@ OM HB EC NG A@ @@ C@ EO SFK
380 REM IM ML CC @@ MM KL @@ ND HB J@ AO EO ML KC @@ IM A@ A@ @@ IM AO I
        M ML @F @@ JC @D HC KL OG HB M@ JC @D HC KL GD @B F@ KL SAH
390 REM OD @B E@ HA CO CB HA HL KN AA XOB KO IM OJ MM KL @@ FL HA GB NO
        CG @B DA AB X@@ KO NG GK HB ON CB EN EO ML XD@ MO SFK
400 REM AO ML XND OO AN HA ON NO BG MM KL @@ NI @B G@ MM KL @@ NM CL XOK
         KO MM KL @@ FD HB F@ ML XD@ MO CL XGJ KO ML XND OO SMC
410 REM CL XOK KO JB @B @D OJ MM FE B@ MM NE A@ MN BE LG FN C@ CF KN MM
        FF B@ MM NF A@ JG CK HB L@ NG CB EN EM ML XD@ MO AM SJ@
420 REM AN KA HA @O MM KL @@ NE HB I@ JC @D HC NO B@ HB B@ HA JL NC M@ M
        L XD@ MO NC M@ ML XND OO CL XGJ KO GK HL FO @H GC SI@
430 REM EO BC OC LC AB A@ @@ ML AB B@ ML XED MO F@ H@ AO OA EO @C E@ AB
        B@ @@ HA C@ AB A@ @@ ML AB B@ ML XED MO E@ @B JN AO SKF
440 REM ML XED MO ML XED MO IL AB EL @@ HA M@ AB @A @@ HA H@ AB AE @@ HA
         C@ AB AN @@ KB LG EK @B KO IL NC @B ML XMF MO F@ SNJ
450 REM NC MA ML CC @@ NC NA ML CC @@ IL EO NC N@ ML CC @@ AO JB @B @D M
        M DG B@ MM EG A@ IL JC @D HC NO D@ @L AB A@ @@ ML AB C@ SBC
460 REM HA BO IM MN KD FA @D IM AB XEN MO BB FA @D ML JD KA AB XNH NO ML
         GJ HB ML XMK MO ML XJF KO HB J@ NO DA HB M@ MM S@E
470 REM KL @@ FE HB G@ JC @D HC NO B@ @B JN IM MM NE C@ MM FE D@ OM @B H
        B ML XA@ NO IM CL XBD KO IM JB DJ @D AA @@ A@ IA MM SFA
480 REM DG D@ MM EG C@ AA XOB KO IM MM KL @@ FM IL GG CB MG FO @H BC NC
        LC OM IL FC M@ KN IM CL BG @@ IM NG NO J@ @B C@ CB HA SC@
490 REM HO EO OM CB LL XA@ NO HB H@ JC @D HC NO H@ LL XA@ NO AO IM IL MN
         CD FA @D IL AB XEA NO BB FB @D AB XOA NO ML GJ SNK
500 REM HB CL BG @@ IG EO ML CC @@ AO ML XD@ MO IL LA OA M@ M@ LD OD AD
        DD @B @E BE OD GD BE AD MD @B DE OD @B BD ED @B DE BE SAC
510 REM AD ND CE MD ID DE DE ED DD M@ M@ GE HD ED ND @B FD ID ND ID CE H
        D ED DD LB @B DE IE @E ED @B @B LD LD ID CE DE M@ M@ BE SBB
520 REM ED DE EE BE ND @B DE OD @B DE ED BE MD IB ND AD LD @B @E BE OD G
        D BE AD MD @B BD IE @B DE IE @E ID ND GD @B @B LC ND AD SGL
530 REM MD ED NC NB M@ @@ LA OA DE HD ED @B @E BE OD GD BE AD MD @B GE I
        D LD LD @B LD ID CE DE @B OD ND @B DE HD ED @B CE CD BE SJM
540 REM ED ED ND @B AD CE @B ID DE @B ID CE @B BE ED CD ED ID FE ED DD N
        B M@ M@ GE HD ED ND @B ID DE @B CE DE OD @E CE LB @B @E SIO
550 REM BE ED CE CE @B CD LD ED AD BE NB @B @B DE HD ED @B @E BE OD GD B
        E AD MD @B GE ID LD LD @B LD ID CE DE @B AD GD AD ID ND S@H
560 REM NB M@ M@ CE AD FE ED @B DE HD ED @B @E BE OD GD BE AD MD @B AD N
        D DD @B DE HD ED ND @B BE ED DE EE BE ND @B DE OD @B DE SJB
570 REM HD ED @B DE ED BE MD @B @E BE OD GD BE AD MD M@ BD IE @B ED ND D
        E ED BE ID ND GD @B @B LC ND AD MD ED NC NB M@ @@ GK HL SGM
580 REM EO MM KL @@ FE HB GA NO M@ HB H@ NO J@ HB D@ NO @B HC K@ IM ML X
        DM MO @B D@ MM KL @@ FI IM AO NO M@ HB BD NO H@ HB GB S@G
590 REM NO @B HM JB @B @D GG CB BB @B @D MG FN OC LL XJH OO HA IC MG FN
        @L OF KB LG NN B@ GF FC @B EN AM KA A@ OC @@ MN HK IL SJD
600 REM ML XNJ OO KB LG NO KC @B C@ AB OO OC EN AN HA @B NC @B JB @B @D
        GG IL ML XNJ OO MG FO OC OF CB BB @B @D ML XJH OO SII
610 REM JB @B @D LG NO @D @B C@ AB @@ LC NC OE GG BB @B @D IL SDB
```


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How is a chip like a cockroach with 16 legs?

For the Novice—Part I

Jay Chidsey
205 E. Adams St.
Green Springs, OH 44836

This is the first of a six-part series we call "For the Novice." It is intended for people who have had no previous experience with computers, and who are only 6–18 months into their use of this exciting technology. This month Jay Chidsey discusses the MEMORY SIZE? facility, high and low line numbers, high memory and low memory addresses, and high-level and low-level languages. We encourage the reader's response to this new series.—Eds.

Every time you turn on your computer, you are asked MEMORY SIZE?. You have to figure, as I did when I first used my Model I, that somebody thinks this is an important question, and should have an answer a bit more definitive than pressing Enter.

The memory size question is a facility you are almost never going to use. Your response, in the form of a high address, reserves a certain amount of high memory space for low language use. But, this function, while important, is seldom used.

High Memory designates addresses above memory location 30000 on a 16K machine. These addresses are even higher on a 32 or 48K machine. Entering a high memory address in response to the memory size query reserves high memory for a machine-language program. The programs you load into your computer using the System command are written in machine language. High address and high memory are analogous. They are not related in any direct way to line number. Line number is a Basic language requirement, whereas individual memory addresses are manipulated by machine language. Machine language occupies the space you reserve by responding to the memory size question; the System command loads programs into specific portions of memory. Reserved memory will stay put if you enter the Basic command New but turning the TRS-80 off or resorting to Reset will wipe out all memory, including reserved memory.

The use of high and low for memory and address, line number, and language can be confusing, since they deal with quite different concepts. A high-level language is one which is most recognizable to the user. A low-level language is one which is more recognizable to the computer. Basic is a high-level language, as are Pascal, Cobol, Fortran and other more specialized languages. They permit us to use English-like commands to program the computer. Machine language, which consists of groups of numbers described in base 2 (ones and zeros) or binary notation, is the lowest level of language. It is the one your computer speaks. Our TRS-80s are designed to interpret Basic to machine language in the ROM (Read Only Memory). If you have a 16K (16,384 bytes) computer, you also have nearly that many thousand bytes of ROM to interpret your Basic commands. You actually have a 32K computer, of which 16K is available for your direct use as RAM (Random Access Memory), or programmable memory. A byte is a character, such as a number or letter or blank space. It is composed of eight bits—on or off signals (which represent a one or a zero). In the earliest computers, such as ENIAC, one bit was a DeForest diode tube. Later it was a transistor. Now it is a capacitor controlled by a field-effect transistor on a silicon chip. Printed circuits form or are integrated into a chip. The 16K memory of a TRS-80 Model I/III resides in eight such chips—1 x 16K chips which look like large flat-backed cockroaches with 16 skinny legs.

There is one way, however, that you and I can use the memory size function without having to spend years in becomming sophisticated machine-language programmers. The Program Listing with this article offers a Basic program written by David Lemley of Savannah, GA, printed with his permission. He wrote it on a 16K Model I, but it works on a 16K Model III as well. This is a very useful merge program.

To use this program, answer MEMORY SIZE? with 32594 (16K machines only) then type the program into your computer. *Do not run it!* CSAVE it to tape, and check it with CLOAD? to be sure you have a good recording, and then run it. What happened? The program disappears! Line 90 was NEW, and it cleared everything out below 32594. The merge program is now in high memory in low language (POKEd into high memory) above the barrier. You have used a Basic

```
1   'BASIC MERGE PROGRAM: DAVID LEMLEY, SAVANNAH, GA.
2   'ENTER 32594 FOR MEM SIZE ON POWERUP
10 FOR X=32595 TO 32712
20 READ Y: POKE X,Y
30 NEXT
40 DATA 221,42,249,64,221,43,221,43,221,43,221,43,175,205,18,2,2
05,150,2,6,4,205,53,2,16,251,205,53,2,221,119,2,183,32
50 DATA 8,58,63,60,238,10,50,63,60,175,221,182,0,221,182,1,221,1
82,2,221,35,32,225,205,248,1,42,249,64,229,221,225,17,235,66
60 DATA 237,82,229,209,221,43,221,43,221,110,0,221,102,1,174,124
,175,25,229,221,117,0,221,116,1,221,225,24,232,221
70 DATA 229, 225,35,35,34,249,64,34,251,64,34,253,64,195,25,26
80 POKE 16526,83: POKE 16527,127
90 NEW
```

Program Listing

program to stick a machine-language program into high memory.

To use this program on a 32K Model I or III enter 48978 for the memory size. Change line 10 to read FOR X = 48979 TO 49096 and change line 80 to read POKE 16526,83: POKE 16527,191. To use the program on a 48K Model I or III enter 65362 for the memory size. Change line 10 to read FOR X = 65363 TO 65480 and change line 80 to read POKE 16526,83: POKE 16527,255.

This merge program, safe in high memory, can splice together several programs provided that each succeeding program has higher line numbers than the one preceding it in memory. These will be programs that you write with higher line numbers and CSAVE for merging or existing programs that you renumber and CSAVE for merging.

With David Lemley's Basic merge program protected in high memory, you may now CLOAD your lowest numbered program, or type it in. Now put the second program into the cassette machine, press play, and type in as a command A = USR(O) (that is a capital O, not zero), and press Enter. The cassette will turn on, your higher numbered program will be added to the original program, and the two will be merged. I would CSAVE then before running or adding another even higher numbered program or doing anything else. You never know when a utility like this will crash and print garbage. ■

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A look at Datahandler, IDM-V and Maxi-Manager.

Data Base Managers—Part II

The Datahandler
Miller Microcomputer Services
Natick, MA
$60

IDM-V
Micro Architect, Inc.
Arlington, MA
$149

Maxi Manager (Version A. 3. 1.)
Adventure International
Longwood, FL
$100

Wynne Keller
Downeast Digital
RD1 Box 4130
Solon, ME 04979

Part one of this series appeared in the August issue and compared three data base programs: Aids III, Maxi Micro Manager, and CCA. I will compare two more data base programs, The Datahandler from Miller Microcomputer Services, and Interactive Data Manager (IDM-V) from Micro Architect, Inc. and rate them with the first three. In addition, since Maxi Manager has just been released in a substantially different version, I will examine any changes in it since the original article.

Comparisons between two programs should normally only be made between programs of similar price. It is unfair, for example, to compare a $20 Basic word processor to Scripsit. At first glance, it might seem the two programs I evaluate here are quite unequal in price. However, because the Datahandler is written in Forth, it must be run with MMSFORTH. Therefore the total package costs $190. It is not realistic to allot all the cost of MMSFORTH to The Datahandler, because Forth has other uses. If we allot half the cost of MMSFORTH for the data base application, the package would cost about $125 which compares equitably to IDM-V at $149.

The two programs use different data storage approaches. The Datahandler, like Aids III, is a sequential data base, which means each file's size is limited by the computer's memory. All records in a file are in memory at one time, and are written to disk at the end of a session. The capacity of The Datahandler in a 48K machine is about 24K of data, or roughly 300 records in a typical application.

The IDM-V program, like CCA and Maxi Manager, uses random access files. This means records are written to disk as they are added, and brought back from disk on request. Only one or two records are normally in memory at any given moment. The size limit is the number of records which fit on the disk, not the number which fit in memory.

Readers not familiar with the use of a data base program are referred to part 1 (August, 1981, page 222) of the series for definitions of field, file and record.

Documentation

Both these programs deserve praise for their documentation, which is written clearly and should offer few problems to a beginner. The Datahandler actually has two manuals. The program's screen displays and command set are based on the PIMS (Personal Information Management System) data base, originally published by Scelbi, Inc. The Datahandler is an original program with many enhancements, but the basic commands remain the same, hence this manual is included with The Datahandler. The PIMS manual is outstanding for beginners because it gives assistance in how to organize a data base. After reading the PIMS manual, turn to the Datahandler manual to learn the changes in some of the commands, and read about the sample files on the disk. Advanced portions of the Datahandler manual will be unclear to beginning Forth users, but you can set that part aside until you gain some experience with Forth.

The IDM-V manual does not explain how to organize a data base but it explains well how IDM-V functions in the simplest possible terms, emphasizing vital information several times and pointing out possible errors. A full-page troubleshooting guide at the end of the manual outlines common beginner errors such as keyboard hangup if the printer has no paper, or what to do if you accidentally press the Break key.

The most obvious change in the new version of Maxi Manager is the manual. It is now in a 7 by 9 three-ring looseleaf binder, more attractively printed than the first manual. The contents have been completely rewritten. Understanding this program will never be simple, but the new manual has been written with greater attention to the beginner. The manual is divided into a technical section and the main section. Some users may never need the technical section. Having used this program for almost a year, I can no longer read the manual as a beginner, hence I cannot fairly evaluate its impact on someone reading it for the first time. It does lead the user through many examples, and all questions asked by the program are answered. It is now a professional manual, both in appearance and content.

Initialize

The initializing section prepares the program for the intended application. You establish numeric and string fields and specify their length in this section. Once this is set, you usually cannot change it except by starting over. (Aids and IDM-V allow you to add or delete fields, but you cannot rearrange them.) The initialization section of IDM-V is a separate program which the user calls from the disk just for this function. Initialization is part of the main Datahandler program.

Initializing The Datahandler is easy because you do not specify each field's length in advance. Simply state the field name and whether it is numeric or string. As provided,

"... The Datahandler allows up to 10 fields and a record length of about 255 bytes."

The Datahandler allows up to 10 fields and a record length of about 255 bytes. The manual explains how to alter the program for larger record size or more fields if needed. As you add records, the program calculates the average length of the records, and gives on request an estimate of the number of additional records which will fit. Unused space in each field is not wasted. Each record uses only the number of bytes which are typed into it.

IDM-V limits the length of a record to 255 bytes, and the number of fields to 40 (20 string, 20 numeric). The first field must be a string field. The major choice at initialization is whether to organize the records by record number or by key. The contents of a key field must be unique for each record. If you request a key field, it is the first field, and is used to find the record on the disk. If you were cataloging a library, for example, the author's name could not be the key field because he may have written more than one book. The book's Library of Congress number, however, could be the key field, because each is unique. The manual explains fully the drawbacks to accessing the data by key. It does not explain the advantages, i.e., what is the point of organizing the data by key field? The answer is it is not necessary to know the record number to access a record. The search function requests the key field contents and will rapidly get the record. If you do not use a key, the records will go to disk in order by record number.

With IDM-V, when you have defined the fields, you must specify the total anticipated number of records. This permits the program to write all the records to disk as blanks and zeroes; such a procedure ensures there will be no lost files later in the event of a system crash. It also allows you to place more than one file on a single side, which is an advantage if the files are small. There are two problems with this section: If you specify too large a total, the file will not fit on the disk and a disk-full error occurs, making it necessary to start initialization over. The manual explains how to calculate how large a file will fit on the disk, but it is a lot of work; the computer should calculate free disk space and size of each record, and then inform the user how many records will fit.

If you use key access, you must specify a prime number for the total number of records. A prime number is any number which cannot be divided evenly by anything but itself and one. I found a prime number by trial and error. The program should calculate the prime number nearest to the total number of records planned.

Input

IDM-V has an easy-to-use add function. Dots on the screen show the field length. You can modify the record before it is written to disk if you have made a mistake. IDM-V allows a fast typing speed. If you have specified a key field, the disk turns on after you type the key field to search for possible duplication of a key item, and to write the previous record. If there is no key field, the disk turns on after you complete the record. (Actually, after the buffer is full. The disk may not turn on after every record.) This disk write slows record entry, but is a random access data base necessity. You cannot duplicate a field from a previous record by pressing a single key while using the add function.

The Datahandler's add function does not show the length of each field because the field length may be any length you wish. It is pleasant not having to determine field length in advance and be limited by whatever you chose. There is one drawback. If the total length of all fields in one record exceeds about 255 bytes, The Datahandler generates an error message which wipes out any file in memory. The program needs a stop message to warn the user of this limit to prevent data loss. In actual practice, however, most users will not encounter this problem, as 255 bytes is sufficient for most applications and is the record size limit in most data base programs.

"IDM-V has an easy-to-use add function."

Unlike IDM-V you can duplicate the contents of a previous record by pressing a single key while using The Datahandler's add function. For example, if you were typing a mailing list and had several records in a row that said "Massachusetts" you would type the full word only once. Thereafter you would hit the semicolon key when you came to the state field, and the program would automatically write "Massachusetts." I encountered this very convenient feature in only one other data base, Maxi Manager.

With The Datahandler, pressing a hyphen backs up one field at a time to correct errors. Once you complete the record, you cannot change it; the program goes on to the next record. To make changes you must use the change mode.

Change

You can enter the change (Modify) mode in IDM-V both from the menu, by selecting "Inquiry", or during the add section if you note an error. Before you can alter a record you must first find the record number using the search function, unless you are using key fields. If this is the case the record number is based on the keyfield contents, so just typing the key entry finds the record.

It was not feasible to test IDM-V with a large number of records, but according to the manufacturer, the program will pull any record from the disk, using a key file, in 0–3 seconds no matter how large the file. The disk looks at no more than four records to find the one it needs, and on the average, scans only 1.5 records. This program's key access feature is extremely fast and convenient.

The Modify function scrolls through the fields. To change an item, retype it, or press Enter to leave it unchanged. This method is simple and the cursor jumps from field to field much faster than in Aids, which has a similar system. The screen does scroll but you may redraw the display by typing D.

In addition to the Modify mode available from the menu, IDM-V allows you to make changes during the printing phase. This global change is very powerful. The results of calculations can be written to the disk all at once. For example, an inventory might have two numeric fields handling quantity: the number-on-hand and the number-on-order. Perhaps you received an order from XYZ company. The print search could find all XYZ items with a quantity in the number-on-order field, add that number to the number-on-hand field, print the results, and zero the number-on-order field after printing. Taking advantage of this feature requires some careful planning at the initialization stage and great care in actual use. Global change and delete can be global disaster if you realize after it is too late that the report file you used was also deleting each record it printed. Do not use this function without complete backup disks.

The Datahandler has complete search

"Usually, the most important purpose of a data base is printing data in the format desired by the user."

capabilities within the change mode, hence it is not necessary to know the record number before asking for changes. You can make an identical change in more than one record by pressing a single key. This very nice feature is similar to the one-key command to repeat a field in the Add mode. Also, because the number of the field to be changed is selected in advance, the record will be drawn on screen with the cursor already in place at the proper field. This can save a lot of time if the field to be changed is near the end of the record.

Search

For The Datahandler, the most time-consuming part of the search is defining all the search requirements. At first, it can easily take 10 seconds to answer all the questions relating to the search, although as you gain experience, you can make the choices in a fraction of that time. Once you have defined the search, The Datahandler finds the record almost instantly. The search's main limitation is that you may search only one field at a time. Aside from that, The Datahandler covers every conceivable search need, including a masked search. A masked search ignores certain parts of a string. A question mark indicates these parts. If the second two digits of an inventory number indicated the vendor, they could be searched by requesting "??34???." This would find all records with the numbers 34 in that position. A number 34 in any other position would be ignored. Maxi Manager is the only other data base that has this feature. Both Maxi Manager and The Datahandler can find a match in any type of search even if the search string does not duplicate the uppercase/lowercase configuration of the original entry.

IDM-V does not support as many search functions as The Datahandler, consequently there are fewer questions to answer before the search begins, and the ability to press Enter for default search parameters also speeds the process. The program searches only the first three characters on a perfect match, greater-than or less-than basis. If, for example, you were searching for Mike Applesmith but could only remember the "Apple" part of the name, you could still find the record if you were using The Datahandler, but not with IDM-V.

The search function prints each record's compared field as it scans, so it is possible to see where the search goes wrong if it doesn't find the record. Searching is a slow process if you do not use a key field. You must exactly duplicate the original record's uppercase/lowercase configuration.

Sort

IDM-V has a fast, capable machine-language sort of up to four fields, but there is a large drawback: Once sorted, the records are not written to disk. The sort is only for a printout. A second drawback is that all records to be sorted must be in memory. While this is true of all data bases, Maxi Manager and CCA handle it automatically whereas IDM-V requires the user to split the file and bring it in a portion at a time to be sorted.

The sort for The Datahandler is very fast because it is an in-memory system, and because of the capabilities of Forth. The speed is comparable to Aids and any number of fields may be sorted—ascending or descending.

The greatest flaw in Maxi Manager when it first appeared was the sort, which would handle only one field at a time. This has now been changed and the new version can sort on three fields at a time. The sort is in machine code and as fast as can be expected for a random access data base. Unlike IDM-V, Maxi Manager stores the results of the sort on disk.

Printouts

Usually, the most important purpose of a data base is printing data in the format desired by the user. The whole process can be very troublesome. It is therefore desirable to be able to save print commands onto the disk once they have been worked out satisfactorily. IDM-V has this capability with room to store 10 different printer command files. The Datahandler cannot store print commands.

IDM-V provides less control over the printout format than The Datahandler; however, it is fairly simple to format the printout which would be adequate for many uses. IDM-V always prints record numbers whether you want them or not. Worse still, the column for record numbers wastes 10 spaces of the total printout. Record numbers can be a nuisance and even a real liability in many applications. There should be a choice as to whether or not you want them.

You cannot align numeric fields to the right and left of the decimal point. IDM-V prints the name given to the file which stores the print commands as the title, so be sure to use a meaningful file name. If the length of the printer line is exceeded, the excess wraps around, and there is no control over the alignment of the second line of data. You have no control of the number of blanks between fields. You cannot abort printout except with the Break key. You can access the data base with Micro Architect's word processor, WORD-V, for use with form letters. The Lister command provides a quick and easy printout.

The section of IDM-V devoted to formatting the printout is quite easy to use. Screen scrolling causes the field numbers to be out of sight when they are needed. The program allows calculated fields which will perform addition, subtraction, division, or multiplication between two numeric fields. Column totals and averages are available. You may select range for printouts, or you may search and print.

The report section search is much more sophisticated than the search in the main program. You may search up to four fields with a choice of logical AND or OR. For example, the search could find everyone whose name is Smith AND who live in New York, or you could search for those named Smith OR those who live in New York, whether or not their name were Smith. As in the main program, the report section search uses only the first three characters of the search string. Thus in the example above, the program would also print Smithe.

Like IDM-V, The Datahandler report formatting section is fairly easy to use. The features available are quite different. You can choose whether or not to print record numbers. There is no wrap around, so it is possible to control the appearance of the second data line. Unfortunately, no math is available for a printout, but full search functions are provided.

The Datahandler has a quick, easy printout via the "standard" mode of the Report command. If you desire a customized format, you may specify which fields are to be printed, and full search functions are available for selecting records. You may change file parameters if desired. Very few commands provide a surprisingly flexible number of printout choices; you can manipulate the maximum field length, the spaces between fields, and the size of the line to obtain the desired result. Some trial-and-error experimentation is necessary. Once perfected, turn the printer on and save the file parameters to the line printer to be reused at a later date. This overcomes the lack of disk storage for printer file commands and is similar to the approach you must take with Aids. The program remem-

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"Speed is The Datahandler's most important special feature."

bers your last requested printer layout and the command Redo prints the records as often as desired according to that layout, until the computer is turned off. The Break key safely aborts printer operations at any time and returns you to "Command?", the program's normal query.

You can obtain continuous printer interaction with the program so everything you type goes to the printer. Unfortunately this function causes the line printer to form feed whenever the screen is cleared. This severely limits the option's usefulness.

The Datahandler has an inventive mailing list printout option which examines the name field. If it sees a comma, it assumes the last name is first and it reverses it for the printout, eliminating the comma and printing one space between last and first names. This space insertion means none is needed when you enter the name, thereby saving one byte per name.

The new version of Maxi Manager includes a utility program to create printer command files. This is a considerable improvement over the version reviewed in August. It is not necessary to learn all the print format commands, as the utility program creates a file of the proper commands based on your answers to various questions. The utility program does not allow corrections, however, so if you desire changes it is necessary to start over or load the file into a word processing program and make the needed changes (assuming you understand the print commands so you know what to change).

At first you could not use Scripsit with the Model III version of Maxi Manager. Scripsit is on a TRSDOS disk and Maxi for the Model III is supplied on DOSPLUS. Thus Scripsit could not read a print file created by Maxi Manager, nor could a Scripsit form letter be merged with Maxi Manager files. Fortunately, a patch is now available from Adventure International ($10 to present Model III owners) to overcome this problem. The patch will be included on all future Maxi Manager disks.

While Maxi Manager's printout system is anything but simple, it remains the most sophisticated one I have seen, and the new version is easier to use than the old.

Calculate

Perhaps The Datahandler's greatest flaw is the lack of many math functions. Addition is the only feature, and it is not available on printouts. The addition may be performed within a record as well as between records, and like all Forth commands is quite rapid. The fact remains, however, that its inability to calculate beyond addition may force some prospective users to look elsewhere for a data base. IDM-V, on the other hand, has a standard addition, subtraction, multiplication and division functions which are also available on CCA, Maxi Manager and Aids. IDM-V math is only available with a printout and is similar to Aids in this regard. CCA and Maxi Manager provide mathematical functions on screen as well as in printouts.

Special Features

The Datahandler's special features stem from the fact it is written in Forth rather than Basic. Actually The Datahandler is not a program so much as a new set of Forth words, defined to perform various functions. As such, a Forth programmer can easily modify it to include any new functions which might be needed. When using The Datahandler you are in the Command mode, similar to Basic's Ready, much of the time rather than in the program. To make a choice, type a command such as Add, Change or List. There is no menu, but the word Help lists all the commands the program understands. A directory is always available because of being in Command mode, and it is possible to stop using The Datahandler temporarily, if desired, to ask Forth to do a few calculations and then go right back into the program.

Speed is The Datahandler's most important special feature. No other data base in these reviews even comes close. Type List and ask for all the records. Hold the space bar down and watch the records flip onto the screen faster than you can scan them. Release the bar and the record on screen freezes. Tap the bar to continue one at a time. One hundred record files may be loaded in seconds. It is this fast disk I/O which makes the big difference between Aids and The Datahandler. Aids is about as fast in search and sort, but is extremely slow writing and reading files.

A nice feature of IDM-V is the audit trail. If you select this function, all changed or added records are automatically sent to the printer—a very handy reference for data base transactions. Another feature which may be important to some users is password security on two levels: one password for read/write access and one for read-only access.

IDM-V has made every effort to speed interaction between program and user by the liberal use of default values for any choice. In formatting a printout, for exam-

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"There is no best *program. The best one must be chosen for the particular application."*

ple, pressing Enter quickly bypasses the mathematics questions. For every question in any section, pressing Enter automatically selects the most commonly used choices. It is a great feature for beginners who aren't sure how to answer many questions. Press Enter and see what happens, it can't do any harm!

IDM-V is advertised as bug free and reliable. It has been released for Models I, II and III, CP/M, and Heath computers. While I have not used it long enough to categorically state there are no errors, it does appear to be a solid, dependable program. Many precautions have been taken to protect files from accidental erasure or damage.

A new feature in Maxi Manager is a utility program that allows it to read Aids III files. An Aids user who has outgrown that in-memory system can thus convert to Maxi's random access without retyping his files.

Readers of part I of this article may wish to know how these two data base programs compare with the three previously reviewed. Since writing part I, I have changed to a Model III and should point out that Aids runs on my Model III if shift, down arrow Z is used as the control key, rather than just shift, down arrow. Maxi Manager users must trade in their old disk to convert to the Model III version ($15 charge). IDM-V Model I users may convert to Model III version for $10. I have not used CCA on the Model III.

There is no *best* program. The best one must be chosen for the particular application. Of the three random access programs, Maxi Manager remains on top for sophistication and file capacity, but it is the most complicated to use. IDM-V has powerful global change and delete, fast sort and good search with printouts. Its greatest flaws are the lack of full control of printout appearance, the need to break files up for sorting, and the inability to save records in sorted order. CCA has better printout control and math than IDM-V, but has very poor search capabilities and a slow sort. IDM-V is the easiest to use of the three, but costs considerably more.

Some programs are better than others for the single-drive owner. On a double density drive, any of the programs would be adequate since the program and data could all be on one disk. On a single density drive, there is often insufficient room for both program and data. Having a separate data disk allows for a larger file, but then the program and data disks must be switched. Maxi Manager requires this switching whenever sorting or printouts are desired, but does prompt for the switch. CCA does not prompt for switching disks, so the user must change them at the right moments. IDM-V also does not prompt for the switch, but requires fewer switches than Maxi Manager.

Of the two in-memory systems, either would work very well for a single-drive owner. Aids has the advantage of being able to manipulate files larger than memory size by calling in portions of a file. However, this feature carries with it the potential for large-scale damage to files if not handled with great care. The two programs are equally easy to use. While Aids is fast once the files are in memory, disk read and write time is very slow. The Datahandler is more pleasant to use because of its great speed, both for calling files in and out and for adding and changing records (faster typing is allowed, and the cursor is at the correct field automatically for changes). They both have great search and sort routines. Aids has far better mathematical ability and can give calculations on printouts (with CALCS III).

Despite the fact that The Datahandler is extremely weak in some important areas, I am fascinated by it. After a few years at a computer keyboard one begins to feel half a life has been spent waiting for the computer to load and save files. Forth and The Datahandler end all that. I recommend the program for anyone willing to take the time to learn Forth, or willing to pay to have The Datahandler customized. The program can be modified to do most of the things a good data base needs to do. The missing Merge function, for example, was provided to MMSFORTH users, after The Datahandler was released, in a newsletter. The missing mathematical sophistication could be provided by a good Forth programmer. Consider the program an exciting nucleus; plan on some customization for any sophisticated applications.■

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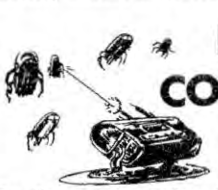

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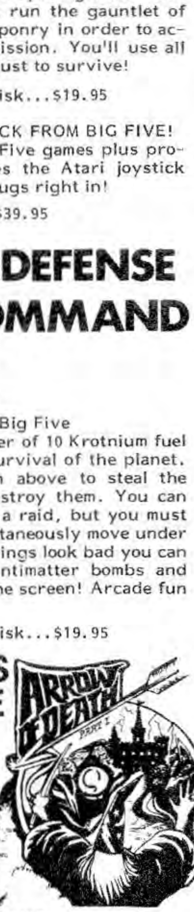

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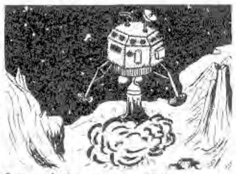

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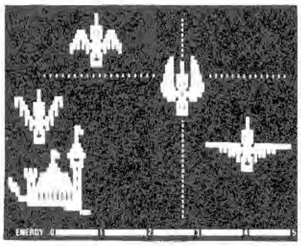

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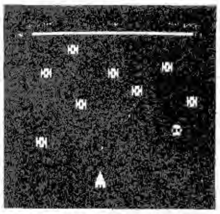

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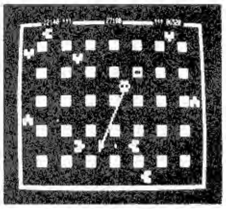

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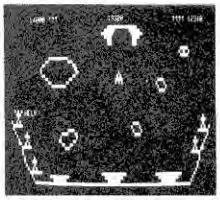

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I built a relay to handle the telephone switching load (approximately 70 volts) and control it from a Model I TRS-80 cassette output port.

Controlling the telephone switching directly from the cassette port might weld the relay.

To further protect the sensitive TRS-80 relay, I wired a diode across the leads of my relay (Fig. 1). This diode shorts out the surge of current caused by the collapse of the magnetic field in the coil when the power is out.

Inside the phone are two or more wires going to the dial. Two of these are normally closed and are switched by the dialing action. They are pulsed open when you dial a number.

Cut either one—it doesn't matter which—and connect it to the normally closed side of your relay. This way you will be able to use the phone without the computer.

If there is enough room inside the phone's casing, install the relay there. If not, put it inside a container; an empty film can will work.

I connected the relay to the computer by mounting two jacks: a miniature jack for power (I used a jack from a battery eliminator of the same voltage as the relay); and a subminiature jack for the remote plug on the cassette cord.

Control Program

All of this wouldn't be worth much without a program to control it, so I wrote a simple one that you can modify to suit your own needs (Program Listing 1).

The subroutine in the first part of the program (lines 20–100) does all the work. It turns on the relay by sending a four out to port 255. Normally this turns on the cassette motor. If we delay the program before turning off the relay (OUT 255,0), we create one pulse. Five of these pulses is the same as dialing the number five.

Lines 200–390 are data lines containing names and addresses. I put these in the program, so I wouldn't have to read them from the tape each time.

The name comes first, followed by the phone number. Don't include dashes or parentheses, but *do* include the 1 that precedes any long distance numbers.

Lines 400–425 look for input. By typing List, the program lists all the names on file. Typing Hangup, or H, gives you a dial tone, and typing Number, or N, finds a number without dialing it.

Line 516 puts dashes in the number before it's printed, to make it easier to read (1-706-556-4563).

Lines 500–510 search for the number corresponding to the name you enter. Then it reads this number into the NO$. Should you change your mind while the computer's dialing, hitting any key will hang up the phone and return the

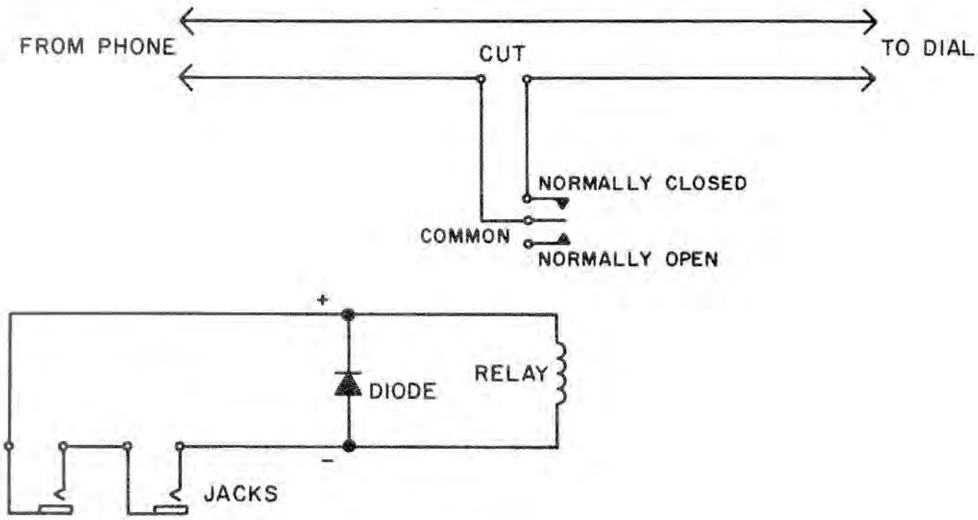

Fig. 1. Schematic

system to command mode.

Flashing Cursor Routine

The subroutine in lines 800–910 flashes the cursor faster and more efficiently than others I have used. I included my remarks in Program Listing 2.

Very simply, it prints a graphics block (CHR$(128)), pauses, then backspaces (CHR$(13)), erasing the block. While the cursor is flashing, it is checking for input.

If the key struck is not a left arrow (backspace), shift backspace or Enter, then the character is added to A$.

A backspace will erase the last character on screen, taking the last character out of A$. Shift backspace erases the whole line and clears A$. If you hit Enter, some variables are set up (Listing 2, line 860), then the program returns to the calling subroutine with the input in E$. ■

```
1 CLEAR5000:CLS:GOTO400'  PROGRAM STARTS AT 400
10 IFNO=0THENNO=10' A "0" ON THE PHONE TAKES TEN PULSES.
20 FORLP=1TONO' SUBROUTINE TO DIAL A NUMBER.
40  OUT255,4' TURN ON RELAY...
50  GOSUB600' DELAY A BIT...
60  OUT255,0' TURN OFF RELAY...
70 GOSUB600'WAIT...
80 NEXT LP' FINISH UP
90 FORLP=1TO100:NEXT:'  DELAY BETWEEN NUMBERS
100 RETURN
199 '             NAMES AND NUMBERS GO HERE
200 DATATIME,7671111
210 DATAUS,9942349
215 DATAEV,12798688
220 DATAED ROBEY,9944849
225 DATAMARK,9941968
230 DATAJASPER,9942647
235 DATASCOT,9945980
240 DATARADIO SHACK,9941950
245 DATAGEORGE,9946299
250 DATATODD,9944588
255 DATARON,19166852093
260 DATAKENT,19176855482
265 DATABRYCE,19166852031
270 DATAFRED PLANTE,12777277
275 DATADAN,9941932
280 DATAGENE-TRAILER,9944044
285 DATAGENE-HOUSE,9946430
390 DATAEND,END' DON'T FORGET THIS AT THE END OF YOUR LIST!!
400 RESTORE:PRINT:PRINT"COMMAND";:L=20:GOSUB800:IN$=W$' GET INPU
T COMMAND.
410 IFIN$="LIST"THENCLS:GOTO490
420 IFIN$="H"ORIN$="HANG UP"THEN 610
425 IFIN$="NUMBER"ORIN$="N"THEN440
430 GOTO500
440 PRINT"NAME";:GOSUB800:IN$=W$:FL=1:GOTO500' INPUT NAME.  AND
SET FLAG (FL) SO THE NUMBER WILL BE DISPLAYED ONLY.
490 READNA$,NO$:IFNA$="END"THEN400ELSEPRINTNA$,;:GOTO490' LIST N
AMES
500 READNA$,NO$' GET A NAME AND NUMBER.
505 IFNA$="END"THENPRINT"NOT FOUND.":GOTO400' CHECK FOR END OF L
IST
510 IFNA$<>IN$THEN500' IF THIS ISN'T THE NAME, KEEP LOOKING
516 LE=LEN(NO$):Q1$=RIGHT$(NO$,4):Q2$=MID$(NO$,LE-6,3)+"-":IFLE=
8THENQ3$=LEFT$(NO$,1)+"-":GOTO620ELSEIFLE=10THENQ3$=LEFT$(NO$,3)
+"-":GOTO620ELSEIFLE=11THENQ3$=MID$(NO$,2,3)+"-":Q4$=LEFT$(NO$,1
)+"-":GOTO620ELSEGOTO620' THIS ROUTINE PUTS THE DASHES, "-"
517 ' IN THE PHONE NUMBER SO WE CAN READ IT AS WE ARE ACCUSTOMED
      TO. (X-XXX-XXX-XXXX RATHER THAN XXXXXXXXXXX AS IT IS
      STORED IN MERORY.)
520 FORX=1TOLEN(NO$)' SET UP LOOP TO LENGTH OF NUMBER.
530  NO=VAL(MID$(NO$,X,1))' GET NUMBER FROM NO$...
540  GOSUB 10' DIAL IT...
550 NEXTX' DO ALL NUMBERS.
560 GOTO400
600 FORLM=1TO10:IFINKEY$=""THENNEXT:RETURNELSE610:'DELAY LOOP
610 OUT255,4:FORLP=1TO300:NEXT:OUT255,0:GOTO400:'  HANG UP
620 Q5$=Q4$+Q3$+Q2$+Q1$:Q4$="":Q3$="":Q2$="":Q1$="":PRINTQ5$:IFF
L=1THENFL=0:GOTO400ELSE520' ADD TOGETHER THE STRINGS TO GET THE
NUMBER IN THE FORM X-XXX-XXX-XXXX
```

Program Listing 1. Telephone Dialer

```
800 HI=90:LO=32:E$=CHR$(13):B$=CHR$(8):C$=CHR$(24):PRINT"? ";
'  ** ENTER - L=MAX LENGTH IF INPUT     EXIT - W$=INPUT
810 PRINTCHR$(143);
820 FORM=1TO50:R$=INKEY$:IFR$=""THENNEXTELSEPRINTCHR$(8);:GOTO86
0
830 PRINTCHR$(8);
840 FORM=1TO20:R$=INKEY$:IFR$=""THENNEXTELSE860
850 GOTO810
860 IFR$=E$THENW$=A$:A$=A$+"U":W=ASC(A$):V=VAL(A$):A$="":PRINT:I
FW<58ANDW>48THENN=-1:RETURNELSEN=0:RETURN
870 IFR$=B$THENIFLEN(A$)>0THENA$=LEFT$(A$,LEN(A$)-1):GOTO900ELSE
810
875 IFR$=C$THENIFLEN(A$)>0THENFORM=1TOLEN(A$):PRINTB$;:NEXT:A$="
":GOTO810:ELSEGOTO810
880 IFLEN(A$)>=LTHEN810
885 IFASC(R$)>HIORASC(R$)<LOTHEN810
890 A$=A$+R$
900 PRINTR$;
910 GOTO810
```

Program Listing 2. Remarks for Flashing Cursor Routine

First impressions on this language.

MMSFORTH

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Pittsburgh, PA 15211

I was intrigued for some time by ads in *80 Microcomputing* for "MMSFORTH, The Professional Forth for TRS-80" (Miller Microcomputer Services). I read with interest claims that MMSFORTH was 10 to 20 times faster than Basic, that it was stack-oriented, that you could add your own commands, that it had a great editor, a variety of utilities, and that MMS would provide professional support. It seemed almost too good to be true.

I read some articles on Forth which further whetted my curiosity (A First Look at Forth, *80 Microcomputing*, July 1981). But even with program examples, the structure and syntax of Forth make it difficult for the newcomer to appreciate its many advantages over Basic.

Basic's Shortcomings

Basic was developed at Dartmouth College in the mid-60's to take advantage of the miracle of time-sharing. Suddenly computing power was available to anyone with a computer terminal and dimes for the phone bill. This caused a minor revolution; the power of the fabled mainframe computers was unleashed on nearly every college campus and business.

Basic fulfilled the need for an easily understood language of students and nonprofessional users. It was easily understood, could be written interactively, was fairly standardized (at least at first), and ran fast enough for a 110-baud terminal. Basic was derived from Fortran, originally designed to run batch programs by loading IBM cards into the mainframes of yesteryear. This may explain why Basic seems so stodgy today.

Why, in this day of CRT displays and floppy disks, do we still number all lines, edit by line rather than by screen, assign variables codes rather than names, call subroutines by line number instead of by name, struggle to get system-level access, contend with a *mysterious* disk system, and shift continually between Basic and DOS modes.

Yet Basic survives and probably will continue to thrive for some time; it is burned into the ROMs of every TRS-80 Model I and III, Color Computer, Pocket Computer, Apple, PET, and so on. But you can bypass the ROMs by loading a completely different language into your TRS-80 and enjoy programming from changed perspective. I used MMSFORTH; now my Model I TRS-80 has a new personality.

What follows is not a comprehensive product review but a subjective appraisal by a first-time user. Many functions of great interest are not covered. They are beyond the scope of an introductory article or I do not even know about them . . . yet.

MMSFORTH—First Impressions

MMSFORTH is available for the TRS-80 Models I and III on disk or cassette. The Model I and cassette require only 16K to run; the Model III requires 32K. Both disk systems need only one drive.

I ordered MMSFORTH by phone; it took about 10 days by first class mail. The System, Program and Utility disks arrived in an attractive three-ring binder with a 126-page instruction manual. The manual includes chapters on Forth operations, editing commands, input/output to disk and printer, data declarations, text handling, conditionals, branches and loops. Three programs, ranging from easy to difficult, provide detailed study notes. This is supplemented with instructions for using MMSFORTH system utilities and a system index.

The optional Utilities disk includes a Cross-Reference utility (XREF), Floating Point Math, and a Z80 Assembler.

For the rest of the documentation the user must sign two license agreement forms promising not to sell or give away MMSFORTH. Programs written for sale require the end user to have the MMSFORTH system owners or be under a separate licensing agreement. Personal use and backups are not restricted.

This seems to exclude MMSFORTH as the vehicle for commercial program development, unless the programs sell for far more than the System (or System and Utilities) cost. I hesitate to comment further without knowing what royalties are involved with the separate licensing agreement. Both disks have embedded serial numbers to deter the rip-off artist. I sent off the license forms and within a week had the rest of the documentation (a complete glossary of commands, various system addresses, a memory map and more material on the Assembler).

I also got an MMSFORTH Version 2.0 Modification Advisory, cures for bugs in their new system. The changes were easy to do using the editor. Newer versions do not require corrections.

The documentation is complete and well written, but it is not a textbook on Forth programming and requires careful reading for the first-time user. (MMS offers other books and magazine articles on Forth, as well as their own "MMSFORTH Newsletter.")

Starting Up

First, Backup all the original MMS disks; Format and Backup utilities are provided. Make several backups to minimize use of your MMSFORTH masters.

The Model I System disk comes ready to run on a 16K system, but you can configure the disk to your particular hardware.

Customize permits you to specify the directory block, the lowest unprotected block, memory size (to protect a printer driver in high memory), printer margin (set left margin of listings), the number of block buffers, disk startup speed (delay before reading and writing after motor is turned on), and number of disk drives. For each drive you may specify single or double density (on Model III), number of tracks and track access speed (allowing a mix of different densities and drives on line). Finally, there is an Auto command to perform a sequence of commands on booting the

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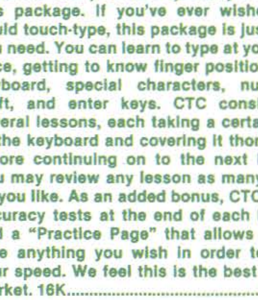

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Oh, one little thing. Before he died, the king placed a small dragon to watch over his treasure. That was 500 years ago. Now there is a large dragon.

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"All is written back to the disk and automatically configures the system whenever that disk is booted."

system. These parameters are written back to the disk and automatically configures the system whenever that disk is booted.

When you are more confident with the MMSFORTH system, you can further modify the system. You can select the maximum number of block buffers (from the default of two), editor-like functions while inputting from the keyboard (recall the last line typed, for example), a lowercase driver and a special printer driver for the MX-80.

Other utilities on the System disk allow copying a range of blocks to another location, finding any word in a range of blocks (with options to print and edit matches), and translating source code from Version 1.9 to the present 2.0 Version of MMSFORTH.

You can design the system to match your needs and hardware. Disk systems for Models I and III have cassette functions. With the Model III version it is possible to select single or double density disks. Model I and Model III users can exchange disks.

System Extensions

As delivered, MMSFORTH is limited to character (8 bit) and single-precision (16 bit) integer arithmetic. What this lacks in handiness and dynamic range is compensated for by speed. You can add the following from the System disk (depending on memory): double-precision integers, arrays, strings, random number, graphics, screen-print (works from any mode, and prints graphics on MX-80), cassette functions, clock, and a few other utilities. Loading them all takes an additional 8K when compiled onto a System disk using Customize.

Several demos and games on the Programs disk allow the novice to appreciate the power of Forth. Then there is a very impressive string-sorting demo, the game of Life (with a Doodling program to input patterns), another version of Life with an assembler core (about one generation per second), and Breakforth (a challenging version of Breakout with sound written entirely in MMSFORTH).

The optional Utilities disk has single and double precision floating point math derived largely from ROM routines to conserve memory. You can select radians or degrees modes for trigonometric functions, rectangular to polar coordinate conversions, complex numbers, imaginary numbers, and a superfast program to solve quadratic equations. A flexible cross-referencing program (XREF) will print (to printer or screen) all references to words you choose in the range of blocks specified. A complete Z80 Assembler rounds out the Utilities disk.

All the programs, extensions and utilities are written in MMSFORTH, not machine language. Customize them by editing the appropriate block of source code, or only those portions of a utility which apply to your program.

Blocks

The basic storage unit of the Forth language is a Block, made up of 1,024 characters (1K). Because a block fits perfectly on the TRS-80 screen, writing, editing and listing programs is a breeze. Just POP from block to block without scrolling. Three blocks fit nicely on 8 1/2 by 11 paper for listings. Each disk on the Model I contains 87 consecutive blocks numbered from 0 to 86. The Model III has 179 blocks per disk. Each block is comprised of four 256-byte sectors. Blocks are numbered consecutively from drive 0 to drive 3; the system behaves as if they were on one large drive. A relative addressing convention allows access to the Nth block on drive D in addition to absolute addressing.

Information is transferred in one-block units from disk to block buffers in RAM. Access to disk blocks is almost as easy as accessing RAM (either directly or under program control). With four drives you have the equivalent of more than 250K of virtual memory and more than 500K on the Model III. Files are created within blocks by calculating the offset from the first byte of the block to where a particular record is written within the block. Any format developed by the programmer can be used. A completely documented example of data file handling is included with a Checkbook program.

Words

Forth consists of a dictionary of words. Words can be up to 31 significant characters (without spaces); they act like named subroutines.

Words are defined as in this example:

```
: PAUSE 2000 0 DO LOOP ;
```

Here the word Pause is defined as an empty loop counting from 0 to 1999. The colon begins the definition and the semi-colon ends it. Once a word is defined it becomes part of the system until you turn the computer off or tell the system to forget it.

A word can be used to build other words:

```
: FLASH 15360 1024 191 FILL PAUSE 15360 1024
  BLANK PAUSE ;
```

Flash whites out the screen (fills from memory location 15360 for 1K with graphic code 191) executes Pause (waits), blanks out the screen (fills the screen with ASCII 32), and waits again. The Fill and Blank functions are executed at machine-code speed; a timing loop prevents Flash from just being a blink. Define your own lexicon of functions and build your own language. (Use Customize to make Flash part of your own MMSFORTH version ready every time you boot up.)

Execute Mode

The Execute mode performs direct functions and enters temporary word definitions.

In the execute mode, if you entered the definition above for Pause you could run it right away, although it would not do much by itself.

After defining Flash you could still run Pause. This is clearly far more useful than the Basic immediate mode, limited to one line. You can define words until RAM is filled. To purge the dictionary from time to time, define a dummy word (by convention, Task) before defining your test words. The MMSFORTH words Forget Task remove Task and all words defined more recently from the dictionary.

You may redefine words; only the most recent definition of the word is active when it is executed. The system prints a message warning you of the duplication. The user has total disk access in execute mode. You can copy blocks, list blocks, get an index of a range of blocks, and load programs written in the edit mode for execution.

Edit Mode

To save programs, write them with the editor and save the source code to disk. When the source code loads from disk it is interpreted as if you were in the execute mode.

The editor is easy to use; I wish I had its range of commands in a word processor. In edit mode you can: insert or delete characters or lines; lock into insert mode; truncate to end of line; copy lines; treat the block as a continuous page of 1024 characters (that is, characters wrap around when inserting or deleting); and use the arrow keys to position the cursor anywhere on the screen.

When you want to quit edit mode, update the block and Quit. Your edit is stored in a block buffer, but not on disk. To force changes to disk for all Updated blocks, use the rather colorful word Flush.

To reenter edit mode, type E and the current block appears on the screen. You can review all blocks on disk with a shift Clear Down-Arrow (or Up-Arrow to go backwards). This visual disk search proceeds at better than one block per second.

The editor also can be used on non-Forth disks as a Superzap-type program with direct visual access to any byte on a disk. This can be useful for inspection of text files.

Assembler

It is easy to include 8080 assembler code in a program using the MMSFORTH word

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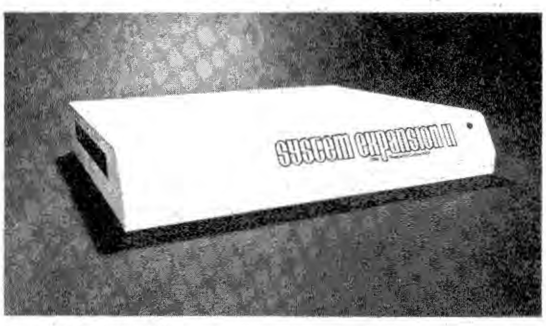

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*8" drive operation requires special cable. 8" double-density requires 3.55MHz CPU speed-up modification or LNW-80 4MHz computer.

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"Edit and customize [utilities] by calling the appropriate block."

Code to start the sequence and either Next, PSH, or PSH2 to return (passing nothing, HL, or DE and HL to the user stack). The 8080 assembler is incomplete, but MMSFORTH words—like CMOVE (which moves a series of bytes from one memory location to another) render some assembler functions unnecessary. Control structures and word order for the assembler follow Forth conventions.

Data Types

Handle data in MMSFORTH by character, single, double and triple-precision integer, single and double-precision floating point and complex numbers.

In an 8-bit computer all data is stored at memory locations as 8-bit bytes. Each byte can represent 256 different bit-patters or states. These 256 states represent ASCII characters, graphics codes, unsigned (positive) numbers from 0 to 255, or signed numbers from minus 128 to plus 127 depending on the context. Numbers larger than 255 are represented by groups of two or more bytes called words (not to be confused with Forth words).

You can consider a 16-bit FORTH variable as two characters, as two 8-bit numbers or as a 16-bit number. The choice depends on the particular memory operator used to access the variable. Quite unlike Basic which is limited to the 8-bit PEEK and POKE commands, you can store and read from 8-bit characters to 64-bit complex numbers as units.

Strings are a maximum of 255 bytes long (the first byte is the length); string functions are a superset of Disk Basic string functions. Unlike Microsoft Basic there are no string pointers, making it easier to directly access and change strings in memory. $XCH (exchange strings) is useful in sorting programs.

Algebraic	RPN
(A * B)	A B *
((A * B) – C)	A B * C –
(A * (B – C))	A B C – *
(A + (B / (C – D)))	A B C D – / +
(A * (B / (C * D) + E))	A B C D * / E + *

Table 1. Algebraic vs. RPN

(A*(B/(C*D) + E))

Entry	3rd	2nd	1st	TOS
A				A
B			A	B
C		A	B	C
D	A	B	C	D
*		A	B	(C*D)
/			A	(B/(C*D))
E		A	(B/(C*D))	E
+			A	((B/(C*D)) + E)
*				(A*((B/(C*D)) + E)

Table 2. Stack values during execution

Memory Functions

The MMSFORTH words to locate numbers or strings in memory are:

' <word>	"tick"—gets memory address of <word>, where <word> is the name of a variable, constant or system word
@	"fetch"—gets contents of memory location
!	"store"—stores to memory location

Use prefixes for memory, math, and stack operations applied to numbers other than single-precision integers. Speed and programming flexibility are gained.

Constants, variables and arrays can be defined for any data type, including strings. A constant's name evokes its value; a variable's name evokes its memory address making it easy to change its value with !. A variable's contents are fetched with @.

The Stack

You can write complex programs in Forth without one variable or constant. Forth uses a stack (a set of memory locations) to hold values and pass them from word to word. Passing numbers from one word to another is as simple as leaving the results of one calculation on the stack for the next word to pick up. The result is a great savings in coding.

The stack is just a pile of numbers in memory with a top-of-stack (TOS) pointer showing the top of the pile. As numbers are entered into the stack the pile gets deeper. The TOS pointer always indicates the most recently entered number. Numbers can only be entered and taken away from the TOS. This sort of stack is also called a Last-In First-Out (LIFO) stack.

All Forth functions involve the numbers in the TOS and the stack positions immediately below. When a function is executed, the stack pops up removing the parameters used in the function and making the stack less deep. The result is left in the TOS.

To use a LIFO stack with its semi-automatic management of number, you cannot use ordinary algebraic notation, with its parentheses and equals signs. Instead you use a more efficient notation called Reverse Polish Notation.

Reverse Polish Notation

RPN is a generalized way to evaluate formulas developed by J. Lukasewicz. RPN was named both in his honor and because it

"Words can be up to 31 significant characters... they act like named subroutines."

seems backwards to those used to algebraic notation.

Table 1 shows some comparisons between algebraic notation and RPN.

To interpret an algebraic expression in RPN, take the operands (ABCDE) from left to right until there is an intermediate result (close-parenthesis) where the appropriate operator (+ − * /) is inserted.

Each operand is pushed into the stack (further and further if there are no intermediate results) and then popped back up as operations are performed on the top two numbers in the stack. Looking at the last expression in Table 1, the stack would contain the values during its evaluation as shown in Table 2.

In MMSFORTH in execute mode, for A = 2 B = 20 C = 4 D = 5 E = 30, the entry for the above example would be:

2 20 4 5 * / 30 + . <ENTER> 62

Each time a value is pushed into the stack, the stack gets deeper, and each time an operation is performed the stack pops back up with the result of that operation. The result is that the original algebraic construct is faithfully executed, although the operators and operands are entered in an entirely different order. In addition to requiring fewer keystrokes than algebraic notation, RPN is relatively easier to implement in machine language. This saves memory and increases speed.

A variety of functions move around, duplicate and delete values on the stack to use the same numbers again and again if required. In Forth, all functions involving numbers and operations are noted in RPN. Thus 17 88 ESET is the same as SET (88,17) in Basic (set a graphics character). Forth's difference of order looks strange to the Basic programmer.

Programming

Writing a program in Forth is unlike writing a program in Basic. Programming in Forth consists of defining a hierarchy of words, up to the word that executes the programming. You add words of your own definition to the dictionary. Each word's definition must be in terms of system words or words defined earlier in the source code. The stack most often holds data to be manipulated by various words, although named constants and variables are also available. The main difficulty in learning Forth is visualizing and keeping track of values in the stack. The reward is faster execution using less RAM.

As a program takes form you feel more and more power at your fingertips. Each word includes within itself more of the previously defined words and all the functions they imply. Tying together the program at the highest level is often the easiest part.

Debugging and testing can be done by revising the source code with the editor and running the updated program or by trying routines in the execute mode using PCRT (display to both printer and CRT) or the screen-print utility to record what you have written. If an error occurs during execution, the EEDIT function places the cursor directly in the block where the error was sensed, ready to edit! Needless to say, this makes debugging far simpler than with Basic.

```
BLOCK 104:

( DYNAMIC STACK DISPLAY  PAGE 1 OF 3  1 AUG 81 N. SPIES )
( MAKES STACK VISIBLE AND PERMITS FUNCTIONS )
: TASK ;
: SETDISPLAY PAGE    ( SET DISPLAY, LABELS, PROMPTS )
 0  0 PTC ." STACK DISPLAY"
 1  5 PTC ." TOS"    2  5 PTC ." 2ND"     3  5 PTC ." 3RD"
 4  5 PTC ." 4TH"    5  5 PTC ." 5TH"     6  5 PTC ." 6TH"
 7  5 PTC ." 7TH"    8  5 PTC ." 8TH"     9  5 PTC ." 9TH"
 1 37 PTC ." N  NUMBER"  6 37 PTC ." R  ROT" 11 37 PTC ." -"
 2 37 PTC ." D  DROP "   7 37 PTC ." <"      12 37 PTC ." *"
 3 37 PTC ." U  DUP  "   8 37 PTC ." ="      13 37 PTC ." /"
 4 37 PTC ." S  SWAP "   9 37 PTC ." >" 14 37 PTC ." M  /MOD"
 5 37 PTC ." O  OVER "  10 37 PTC ." +" 15 37 PTC ." BREAK"
              ( CAUSES NEXT BLOCK TO BE LOADED )  -->


BLOCK 105:

( DYNAMIC STACK DISPLAY  PAGE 2 OF 3  1 AUG 81 N. SPIES )
: DSTACK 1 15 PTC  'S      DUP U. ? ."      " ( TOS , @ )
         2 15 PTC  'S  2 + DUP U. ? ."      " ( 2ND , @ )
         3 15 PTC  'S  4 + DUP U. ? ."      " (   ETC   )
         4 15 PTC  'S  6 + DUP U. ? ."      "
         5 15 PTC  'S  8 + DUP U. ? ."      "
         6 15 PTC  'S 10 + DUP U. ? ."      "
         7 15 PTC  'S 12 + DUP U. ? ."      "
         8 15 PTC  'S 14 + DUP U. ? ."      "
         9 15 PTC  'S 16 + DUP U. ? ."      " ; ( 9TH TOS )
: POS    0 40 PTC ;       : POS1 0 23 PTC ; ( CURSOR POSITION )
: EL    30 EMIT   ; ( CLEAR TO END OF LINE )
: ENUMBER  POS1 EL ." NUMBER - ENTER" #IN POS1 EL ; ( NUMBER )
: EDROP      DROP     POS  ." DROP"    EL ; ( DROP )
: EDUP       DUP      POS  ." DUP"     EL ; ( DUP )
: ESWAP      SWAP     POS  ." SWAP"    EL ; ( SWAP )   -->


BLOCK 106:

( DYNAMIC STACK DISPLAY  PAGE 3 OF 3  1 AUG 81 N. SPIES )
: EOVER  OVER POS  ." OVER"           EL ; ( OVER )
: EROT   ROT  POS  ." ROT"            EL ; ( ROTATE )
: E<     <    POS  ." LESS THAN"      EL ; ( LESS THAN )
: E=     =    POS  ." EQUALS"         EL ; ( EQUALS )
: E>     >    POS  ." GREATER THAN"   EL ; ( GREATER )
: E+     +    POS  ." ADD"            EL ; ( ADD )
: E-     -    POS  ." SUBTRACT"       EL ; ( SUBTRACT )
: E*     *    POS  ." MULTIPLY"       EL ; ( MULTIPLY )
: E/     /    POS  ." DIVIDE"         EL ; ( DIVIDE )
: E/M   /MOD  POS  ." /MOD"           EL ; ( /MOD )
: STACK SETDISPLAY  BEGIN  DSTACK   POS1 ( MAIN PROGRAM )
  ." SELECT BY KEY :"  KEY  ( WAIT FOR INPUT, BRANCH ON INPUT )
 ACASE NDUSOR<=>+-*/M" ENUMBER EDROP EDUP ESWAP EOVER  EROT
    E<   E=   E>   E+   E-   E*   E/   E/M  ( ROUTINES )
 CASEND 0 UNTIL ;    STACK  ( EXECUTE PROGRAM WHEN LOADED )
```

Program Listing 1. Stack Memory Locations

"RPN was named both in his honor and because it seems backwards to those used to algebraic notation."

Program Listings

Program Listings are easy to read because each word is defined by words defined earlier. Enter notes on program flows and the actions of words parenthetically.

I have included two MMSFORTH utility programs.

Program Listing 1 shows the top nine stack memory locations and their contents dynamically, with the option to perform a variety of stack functions. Do not enter the line numbers.

Program Listing 2 shows the keyboard scan memory locations and how their values change when you press various combinations of keys. This is useful for game planning and where branching is based on keys pressed.

Conclusion

MMSFORTH is a complete version of the Forth language (a superset of the Forth 79 Standard) and makes the TRS-80 a very powerful tool for developing programs. Build a powerful set of subroutines and build on your previous work with an ease unknown to Basic.

Be prepared to spend some time learning the system, getting familiar with the stack and RPN, and mastering the data types. Your effort will well spent.■

```
BLOCK 107:

( KEYBOARD SCAN DEMO - PAGE 1 OF 1   28 JUL 81    N. SPIES     )
: TASK ; ( DUMMY WORD TO FORGET PROGRAM AFTER EXECUTION )
  ( PROGRAM - FIRST PART PRINTS LABELS FOR MEMORY LOCATIONS )
: KEYS PAGE 0 25 PTC ." 14337:"  1 25 PTC ." 14338:"
            2 25 PTC ." 14340:"  3 25 PTC ." 14344:"
            4 25 PTC ." 14352:"  5 25 PTC ." 14368:"
            6 25 PTC ." 14400:"  7 25 PTC ." 14464:"
( START PROGRAM LOOP - FETCH/PRINT CHARACTER AT EACH MEM LOC )
 BEGIN  0 35 PTC 14337 C? ."     " 1 35 PTC 14338 C? ."     "
        2 35 PTC 14340 C? ."     " 3 35 PTC 14344 C? ."     "
        4 35 PTC 14352 C? ."     " 5 35 PTC 14368 C? ."     "
        6 35 PTC 14400 C? ."     " 7 35 PTC 14464 C? ."     "
 0 UNTIL ;  ( END FOREVER LOOP - BREAK TO EXIT PROGRAM )

KEYS    ( EXECUTE PROGRAM WHEN LOADED )

```

Program Listing 2. Keyboard Scan Memory Locations

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Everything you need to know to get started programming your own computer. These handy books of programs and about programming are jammed with easy-to-understand info for beginners. They are crammed with hundreds of tips, tricks, secrets, hints, shortcuts and techniques plus hundreds of tested ready-to-run programs. Our full line includes program books and programming aids for eight of the most popular computers for beginners: TRS-80 Color Computer. APPLE II. IBM Personal Computer. TRS-80, Sharp and Casio pocket computers, including the new TRS-80 PC-2 and Sharp PC-1500

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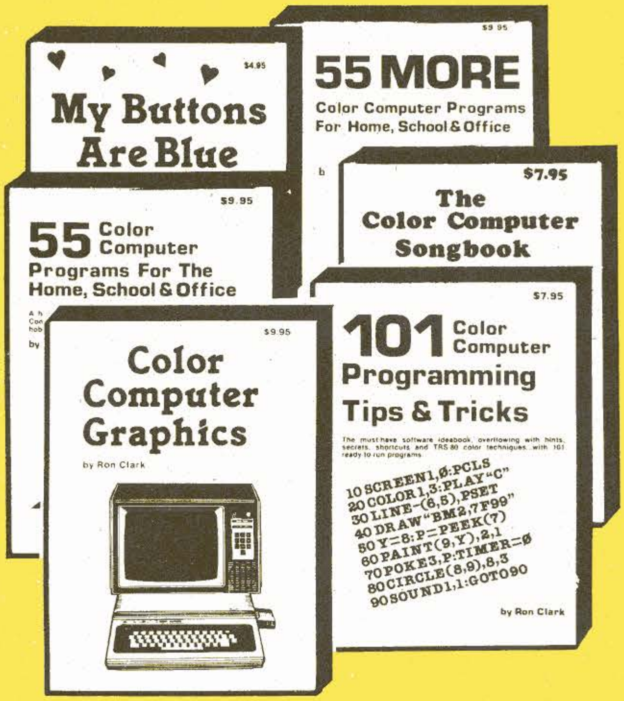

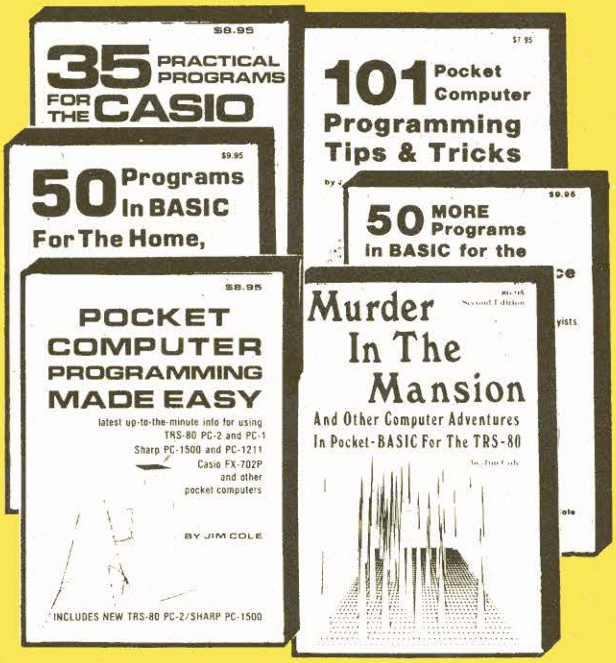

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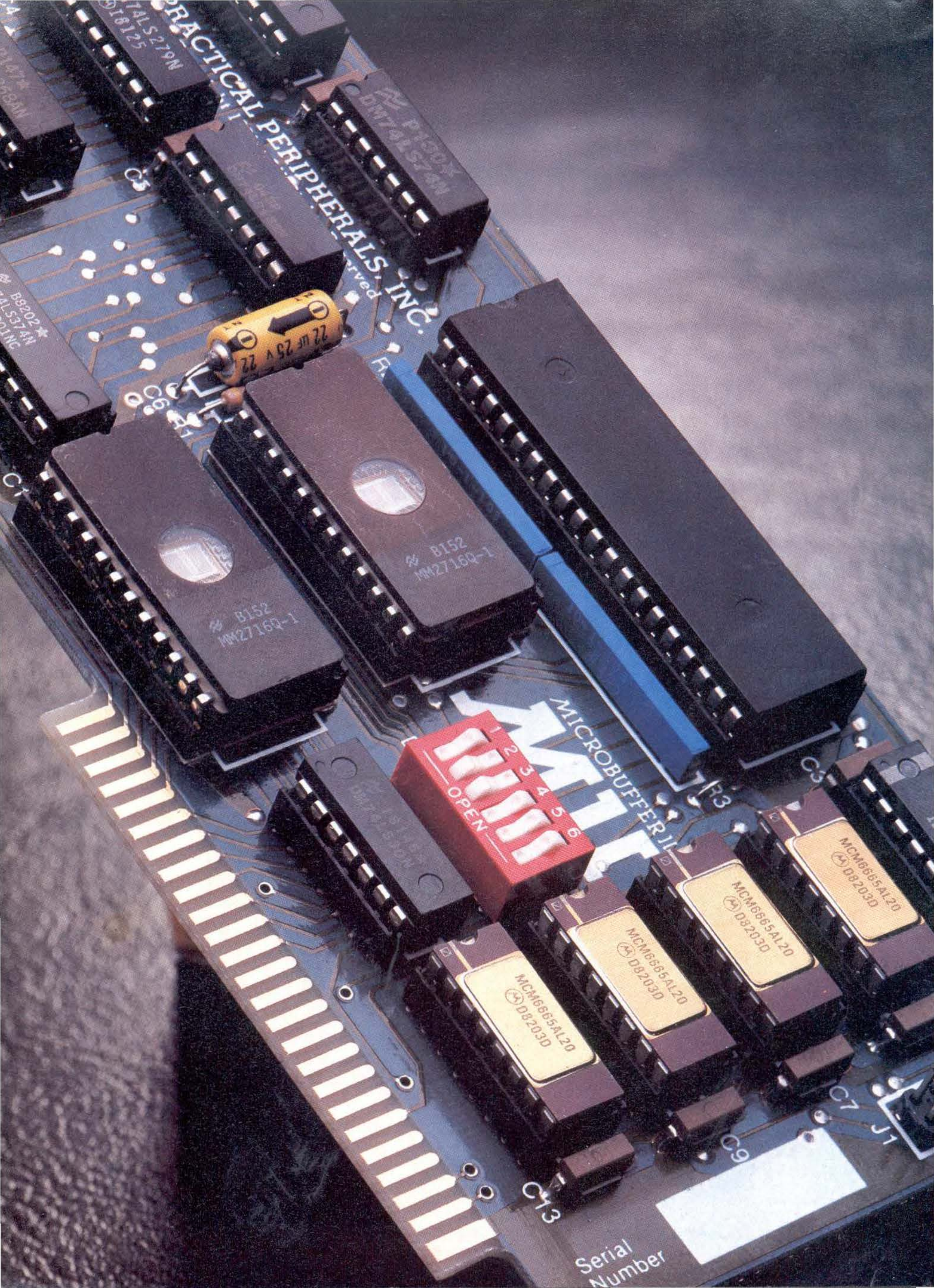
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Screen echo for your typed communications.

Half Duplexer

Richard C. McGarvey
221 Hirschfield Drive
Williamsville, NY 14221

When you buy a Modem and an RS-232C for your TRS-80 you undoubtedly plan on talking to other computers. You will get a machine language terminal program with the RS-232C to help you talk to other computers. When you power up you do not see what you type on your screen!

Networks normally echo transmissions back so you can see what you type. But if you want to talk to another TRS-80 directly, you will not know what you are typing.

The RS-232C manual suggests shorting pins 1 and 2 to get a CRT echo. Another suggestion is to go half duplex—a lot of work for a simple result. The new Modem I does not even have half duplex. If you short the pins you could disturb compatibility with CompuServe, The Source or any other network. Why bother with all that when a simple software fix produces a CRT echo?

My friend, John Storfer, and I went to work on the problem of RS-232C communication. After looking at the RS-232C manual John's first reaction was, "This should be easy in Basic!" John wrote a short Basic program, transmitted it to me and together we debugged it. It worked!

We wanted to write a game like Battleship to be played between operators on different computers at remote locations. The success of our routine was an essential step toward that goal.

How It Works

The program checks for parity, sets baud rate at 300 (note line 90 in Program Listing 1) and sets the number of stop bits and all the rest. It is written for two TRS-80's with their RS-232C's set identically. If you want to make changes in baud, word length or other parameters refer to the RS-232C manual. Beware of manual errors.

There are two clear screen options. To clear both screens, move the cursor to the top right corner of the screen and hit Clear. To clear only your CRT, just hit Clear. As long as the cursor is not in the home position it will clear only your screen.

Using the Basic Terminal

Enter the program, save and run it. The screen will clear and a message will print at the top of the screen. Call the other computer operator. Decide who will answer and who will originate. The other computer must have this program, or one like it, running.

Set the Modems to Answer and Originate. Replace the phone as required by your Modem. Hit any key to start. The cursor will appear in the upper right corner of the cleared screen. Whatever you type on your screen will appear on the other and vice versa.

You have full cursor control. To move the cursor without erasing text, hold the shift key while you use the arrow keys. The space bar alone will erase a character. The unshifted arrows erase lines. The right arrow has no effect at all without holding the shift key.

There appear to be incompatibilities between different TRS-80's. I have full cursor control while John has only partial cursor control. On the other hand, John can use hexadecimal numbers in his OUT, INP and AND statements while I have to use decimals in those areas.

The program was written using Radio Shack Modem I's and Radio Shack RS-232C's. The program might not work on a home brew or hybrid system. If you use this program with a network that echos your transmissions, you will get double characters and a displayed password. This echo can be eliminated by deleting line 250 in Listing 1. The program is designed for TRS-80 to TRS-80 over direct phone line.

The Programs

Refer to your RS-232C manual for further information. The RS-232C manual uses hex values and the listing uses decimal values; make a conversion table for easy reference. The back of your Level II guide will help.

Listing 1 is almost all remarks. Program Listing 2 is the actual program compacted to operating size. Short and sweet. ■

Richard McGarvey, a veteran police officer, started computing when the first TRS-80 hit the market.

Program Listing 1

```
10 CLS:PRINT"PUT PHONE IN MODEM (OR HANG UP AS REQUIRED) AND
SELECT 'ANSWER' OR 'ORIGINATE' - HIT ANY KEY TO START.
** NOTE ** HIT <CLEAR> TO CLEAR !YOUR! CRT.
20 I$=INKEY$:IFI$=""GOTO20
30 PRINTCHR$(14):' TURN ON CURSOR
40 OUT(232),A:' MASTER RESET - VALUE OF A UNIMPORTANT
50 A=INP(233):' GET SWITCH POSITIONS
60 B=A AND 248:' STRIP BAUD RATE BIT
70 A=B OR 5:' SET BREAK , RESET REQUEST TO SEND AND TERMINAL
READY
```

Program continues

The Key Box

Basic Level II or Disk Basic
Model I
16K RAM
Radio Shack Modem I
RS-232C
Expansion Interface

Program continued

```
80 OUT(234),A:' LOAD CONTROL REGISTER WITH ITEMS LINE 50
90 A=85:' SET BAUD RATE
100 OUT(233),A:' SET BAUD OF 300 TO RS-232C
110 P=INP(232) AND 32:' WAIT FOR MODEM TONE
120 IFP<>0THENGOTO110ELSECLS:' IF NO TONE TRY AGAIN/ IF TONE
CLEAR SCREEN
130 A=INP(234):' GET DATA RECIEVED BIT
140 B=A AND 128:' STRIP ALL BUT 7TH BIT
150 IF B=0 THEN 180:' IF NO INCOMMING DATA CHECK FOR OUTGOING
160 C=INP(235) AND 127:' GETS INCOMMING DATA STRIPS ONLY 7TH BIT

170 PRINTCHR$(C);:' PUT INCOMMING DATA ON SCREEN
180 H$=INKEY$:'SCAN KEYBOARD
190 IF H$=""THEN130
200 IF ASC(H$)=31 THEN PRINTCHR$(28);CHR$(31)
210 A=INP(234):'LOAD A WITH STATUS REGISTER
220 B=A AND 64:' STRIP ALL BUT 6TH BIT
230 IFB=0THEN210:' CHECK AGAIN TO SEE IF READY TO TRANSMIT
240 OUT(235),ASC(H$):'IF LAST DATA TRANSMITTED THEN TRANS-
MIT NEXT DATA
250 PRINTH$;:'ECHO TO CRT - THIS LINE CAN BE DELETED IF YOU USE
A TIMESHARING SYSTEM THAT ECHOS YOUR INPUT.
260 GOTO130:END
```

```
10 CLS:PRINT"PUT PHONE IN MODEM (OR HANG UP AS REQUIRED) AND HIT ANY KEY TO START."
20 I$ = INKEY$:IFI$ = ""THEN20ELSEPRINTCHR$(14):OUT(232),A:A = INP(233):B = AAND248:A = BOR5:OUT
(234),AA:A = 85:OUT(233),A
30 P = INP(232)AND32:IFP< >0THEN30ELSECLS
40 A = INP(234):B = AAND128:IFB = 0THEN50ELSEC = INP(235)AND127:PRINTCHR$(C);
50 H$ = INKEY$:IFH$ = ""THEN40ELSEIFASC(H$) = 31THENPRINTCHR$(28);CHR$(31)
60 A = INP(234):B = AAND64:IFB = 0THEN60ELSEOUT(235),ASC(H$):PRINTH$;:GOTO40
```

Program Listing 2

✓See List of Advertisers on page 386

Build a better bulletin board and the world will beat a path to your door.

Bob Rosen—A Colorful Success Story

by Kerry Leichtman
80 Micro *Staff*

When forming an opinion of the Color Computer's success, it would be best to consider the story of Bob Rosen. Bob's claim to Color Computer fame is his bulletin board—Connection-80 of Woodhaven, NY. It is the only bulletin board exclusively serving the Color Computer.

It didn't start out that way. Bob began his bulletin board in March of 1981 on a Model I providing information on TRS-80 Models I and III. Then he bought a Color Computer. Bob's fascination with the Color Computer is similar to that of many other computerists. He was amazed by its power, ease and versatility.

"I was kind of surprised there was no support from Radio Shack—very little, like the Pocket Computer," Bob told *80 Micro.* "I started putting things on about the Color Computer and all of a sudden I was getting a lot of out-of-state calls.

"It just mushroomed; it's amazing. I can be here any time of the day and get a call from just about anywhere. I've gotten calls from England, Israel, Alaska, Puerto Rico, Canada, Mexico, Switzerland and all over the United States.

Bob was a Radio Shack employee for seven and a half years. He enjoyed working for Radio Shack and, apparently, Radio Shack liked employing Bob. For four straight years, as a retail salesman, he was their area's number one man behind the counter in total sales. Is running a bulletin board a profitable business? To leave behind the salary a number one salesman earns should lead to some positive conclusions.

To be a good salesman you have to believe in what you are selling. Bob was one of the first, if not the very first, New Yorker to buy a Model I TRS-80. His sales receipt is dated August 5, 1977. At the time he was attending New York City Community College as an electrical technology major.

"I was always fascinated by computers. One thing led to another. I met a gentleman by the name of Tom Vande-Stouwe of B.T. Enterprises at a computer user's group. He started what I believe was the first bulletin board service in the New York City area. He told me all you need is a Model I, two disk drives, an auto-answer modem and a software package. So I bought the package and set up my Model I. At the time it was mainly a hobby."

The package is called Message 80, written by Richard Taylor of Programs Unlimited with enhancements by Vande-Stouwe. It consists of a 1K machine-language driver program and a 15K Basic program. The bare-bones system requires a 32K micro and two disk drives.

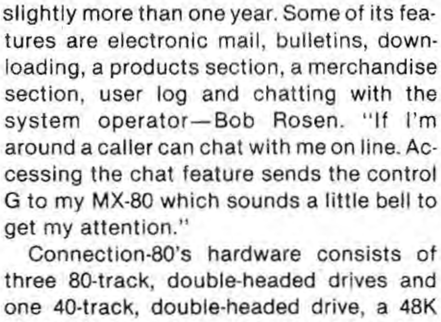
But let's back up a little more, to where Bob Rosen and the wonderful world of electronics collide. "It's all because of Roger Maris and Mickey Mantle," Bob confessed. (For the younger hobbyists: Maris and Mantle were not Radio Shack salesmen. They were the driving forces behind an almost unstoppable New York Yankee baseball team in the 1960s.)

"I was a sports fan. I was always a Yankee fan. I got intrigued by listening to the AM radio at night trying to pick up Yankee games when they were on the road. I got interested in that and started reading articles about short-wave listening. I got into short-wave DXing, I got my amateur radio license (K82HKO), and that got me into electronics."

Connection-80 has been in existence slightly more than one year. Some of its features are electronic mail, bulletins, downloading, a products section, a merchandise section, user log and chatting with the system operator—Bob Rosen. "If I'm around a caller can chat with me on line. Accessing the chat feature sends the control G to my MX-80 which sounds a little bell to get my attention."

Connection-80's hardware consists of three 80-track, double-headed drives and one 40-track, double-headed drive, a 48K Model III, an auto-answer modem and an MX-80 printer.

The bulletin board is accessed more for electronic mail than anything else. "What happens is a lot of people put on fixes, hints and general information that they have found out for themselves about the Color Computer that you can't get anywhere else. People go on the board asking for a solution to a problem, or something about a software bug.



Bob Rosen—one of the first TRS-80 purchasers with the Connection-80 hardware.

"When Bob Rosen dreams he sees a multi-user bulletin board with a toll-free 800 number, no errors and no disk or memory crashes."

"What we have here is a central point now where people can call in and reasonably get an answer, instead of calling Radio Shack's 800 number in Texas and getting, 'We don't know.'"

For users accessing Connection-80 for help, there is one aspect to Bob's service that might remind them of Radio Shack—a busy signal. At present Connection-80 can only handle one caller at a time. "If I get 40 callers a day, I might have had 200 attempts to get on." Corrective measures are in the works. "I have plans to go multi-user in the near future. Maybe I'll purchase a Model 16.

"I'm also looking at getting a 10-megabyte hard-disk system with DOSPLUS from MTI. The only reason I didn't have one before is that there wasn't any software for the Model III. Now there is."

Even with his one-caller-at-a-time limitation, Connection-80 is enjoying financial success and gaining itself a reputation as a Color Computer resource. "Color Computer gurus, such as Alfredo Santos, Cal Rasmussen, Syd Hahn, Wayne Day and Jorge Mir started calling Connection-80 with all kinds of Color Computer secrets not yet released by Radio Shack. For example, to speed up the CPU, all you have to type is a POKE 65495,0. Or to get 6K more memory, POKE 25,6:POKE 27,6:POKE 29,6:POKE 31,6."

To access Bob Rosen and Connection-80 users need a TRS-80, a full-duplex, 300-baud modem and the phone number: (212) 441-3755. There is no charge, other than what Ma Bell requires. To download from the system users need a ROM pack called ColorCom/E for $49.95, available either from Bob or Eigen Systems.

"If someone calls me from my same area, with the same message rate, they could be on 10 hours and it would only cost them eight cents. That's it."

Bob, through his company Spectrum Projects, runs the bulletin board full time. He makes his living by mail order selling many of the products listed on the board's merchandising section and by selling advertising. Bob gets calls on a daily basis from businesses requesting space on Connection-80. With all this instantaneous success attributable to the Color Computer's popularity, Bob finds Radio Shack's slow-to-support attitude puzzling.

"It's still amazing to me that after all this Radio Shack still does not do anything. They say it's in the works. I can believe some of that, but I can remember waiting eight months to get Level II chips when I first got my Model I."

Connection-80's future looks bright. When Bob Rosen dreams he sees a multi-user bulletin board with a toll-free 800 number, no errors and no disk or memory crashes. And everyone who calls up will be able to access it.■

✓ *See List of Advertisers on page 386*

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The abundance of data base programs available demonstrates the demand for this type of program. Most are specialized and, due to their complexity, are not easily adapted to individual needs.

Preliminary Thoughts

A program built of modules controlled by a menu is the easiest to understand and modify. Following this direction I will develop a data base program section by section, and explain the operation of each. It will be a skeleton which you can flesh out to fit your own needs.

Two key elements in the program's construction are the menu and the chaining insertion sort. Since I want to add, edit or delete records at will, the file should not be completely re-sorted after each operation. Chained file sequencing fills the bill. The menu is necessary to structure the program logically and to enable program changes and enhancements.

In its initial form, the program holds up to 50 records of one to five fields. You can change these limits to suit yourself and the size of your computer's memory. Memory is critical as the file is retained in memory for all operations.

The program will contain two print formats. The first will print the records as contained in the file without alteration or sequencing. This is a work print. The second print format is sorted, permitting you to run the listing in sequence by any selected field. This would be your normal output print. The resultant file is set up so you can use it for input to other programs for further data manipulation.

For this or any other program, you must specify what the output is to be. In this case I have defined it to be a small data base which I can list in sequence by any field within the file record. It should also be able to serve as an input file for additional programs. After you have made these decisions you can develop the functions required for support.

Add—Add new records to the file
File P—Print the raw file without modification
Print—Print the file in sequenced format
Edit—Provide corrections to individual records
Delete—Delete selected records
Purge—Remove unwanted records from the file
Select—Select groups of records for printing
Save-T—Save file to cassette tape
Load-T—Load file from cassette tape
Look—Scan records on the screen
Save-D—Save file to disk
Load-D—Load file from disk
New—Start new file
Restore—Restore file after a Select function
Stop—End the program

Table 1

Menu

To assist in the structure and to help in future program enhancements or maintenance, a menu will reference each function. Program Listing 1 shows the menu and the functions. Table 1 lists the definitions of these menu functions.

I have made no attempt in these listings to save memory by compressing spaces or combining lines. Such programs are difficult to analyze; one of the major objectives here is to demonstrate methods, so I have left the program in open format. The initial program (in this article) is about 2500 bytes long. It will approximately double in size before I finish. You may compress the spaces as you enter the various listings and save about 300 bytes. If you want to combine statements onto a single line, watch GOTO and If statements so you do not change the program's logic.

Enter Listing 1 and then we can start adding the individual subroutines that do the work. Notice that the menu-referenced subroutines begin each thousand lines. (It is better to have too much room than not enough!) Note also that each of the referenced lines now contains Print "Not yet implemented" and a Return. This avoids

Reader Service for facing Page ✓20→

"This avoids crashing the program by selecting a subroutine not yet written."

```
10 'DBI/L01
500 PRINT "MENU"
510 PRINT "ADD      -<1>          PURGE      -<6>          SAVE-D     -
<11>"
520 PRINT "FILE P   -<2>          SELECT     -<7>          LOAD-D     -
<12>"
530 PRINT "PRINT    -<3>          SAVE-T     -<8>          NEW        -
<13>"
540 PRINT "EDIT     -<4>          LOAD-T     -<9>          RESTORE    -
<14>"
550 PRINT "DELETE   -<5>          LOOK       -<10>         STOP       -
<15>"
560 INPUT ME
570 ON ME GOSUB 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000,9
000, 10000, 11000, 12000, 13000, 14000
580  IF ME = 15 THEN GOTO 20000 ELSE GOTO 500
1000 PRINT"NOT IMPLEMENTED": RETURN
2000 PRINT"NOT IMPLEMENTED": RETURN
3000 PRINT"NOT IMPLEMENTED": RETURN
4000 PRINT"NOT IMPLEMENTED": RETURN
5000 PRINT"NOT IMPLEMENTED": RETURN
6000 PRINT"NOT IMPLEMENTED": RETURN
7000 PRINT"NOT IMPLEMENTED": RETURN
8000 PRINT"NOT IMPLEMENTED": RETURN
9000 PRINT"NOT IMPLEMENTED": RETURN
10000 PRINT"NOT IMPLEMENTED": RETURN
11000 PRINT"NOT IMPLEMENTED": RETURN
12000 PRINT"NOT IMPLEMENTED": RETURN
13000 PRINT"NOT IMPLEMENTED": RETURN
14000 PRINT"NOT IMPLEMENTED": RETURN
20000 END
```

Program Listing 1

crashing the program by accidentally selecting a subroutine not yet written. As I develop each subroutine, these lines will be overwritten and the subroutine will operate normally.

Line 20000 provides the program end. On menu selection 15, Stop, the program will jump to 20000 for an orderly end.

Housekeeping

To begin any program, you should include certain housekeeping items to ensure your program will work as planned. Enter the lines shown in Program Listing 2.

Line 10 is a Remark statement identifying the program and the version number. I use an identification line within a program because there may be as many as a dozen different versions of a given program on my files at any given time. Using a version number allows me to use a common program name to show relationship, but still permits selection of a specific program.

To allow string space, we clear 2000 bytes in line 100. Later you may need to expand this figure; watch your memory size as you do so. Line 110 defines variables to save time entering the program, and to save

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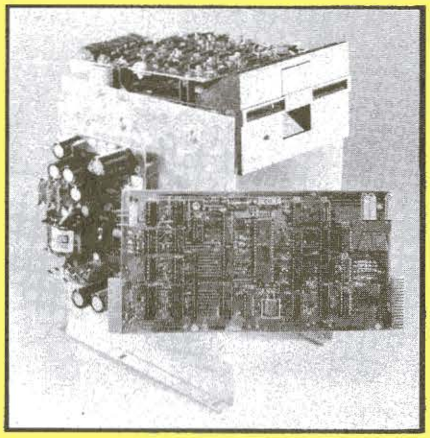

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"Bugs will usually be limited to the routine last entered. . ."

memory space and running time. Our main data storage array (DA) is a string array; defining D as a string saves typing the dollar sign each time we reference it. I have defined all other variables as integers to save memory space and to speed up the program.

The final housekeeping item is dimensioning the arrays. I have dimensioned the main data array (DA) to 50 records of five fields each. I have also dimensioned the chaining array (KY) to 50 by 5 since it must provide a position to correspond with each position in the data array. These values are flexible. For example, you can set it up as 100 records of 10 fields each (if you have sufficient memory). You may change the number of records allowed without disturbing the program's operation. Be certain the KY array dimensions agree with any changes you make to the DA array. If you change the number of fields, you will have to change some of the statements in the remainder of the program to agree.

Now run the program. It will do little except print the menu. If you make a selection, it will print the "Not yet implemented" comment and return you to the menu.

This illustrates one of the valuable features of modular programming—the ability to run and debug each routine as you program it. Bugs will usually be limited to the routine last entered, and this limits the area you must examine. Do not fall into the trap, however, of insisting that that bug has to be in the routine you are working on. For example, if you inadvertently delete a record, the print routine will not print it. Use this concept with care and you will find it a great assist in debugging.

New

Since we are just getting started, the most logical subroutine to enter first is New. Designed to initiate a new file, we will use this as we input test data and check the other routines. New has two functions: one is to clear the arrays to make certain there is no garbage left in them to interfere with the new data input; the second allows you to name your file and tell the program the number of fields per record that will be used. New is a very small subroutine now, but it will grow as we enhance the program.

Type in New from Program Listing 3.

Lines 13010–13060 clear the data array (set all positions to null) and set the chain array to all zeros. The record counter (RC) is set to one in line 13070, as the only record in file at this time is the dummy record showing where the first record will be positioned. Lines 13110 and 13120 input the title (TI$) and field count (FC). With this completed, line 13130 returns the program to the menu.

Add

The record input routine includes multiple fields. Enter Program Listing 4 and we can review the actions taking place.

Using the new record count (NC) obtained from the prompt in line 1000, a For...Next loop inputs the new records and stores them at the end of the data array (DA). This input loop prints rather primitive prompts (an early enhancement will fix that) to give the operator some idea of where he is in the input cycle. Lines 1010–1070 contain this loop.

Lines 1090–1210 contain the insert sort that will chain each field. It is a triple-nested loop. The first (I) loop cycles each new record against the current sorted file records. The second (J) loop cycles the sort across the fields so that each is sorted in turn. The final (K) loop cycles the new record against each of the current records until its location in the sort is found. The K loop will perform this action for each field in the record.

Enter the statements in lines 1140 and 1150 with care because they are the heart of the sort; any error here can give real problems.

On completion of the sort, the program returns to the menu via the Return in line 1220. The new records have been sorted into the file and are awaiting printing. Enter some records to see that there are no er-

```
10 'DBI/L02
100 CLEAR 1000
110 DEFSTRD: DEFINT A-C,E-Z
120 DIM DA(50,5), KY(50,5)
```

Program Listing 2

```
10 'DBI/L03
13000 PRINT "PREPARE FOR NEW FILE"
13010 FOR I = 0 TO 50
13020 FOR J = 0 TO 5
13030 DA(I,J) = ""
13040 KY(I,J) = 0
13050 NEXT J
13060 NEXT I
13070 RC = 1
13110 INPUT "ENTER FILE TITLE.";TI$
13120 INPUT "HOW MANY FIELDS PER RECORD? 1-5";FC
13130 RETURN
```

Program Listing 3

```
10 'DBI/L04
1000 INPUT"HOW MANY NEW RECORDS TO INPUT?";NC
1010 FOR I = RC+1 TO RC+NC
1020 PRINT "ENTER RECORD # ";I
1030 FOR J = 1 TO FC
1040 PRINT "FIELD # ";J
1050 INPUT DA(I,J)
1060 NEXT J
1070 NEXT I
1090 FOR I = RC+1 TO RC+NC
1100 FOR J = 1 TO FC
1110 GO = 1
1120 FM = 1
1130 FOR K = 1 TO RC
1140 IF DA(I,J) =< DA(GO,J) THEN KY(I,J) = GO:
      KY(FM,J) = I:
      K = RC:
      GOTO 1180
1150 IF KY(GO,J) = 0 THEN KY(I,J) = 0:
      KY(GO,J) = I:
      K = RC:
      GOTO 1180
1160 FM = GO
1170 GO = KY(GO,J)
1180 NEXT K
1190 NEXT J
1200 RC = RC + 1
1210 NEXT I
1220 RETURN
```

Program Listing 4

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"Any change of data in a field is likely to change its sequence in the file."

rors. Without a print routine, however, it is difficult to ensure proper operation.

Print

The print routine (also somewhat primitive) is found at line 3000 of Program Listing 5. When you run the program and select the print option you are asked which field the listing should follow. On response to this, the position count (PC) will direct the print routine to select the proper chain listing. Once the title is printed in line 3040, the "go to" (GO) variable is set to a one; in line 3100 it looks at the "go to" chain in the dummy record to find where the first sorted record is located. The PC within the parenthesis will select the proper field.

This routine uses nested loops. The I loop will cycle through each of the records from two (we do not want to print the dummy record) to the end of the file. The J loop prints each field in each record before dropping back to the I loop for the next record. After printing the last record, the Return in line 3240 sends execution back to the menu.

Each line will contain the following information in order: a sequential line number, the position of the record in the storage array, and the data fields themselves. Since we are using very simple formatting via the comma, the print will be rather messy—another early enhancement required!

We have now implemented three subroutines: New, Add, and Print. Play with the program to see how it works. Try entering different combinations of data and number of fields. Build the file by entering two or three records; then go back to enter a few more. Remember, if you are going to change the file, go back to New to clear everything. When you are satisfied that all is working properly, move on to saving and reloading data using tape.

Save-T

The tape save routine as shown in Program Listing 6 is straightforward: Once the heading data is saved, the routine cycles through the file arrays saving chaining keys and data records. Since the chaining information will be saved in the same PRINT#-1 statement as the data, limit the character count in the data record to a maximum of 200.

Line 8000 supplies a prompt reminding the operator to prepare the cassette and press Enter to start the save. The first record saved (line 8010) consists of the file title, the record count and the field count. These will be required next time the file is read in.

The For...Next loop in lines 8020–8040 saves the body of the text. Each cycle of the loop transfers one data record along with its chaining keys to the cassette. Line 8050 returns the program to the menu when the subroutine completes the save.

Load-T

The tape load routine in Program Listing 7 is almost the same as the save routine (except for the INPUT#-1 statement rather than the PRINT#-1 statement). Again, a prompt in line 9000 tells the operator to prepare the cassette unit for input and to press Enter when ready. Line 9010 reads into the program the file title, record count and field count. The loop in lines 9020–9040 reads in the individual records and chaining information. On completion, the program returns to the menu. The file is resident in memory awaiting your application.

Edit

One final subroutine completes the basic program. Since we are all likely to make mistakes on data entry, or find that we must modify our data, we will have to make provision to edit the data file.

To do this, a listing of the data file is required, showing the record numbers and the fields to be edited. The program requests the record and field number to be edited, prints the current file data and waits for your corrected input. When editing is complete, entering minus one will return the program to the menu.

Editing a chained file poses a particular problem: Any change of data in a field is likely to change its sequence in the file. To accommodate this, it would be necessary to remove the record from its current position in the chain, close up the chain to skip around the record and find its new location in file. This, as you can readily visualize, is a rather complex problem and requires some fancy programming. We are going to do it the easy way for now.

When you select a record for editing, the Edit subroutine copies it and any changes to the end of the file where it will be treated as a totally new record. When editing is complete, these edited records will be sorted into the

```
10 'DBI/L05
3000 PRINT "WHICH FIELD SHOULD THE PRINT FOLLOW? FIELD 1 - ";FC
3020 INPUT PC
3040 LPRINT TI$: LPRINT""
3060 GO = 1
3080 FOR I = 2 TO RC
3100 GO = KY(GO,PC)
3110 IF DA(GO,0) = "D" THEN GOTO 3220
3120 LPRINT I-1, GO,
3140 FOR J = 1 TO FC
3160 LPRINT DA(GO,J),
3180 NEXT J
3200 LPRINT
3220 NEXT I
3240 RETURN
```

Program Listing 5

```
10 'DBI/L06
8000 INPUT "MOUNT TAPE AND SET FOR RECORD - <ENTER>";X$
8010 PRINT#-1,TI$,RC,FC
8020 FOR I = 0 TO RC
8030 PRINT#-1, KY(I,0), KY(I,1), KY(I,2), KY(I,3), KY(I,4), KY(I
,5), DA(I,0), DA(I,1), DA(I,2), DA(I,3), DA(I,4), DA(I,5)
8040 NEXT I
8050 RETURN
```

Program Listing 6

```
10 'DBI/L07
9000 INPUT "MOUNT TAPE AND SET FOR PLAY - <ENTER>";X$
9010 INPUT#-1,TI$,RC,FC
9020 FOR I = 0 TO RC
9030 INPUT#-1, KY(I,0), KY(I,1), KY(I,2), KY(I,3), KY(I,4), KY(I
,5), DA(I,0), DA(I,1), DA(I,2), DA(I,3), DA(I,4), DA(I,5)
9040 NEXT I
9050 RETURN
```

Program Listing 7

". . . keep a copy of the unmodified program for addition of the remaining functions."

file just as any new record would be. In fact, the program jumps to the Add sort routine to do this. The initial location of the record that was edited will remain exactly as it was with one exception: A D will be inserted into the field zero position of the DA array. Before the program is complete, we will find uses for these zero positions.

Looking at the Edit subroutine in Program Listing 8, you will note that the new record counter (NC) is set to zero. The new counter will keep track of how many records are changed and must be sorted into file again.

Line 4020 prompts the operator for the record number to be edited. Entry of minus one at this point indicates that you are finished editing and the program will go to line 1090 to sort the edited records into file. Entry of a record number does three things immediately. First, the new record counter (NC) is incremented by one; second, the specified record is copied to the end of the file; and third, the current record is marked deleted.

The program then requests the particular field to be changed (line 4060). On input of the selected field, the program prints the current field data contents and awaits keyboard input of the new entry. This input is written to the "new" record at the end of the file. The program then returns to the field prompt to allow selection of another field within the same record. If there are none, entry of minus one returns the program to the "which record" prompt, where you can select another record for editing or enter a minus one to complete the editing function.

This method has a drawback: If you do much editing, the file will grow as it is filled with deleted records. We will have to provide a way to rid the file of these unwanted records. This is a function of the Purge subroutine, which we will look at next time.

Tune in Next Time

You now have a rudimentary but usable data base program. You can enter data, save and retrieve it, edit it and provide a listing. Looking at our original specifications, many functions have not yet been implemented, but for the moment we can work around them.

Until next time try different exercises with the program, making your own tentative modifications to fit your needs. However, be certain to keep a copy of the unmodified program for addition of the remaining functions. Also keep notes on the glitches you may encounter; some of them can be frustrating as well as a lot of fun to overcome. Consider some humanizing features, making it easier for the operator to use the program. ■

```
10 'DBI/L08
4000 NC = 0
4020 INPUT "EDIT WHICH RECORD?";RN
4040 IF RN = -1 THEN GOTO 1090
4042 NC = NC + 1
4044 FOR I = 1 TO FC
4046 DA(RC+NC,I) = DA(RN,I)
4048 NEXT I
4050 DA(RN,0) = "D"
4060 INPUT "WHICH FIELD?";CN
4080 IF CN = -1 THEN GOTO 4020
4100 PRINT DA(RN,CN)
4120 INPUT DA(RC+NC,CN)
4170 GOTO 4060
```

Program Listing 8

✓See List of Advertisers on page 386

Back to April '80 80 Micro.

Print That Index

Carl Everett
6835 Bridge Lk. Rd.
Clarkston, MI 48016

After purchasing my printer, I found I needed a cassette-based address file. I found William Klungle's "Magazine Index" program (*80 Micro*, April 1980) convenient to modify.

The file holds 175 addresses and the printer routine is spaced to print equally on 15/16 inch labels. It creates, corrects, stores, lists, and searches just as the original program.

The essential program change, other than minor data handling routines and titles, is the printer routine in lines 700–800. (See the Program Listing.) This routine allows you to print only selected names, selected cities, or start with any file number you choose. Selecting a file number allows you to interrupt the printing and start again without reprinting the complete list.■

Carl Everett is an electrical supervisor at Pontiac Motor Division. He uses industrial computer systems at work and a family computer at home.

The Key Box

Basic Level II
Model I and III
16K RAM
Any printer

```
1 REM: ADDRESS FILE PROGRAM - MODIFIED MAGAZINE INDEX PROGRAM
2 REM: MAGAZINE INDEX PROGRAM BY WILLIAM KLUNGLE
3 REM: 80 MICROCOMPUTING - APRIL 1980
4 REM: MODIFIED BY CARL EVERETT, 6835 BRIDGE LK. RD., CLARKSTON,
 MICHIGAN 48016
5 CLEAR11000:DIMR$(175):X$="                    ":N$="ADDRESS"
10 CLS:PRINTN$;" FILE INDEX":PRINT:PRINT"1 = KEYBOARD ENTRY":PRI
NT"2 = READ DATA TAPE":PRINT"3 = CORRECTIONS":PRINT"4 = PRINT LI
ST":PRINT"5 = NAME SEARCH":PRINT"6 = CITY SEARCH":PRINT"7 = PRIN
TER":PRINT"8 = STORE DATA ON TAPE":PRINT"9 = EXIT"
15 ONERRORGOTO10:PRINT:E=1:INPUT"SECTION";S:ONSGOTO100,200,300,4
00,500,600,700,800,900:GOTO10
100 IFLEN(R$(E))>1THEN125ELSECLS:PRINT"NEW ENTRY RECORD #";E;"
  (0=RETURN) ":D$=" ":T$=" ":S$=" "
105 P=3:GOSUB1000:INPUT"NAME     (20 MAX):    ";D$:IFD$="0"THEN10
ELSEIFD$="DELETE"THEN305ELSEPRINTTAB(22);CHR$(27);" ";D$:IFLEN(D
$)>20THENGOSUB1100:GOTO105
110 P=4:GOSUB1000:INPUT"ADDRESS (20 MAX):    ";T$:PRINTTAB(22);C
HR$(27);" ";T$:IFLEN(T$)>20THENGOSUB1100:GOTO110
115 P=5:GOSUB1000:INPUT"CITY     (20 MAX):    ";S$:PRINTTAB(22);C
HR$(27);" ";S$:IFLEN(S$)>20THENGOSUB1100:GOTO115
120 P=7:GOSUB1000:INPUT"MORE ENTRIES  (Y-N-E)";Y$:IFY$=""THEN120
ELSEIFY$="E"THEN105ELSED$=D$+X$:T$=T$+X$:S$=S$+X$:R$(E)=LEFT$(D$
,20)+LEFT$(T$,20)+LEFT$(S$,20):IFY$="N"THEN10
125 E=E+1:IFE>175THEN10ELSE100
200 CLS:PRINT"READ DATA TAPE":PRINT:PRINT"SET TAPE TO READ ('PLA
Y') DATA.":INPUT"ENTER WHEN READY.....(0=RETURN) ";Y$:IFY$="0"TH
EN10ELSEINPUT#-1,N$:E=1:PRINT@386,N$;" DATA READ IN PROGRESS."
205 PRINT@530,"READING FILES ";E;"-"E+3;:INPUT#-1,R$(E),R$(E+1),
R$(E+2),R$(E+3):IFR$(E+1)=""ANDR$(E+2)=""ANDR$(E+3)=""THEN10ELSE
E=E+4:IFE>175THEN10ELSE205
300 CLS:PRINTN$;" CORRECTIONS    (COMMANDS: 0=RETURN, DELETE)":PR
INT:INPUT"CORRECT FILE #";E:IFE=0OR(E)>300THEN10ELSEIFLEN(R$(E))
<1THEN300ELSED$=MID$(R$(E),1,20):T$=MID$(R$(E),21,20):S$=MID$(R$
(E),41,20):GOSUB1200:GOTO105
305 IFS<>3THEN10ELSER$(E)="":GOTO300
400 E=1:L=0:GOSUB490
405 IFR$(E)=""THEN410ELSEGOSUB480
410 E=E+1:IFE<176ANDL<5THEN405ELSEPRINT@990,"C=CONTINUE, F=FINIS
H";:INPUTY$:IFY$="F"ORE>175THEN10ELSEL=0:GOSUB490:GOTO405
480 PRINT:PRINTE;TAB(9);MID$(R$(E),1,20):PRINTTAB(9);MID$(R$(E),
21,20):PRINTTAB(9);MID$(R$(E),41,20):L=L+1:RETURN
490 CLS:PRINT"REC #":L=2:RETURN
500 CLS:PRINTN$" SEARCH BY NAME    (0=RETURN - S=STOP SEARCH)":PR
INT:B=1:IN=20:E=1:INPUT" ENTER NAME :";S$:IFS$="0"THEN10ELSEGOSU
B490
505 Y$=INKEY$:IFY$="S"THENL=3ELSEZ$=MID$(R$(E),B,IN):GOSUB1300:I
FI=0THEN510ELSEGOSUB480
510 E=E+1:IFE<176ANDL<5THEN505ELSEPRINT@990,"C=CONTINUE, F=FINIS
H";:INPUTY$:IFE>175ORY$="F"THEN10ELSEGOSUB490:GOTO505
600 CLS:PRINT"SEARCH ";N$;"FILE FOR CITIES     (0=RETURN - S=STOP
 SEARCH)":PRINT:B=41:IN=20:E=1:INPUT"ENTER CITY:";S$:IFS$="0"THE
N10ELSEGOSUB490:GOTO505
700 CLS:INPUT" L=COMPLETE LIST, N=SELECTED NAMES, C=CITIES";A$:I
FA$=""THEN10ELSEIFA$="L"THEN768ELSEIFA$="N"THEN710ELSEIFA$="C"TH
EN740
710 B=1:IN=20:E=1:INPUT" ENTER NAME :";S$:IFS$="0"THEN10ELSEIFLE
N(S$)<1ORLEN(S$)>20THEN710
712 INPUT" STARTING RECORD #";E
715 Z$=MID$(R$(E),B,IN):GOSUB1300:IFI=0THEN720ELSEGOSUB780
720 E=E+1:IFE<176THEN715ELSE10
740 B=41:IN=20:E=1:INPUT" ENTER CITY :";S$:IFS$="0"THEN10ELSEIFL
EN(S$)<1ORLEN(S$)>20THEN740ELSE712
768 INPUT" STARTING RECORD #";E
770 IFR$(E)=""THEN775ELSEGOSUB780
775 E=E+1:IFE<176THEN770ELSE10
780 GOSUB480:LPRINT:LPRINT;MID$(R$(E),1,20):LPRINT;MID$(R$(E),21
,20):LPRINT;MID$(R$(E),41,20):LPRINT:LPRINT:RETURN
800 CLS:Y$="":PRINT"STORE ";N$;" DATA ON TAPE    (0=RETURN)":PRI
NT:PRINT"SET RECORDER TO PRINT ('RECORD') DATA .....":INPUT"ENTE
R NAME OF DATA FILE  :";Y$:IFY$="0"THEN10ELSEIFLEN(Y$)>0THENN$=Y
$
805 CLS:E=1:PRINT@130,"STORING "N$" DATA ON TAPE":PRINT:PRINT#-1
,N$
810 PRINT@390,"WRITING FILES #";E;"-"E+3;:PRINT#-1,R$(E),R$(E+1)
,R$(E+2),R$(E+3):IFR$(E+1)=""ANDR$(E+2)=""ANDR$(E+3)=""THEN10ELS
EE=E+4:IFE>300THEN10ELSE810
900 CLS:PRINTTAB(20);"* WARNING *":PRINT:PRINT"WHEN THE PROGRAM
TERMENATES, ALL DATA WILL BE LOST!":PRINT:INPUT"HAS THE DATA BEE
N STORED ON TAPE ";Y$:IFLEFT$(Y$,1)<>"Y"THEN800ELSEEND
1000 PRINTCHR$(28);:FORI=1TOP:PRINTCHR$(26);:NEXTI:RETURN
1100 PRINTTAB(22);CHR$(27);"                         |   ":PRINTTAB(
55);CHR$(27);"* ERROR *":RETURN
1200 CLS:P=3:GOSUB1000:PRINTTAB(23);D$:PRINTTAB(23);T$:PRINTTAB(
23);S$:RETURN
1250 FORI=1TOLEN(W$)-LEN(D$)+1:IFD$=MID$(W$,I,LEN(D$))RETURN
1300 FORI=1TOLEN(Z$)-LEN(S$)+1:IFS$=MID$(Z$,I,LEN(S$))RETURN
1305 NEXTI:I=0:RETURN
```

Program Listing

Reader Service for facing page ✓29→

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GALAXY INVASION
A fleet of invading aliens has landed and you are the Earth's only hope. Can you protect our planet from these creatures? (With Sound!)
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COSMIC FIGHTER
Your fuel level is low and you must refuel soon. Can you survive the alien's missile attacks before fuel runs out? (With Sound)
ROBOT ATTACK
Robots have overtaken a local space station. Fire your laser-pistol quickly because they are programmed to kill you! (With VOICE Sound)
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utside USA (except Canada) please add $3.00 per order for postage & andling.
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The systems approach to selling Girl Scout cookies.

Technological Destiny—Part III

Gary Dillio
1109 Madison Ave.
Prospect Park, PA 19076

The development of a computer software system is not an easy task. It involves good communications, sound problem analysis, efficient programming, extensive testing, documentation, audit trails, user acceptance and program/file maintenance procedures. Unfortunately, microcomputer users are often their own programmers and analysts. As a result, they never learn the systems development process.

The next few articles in this series will address the systems development process as practiced by the best data processors in industry. We will examine each step necessary to transform a user concept into a computer reality utilizing the TRS-80. The systems development process is usually explained by paralleling an existing complex business system, but we will concentrate our efforts on actually developing a system that can be used in most homes. Since our problem will be much simpler than a complex business system, some steps in the process may seem trivial. But, as the complexity of a problem increases, the value of each step becomes more apparent. Throughout the process, keep in mind the system we develop is only serving as a vehicle for the process we are learning. Its value is as a teaching aid, rather than as a unique application package.

The Key Box

Basic Level II
Model I
4-48K RAM
NEWDOS 80
One 80-track disk drive
Epson MX-100 Printer
Material in this article is not machine dependent.

Problem Definition

Computer programs are not created in a vacuum. No programmer develops a system without a need for that system. The need usually arises when someone develops a problem or foresees a potential problem.

"No programmer develops a system without a need for that system."

Shortly after I began writing this series, my daughter returned from a Girl Scout meeting and casually announced that my wife would again be Cookie Mother. Painfully, I remembered the two previous years we experienced as Cookie People. Hundreds of cases of Girl Scout cookies littered the house. We ordered, reordered, returned and distributed cookies, keeping track of over two thousand dollars trickling in, in dimes, nickels and crumpled dollar bills. Who owed how much? How many boxes of mints were available? Both years we had to make up payment shortages totalling $45.00. Who didn't pay? Who knows! My wife thought this problem would be an excellent application for this E.D.P. series.

I asked my wife, the potential user, to help define the problem. The following list of problems emerged:

- Past experience showed a lack of control over money and cookies. My wife could not always be sure who had outstanding money and who was given what type of cookies. The problem would take on another level of complexity this year—two troops merged for the cookie drive, but each troop's sales and profits had to be kept separately.
- My wife consistently ordered too many cases of one kind of cookie or too few cases of another. No attempt had been made to analyze initial and replenishment orders based upon past sales.

Reader Service for facing page ✓28→

• Money was not adequately controlled in past years, and attempts to balance inventory and cash received were never successful.

• Adequate records of how many boxes each child finally sold and paid for were a disaster. Since the Girl Scouts offered incentive awards for the sale of cookies, it was not an easy task to decide which girls earned what incentives.

System Goals

Assuming the problem definition is accurate, step two in the systems development (SD) process is to define what the user expects of the new system. Users often have neither the knowledge, nor the appreciation of computers and their programming limitations. It is the job of a computer analyst to temper user expectations with reality without destroying the usefulness of the project. System goals and expectations are arrived at by communication between the ultimate user and the system analyst.

Data Element	File	Picture	Source	Notes	Goal	Alterable	Just.
Last Name	GCF/CHF	X(15)	User	GCF File Key	4/8	No	Left
First Name	GCF/CHF	A(5)	User		4/8	No	Left
Troop Number	GCF/CHF	9(3)	User		4/8	No	None
Cookies Sold—Type 1	GCF/CHF	9(3)	User		4/8	Yes	Right
Cookies Sold—Type 2	GCF/CHF	9(3)	User		4/8	Yes	Right
Cookies Sold—Type n	GCF/CHF	9(3)	User		4/8	Yes	Right
Last Payment Date	GCF	9(5)	User	Julian Date Format	4	Yes	None
Total Paid	GCF/CHF	9(4).99	Computer	To Date	4/8	Yes	Decimal Aligned
Payments Outstanding	GCF	9(4).99	Computer		4	Yes	Decimal Aligned
Boxes Outstanding	GCF	9(3)	Computer		4	Yes	Right
Total Boxes Sold To Date	GCF/CHF	9(3)	Computer		4/8	Yes	Right
Cookie Type	CRF/CHF	X(10)	User	Total;Cookie Type 1+2...+n	6/8	No	Left
On Hand	CRF	9(6)	Computer	In Stock	6	Yes	Right
Sold	CRF/CHF	9(6)	Computer	To Girls	6/8	Yes	Right
Reorder Level	CRF	9(4)	User	Reorder Point	6	No	Right

Table 1. COMS system data elements

Based on the problems stated above, the following goals of the proposed Cookie System were negotiated:

• The System would recommend an initial ordering quantity for each type of cookie based on a user-supplied percentage of total sales of the previous year.

• The System would compute an average sale per child for each type of cookie from previous-year data supplied by the user.

• The System would subtract or add to the total initial order a per-child average based upon children no longer in the troop or children who joined the troop since the last cookie drive. This figure would become the actual initial order for each type of cookie.

• The System would keep track of all children participating in the cookie drive, their troop number, the number of boxes sold by type, payments to date, payments outstanding and boxes outstanding.

• The System would compute reorder levels for inventory falling below a specific user-supplied quantity based upon total sales of that item to date.

• The System could, at any time, display totals of cookies or money or both for each child, each troop or both troops.

• The System would compute which children qualify for incentive awards based on user-supplied data.

• The System could produce a composite file of data used for future year projections.

Feasibility Analyses

At this point, the analyst has some serious thinking to do. How much effort will be involved in producing such a system? How much data will be entered to initialize the system? How much effort is necessary to maintain the system? Is the effort involved in producing, updating and maintaining the system greater than that of the manual system? How long will the new system be used? How frequently will it be updated or accessed? In short, is the development of the new system worth the effort?

There is always a tendency for the user to underestimate the labor in developing a system. After all, television computers answer English language questions effortlessly. New analysts often fall into this same trap. A good rule of thumb is to double the estimate of work hours and costs projected by an inexperienced analyst.

Our Cookie System is certainly not worth the effort if it will only be used for the eight week cookie drive. However, realizing this is our third year of cookie distribution, there is no reason to conclude that future years' cookie drives will not be our responsibility. In addition, the final product can be adapted to a host of other Girl Scout drives, including calendar drives, subscription drives, fund drives and just about every other kind of drive except disk drives. Because I estimate the system could be used for at least three months per year, I decided to create it.

The next step in feasibility analysis is to examine software that can be purchased and modified without sacrificing the goals of the proposed system. The only applicable software available which would satisfy our criteria were a few Data Base Management Systems (DBMS). A good DBMS costs between $90 and $400. Despite the fact that a DBMS is almost essential to a serious disk user, I chose to develop the system from scratch to better demonstrate the SD process.

Hardware Analysis

Next, we must determine if the proposed application can be utilized on the available hardware. Since the data will be assessed and updated while actually receiving cash or distributing cookies, the programs necessary to query and update the data base should load quickly and operate in a real-time mode. These factors effectively eliminate a cassette based system. Reports must be portable and should have the option to be printed as well as displayed on the CRT screen. The minimum system adaptable to this application is a one disk, 32K system with a printer.

". . . double the estimate of work hours and costs projected by an inexperienced analyst."

On a lesser system, the program and file access times and the reliance on hand copying CRT screens would make the system slow and inconvenient.

Identifying Necessary Files

Our next task is to examine the goals and decide which files will be necessary to accomplish those goals. Goals 1-3 are calculations, based upon user-prompted data. They will not require external files. Goal 4 requires a disk data file. For the sake of simplicity, the example system will be called COMS, an acronym for the Cookie Management System. The file required to fulfill Goal 4 may be called the Girls Cookie File (GCF). This same file should contain enough information to satisfy Goals 6 and 7.

The fifth goal requires a file to compute reorder levels of inventory. We will call this file the Cookie Reorder File (CRF). Finally, Goal 8 requires combining and storing the data from the two original files (GCF and CRF) for next year's use. We will call this combined file the Cookie History File (CHF).

Access Keys

For every file updated randomly, one data element must be used as a key. A key is a data field unique to a specific record;

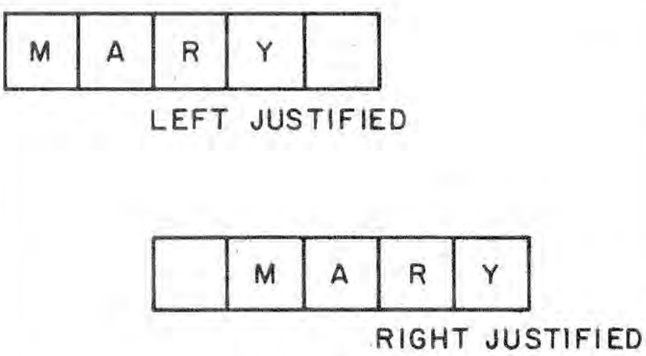

Fig. 1. Justification

✓See List of Advertisers on page 386

the program can call it to access that specific record. The GCF is accessible by the Girl Scout's last name. The CRF will be accessed by cookie name.

Data Elements

A data element is a data field that enhances the meaning of the record. At this point it is necessary to define what information is needed to initialize, maintain and update the system. It is also necessary to determine what data elements the system will compute from related user supplied information. Table 1 contains the data elements necessary to accomplish system goals. The first column supplies the data element name. The second column outlines the file containing the data element. In some cases, the data element appears in more than one file. Column three supplies the future programmer with information on the data element's size and composition. A field marked "X" is alphanumeric and can contain any letter or number. A field marked "A" is alphabetic and will contain only letters. A field marked "9" is numeric and can only contain numbers. The number in parentheses represents the character length of the field. These symbols can be mixed together. A field marked 9(3) XXA(2) would accept the following data: 736A9RAK.

The next column shows the source of the data. Some of the data elements are supplied by the user; others are computed based upon other user-supplied data. Notes and Goal columns are self-explanatory. The Alterable column tells if the data element can be changed after it is initially given a value. Any data element defined as a key cannot be changed. The final column, JUST, is the data storage field justification. A right-justified field places the data to the far right with trailing spaces. Left justified fields do the opposite. If a data element fits the field size exactly, justification is moot. Fig. 2 shows the field First Name as it would appear justified. Fig. 3 shows justification if the value of the field is larger than the allocated field space. When a data element is larger than the field it occupies, truncation occurs.

NAME; SHARON

S	H	A	R	O

LEFT JUSTIFIED

H	A	R	O	N

RIGHT JUSTIFIED

Fig. 2. Justification of truncated fields

Summary

So far, we have looked at the first phase of systems analysis. We have identified the problem, and explored the goals, objectives, scope and limits of the potential solution. We have determined the system software, hardware files and data elements necessary to begin system preparation. In Part IV we will begin to design the system. ■

Gary Dilllio is a Computer Systems Analyst for the Department of the Navy.

The Key Box
Basic Level II Model I or III 16K RAM

An aid to learning graph theory.

DIGRAPH Digressions

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Do you remember the last time you solved a problem in chemistry, economics, operations research, physics, probability, or numerical analysis? You probably applied some aspect of graph theory to the problem solution.

Graph Theory

Graph theory uses the fundamental concepts of set and relation to depict the relationships of a given graph. Mathematically, a graph G consists of a finite nonempty set of N nodes and E edges. Think of the cities listed on a road map as nodes and the highways linking these cities as edges.

My program takes this definition of a graph further by introducing a directed graph (digraph). In this case, the nodes of the graph represent the same collection of points of interest; but, the edges which connect one node to another have direction. If you think of the program flowchart shown in Fig. 1 as a graph, the operations enclosed in the flowchart symbols are the nodes of the graph while the arrows connecting specific operations represent the edges of the graph. Organizational charts apply graphs to real-world situations.

We must now define a path. Use our road map example (assuming one-way and two-way roads) to find a way from one city to another. We initialize our starting point at our present location and follow the edges through the various connecting nodes to the destination. Our path is the list of cities (nodes) passed through following the various roads (edges).

Our physical world allows us to represent a digraph with circles for nodes and arrows for edges, but computers do not recognize this type of data. For this reason, we will use an array which contains the logical values relating to the presence or the absence of a connecting edge between particular nodes. This array is known as the adjacency matrix. An example of a digraph and its associated adjacency matrix is in Fig. 2. The matrix is a square array where the number of rows and the number of columns are both equal to the number of nodes in the digraph. Whenever an edge connects two nodes, the matrix entry has a logical value of T. A logical F represents no connecting edge between two nodes.

The Program

I will use the example shown in Fig. 2 to demonstrate the program. Load and run the program as listed. The program requests the number of digraph nodes; enter four. The dimension statement for the adjacency matrix G as well as the two other lists accepts up to 25 nodes. If you have a larger digraph, redimension these lists and the matrix.

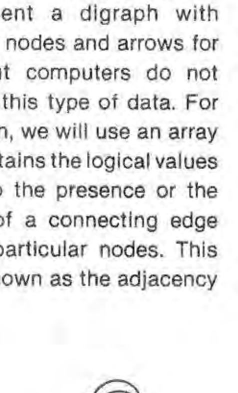
Next, enter the adjacency matrix values. Load a logical T or F into the required edge; input is row by column (left to right and top to bottom). Do not use the

Program Listing

```
1000 DIM G(25,25), S1(25), S2(25):
     CLEAR 2000:
     DEFSTR G,  L, O
1010 CLS:
     INPUT"ENTER NUMBER OF NODES IN GRAPH";N:
     IF N <= 0 THEN GOTO 1620
1020 PRINT"ENTER LOGICAL VALUES OF GRAPH"
1030 FOR R = 1 TO N
1040   FOR C = 1 TO N
1050     PRINT"NODE";R;"TO NODE";C;
1060     L = "":
         L = INKEY$:
         IF L = "" THEN GOTO 1060
1070     IF L >< "T" AND L >< "F" THEN GOTO 1050
                                  ELSE PRINT L: G(R,C) = L
1080   NEXT C
1090 NEXT R
1100 CLS
1110 FOR R = 1 TO N
1120   FOR C = 1 TO N
1130     PRINT G(R,C);
1140   NEXT C
1150   PRINT
1160 NEXT R
1170 INPUT"STARTING NODE";S: IF S > N THEN GOTO 1170
1180 INPUT"TERMINAL NODE";E: IF E > N THEN GOTO 1180
1190 '
      PATH FOUND WHEN STARTING NODE EQUALS TERMINAL NODE
      AND NODE IS REFLEXIVE.

1200 IF S = E AND G(S,E) = "T" THEN OK = "T": P1 = 2:
```

Program continues



	1	2	3	4
1	T	T	T	T
2	F	F	F	F
3	T	F	F	F
4	F	F	F	F

Fig. 2. Digraph and Adjacency Matrix

Enter key during this data input.

Next enter starting and terminal node values. To determine if a path exists from node three to node four of the digraph, enter three for the starting node and four for the terminal node. The program will search for a path through the adjacency matrix. If you entered the program correctly, it will tell you that the path from node three to node one to node four exists as a path from node three to node four.

Trace a few other paths through this digraph and try the program. It tells you if a path does or does not exist at the end of its search.

As a final test of the program, convert the flowchart in Fig. 1 to its equivalent adjacency matrix. Trace through the flowchart to see the paths taken by program logic. The next time you develop a flowchart, use the path tracing program as a test of the program logic. ■

Program continued

```
                                   S1(1) = S: S1(2) = E:
                                   GOTO 1550
1210 '
       PATH FOUND WHEN STARTING NODE AND TERMINAL NODE ARE
       SEPARATED BY ONE EDGE.
1220 IF G(S,E) = "T" THEN OK = "T": P1 = 2:
                          S1(1) = S: S1(2) = E: GOTO 1550
1230 '
       INITIALLIZE FIRST LOCATION IN STACK TO STARTING NODE.
1240 P2 = 1: S2(P2) = S
1250 '
       DOES A PATH EXIST FROM THE STARTING NODE TO ANY NODE?
       IF AT LEAST ONE EDGE EXISTS, THEN OTHER EDGES MAY EXIST
       FROM THE J(TH) NODE TO THE TERMINAL NODE.
1260 FOR J = 1 TO N
1270   IF G(S,J) = "T" THEN GOTO 1310
1280 NEXT J
1290 '
       FALLING THRU ABOVE LOOP SAYS NO PATH EXISTS FROM THE
       STARTING NODE TO ANY OTHER NODE.
1300 OK = "F": GOTO 1560
1310 '
       A PATH EXISTS FROM THE STARTING NODE.  INITIALIZE R TO
       THE STARTING NODE THEN TO THE NODE TO WHICH THE STARTING
       NODE CONNECTS TO ETC.
1320 R = S
1330 '
       P1 KEEPS TRACK OF THE PATH BEING TRACED INTO STACK S1.
1340 P1 = 1: S1(P1) = S
1350 FOR C = 1 TO N
1360 '
       DISREGARD REFLEXIVE LOOPS.
1370   IF R = C THEN GOTO 1490
1380 '
       DOES AN EDGE EXIST BETWEEN NODE R TO NODE C?
1390   IF G(R,C) = "F" THEN GOTO 1490
1400 '
       SKIP OVER NODE WHICH HAD PREVIOUSLY BEEN TRACED.
1410   IF S1(P1) = C THEN P1 = P1 - 1: GOTO 1490
1420 '
       WHEN NODE C IS AT TERMINAL NODE, PATH IS TRACED IN S1.
1430   IF C=E THEN P1 = P1 + 1: S1(P1) = C: OK = "T": GOTO 1550
1440 '
       P3 IS THE RETRACE POINTER THRU S1.
1450   P3 = P1
1460 '
       CHECK IF PATH IS BEING RETRACED; I.E., IF THE C(TH) NODE
       IS ALREADY IN S1 THEN THE PATH HAS BEEN TRACED INTO S1.
1470   IF P3 <= 0 THEN P1 = P1 + 1: P2 = P2 + 1: S1(P1) = C:
                  S2(P2) = C: R = C: GOTO 1350
1480   IF C = S1(P3) THEN GOTO 1490
                  ELSE P3 = P3 - 1: GOTO 1470
1490 NEXT C
1500 '
       EXIT LOOP WHEN NO PATH FOUND FROM R TO C.
1510 IF P2 <= 0 THEN GOTO 1540
             ELSE P2 = P2 - 1
1520 '
       BACK UP ONE NODE SINCE NO PATH IS FROM R TO C.
1530 IF P2 <= 0 THEN GOTO 1540
             ELSE R = S2(P2): GOTO 1350
1540 OK = "F"
1550 '
       IF OK IS TRUE THEN A SIMPLE PATH EXISTS FROM THE
       STARTING NODE TO THE TERMINAL NODE ELSE ( WHEN OK
       IS FALSE ) NO PATH EXISTS.
1560 IF OK = "F" THEN PRINT"NO PATH EXISTS FROM NODE";S;"TO";E:
                 GOTO 1610
1570   PRINT"SIMPLE PATH EXISTS FROM NODE";S;"TO";E:
       PRINT"PATH IS";S;
1580   FOR J = 2 TO P1
1590     PRINT"TO";S1(J);
1600   NEXT J
1610 PRINT:
     INPUT"ENTER Y FOR SAME GRAPH ELSE ENTER N";L:
     IF L = "Y" THEN GOTO 1100 ELSE RUN 1000
1620 END
```

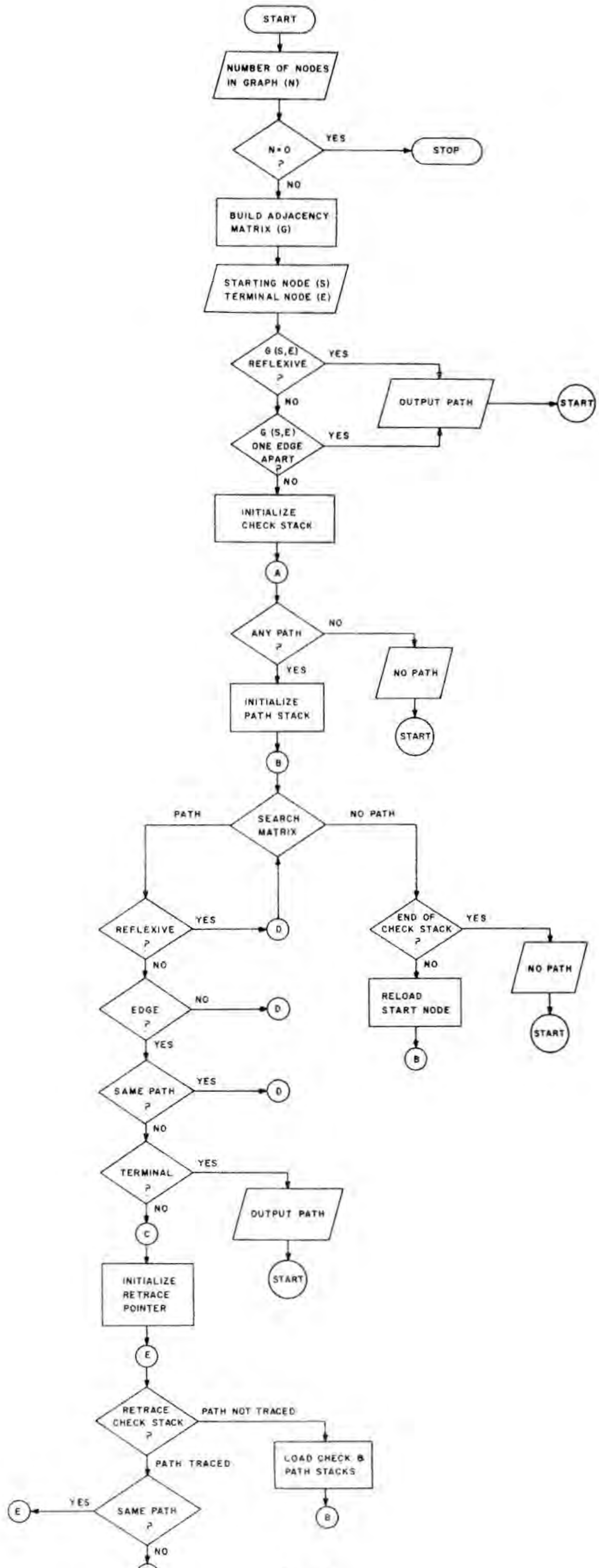


Fig. 1

Keyword changes for Basic dialects.

Basic Translator

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Telephone line computer information exchanges have become a subset of the computer hobbyist field. In the Atlanta, GA area alone, there are at least six full time and three part time bulletin board services.

Unfortunately, there are several dialects of Basic. Reediting a program written in one dialect to run in another can be difficult. My character change program uses the computer to shorten the job (see Program Listing). CLOAD this program and append the program to be altered. The appended program must have a starting line number greater than 32.

Basic statements such as If, Then and Print are stored in memory as single byte numbers ranging from decimal 129–250. These numbers decode the corresponding subroutine's location in ROM and shorten the amount of memory space taken by the program. When a program is listed, the Basic keyword is substituted for the number. Keyword numbers are on page E/1 of the Level II Basic manual. Note particularly the keyword numbers 205–214.

When the program begins it prompts Character To Change?. Type in the character you want changed. To change a keyword or character not on the keyboard, type shift-A. The program will respond Keyword Number?. Enter the keyword number or character you want changed. The program prompts Change To?. Respond with the character you want.

Once the entries are completed, the program's text will appear on the screen. Characters in quotation marks are not changed. ■

The Key Box

Basic Level II

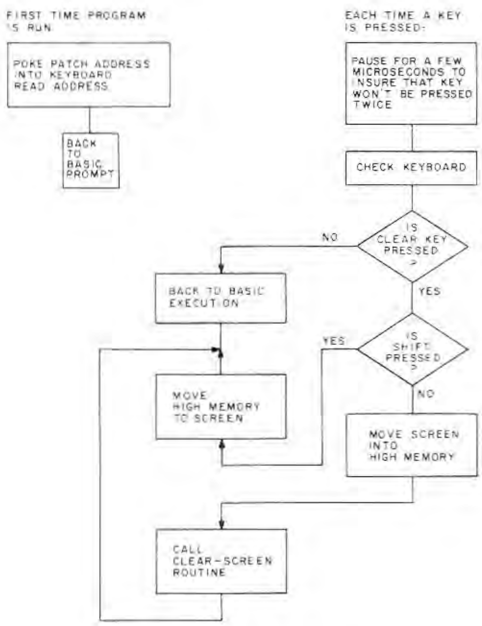

Fig. 1

```
1 CLS:DEFSTR K:D=17129:DIM K(122):FOR N=1 TO 122:READ K(N):NEXT
2 PRINT"CHARACTER TO CHANGE?";
3 A$=INKEY$:IF A$="" THEN 3
4 IF A$="a" THEN PRINT:INPUT"KEYWORD NUMBER";A1:A$="":ELSE PRINT
 A$
5 PRINT"CHANGE TO?";
6 B$=INKEY$:IF B$="" THEN 6
7 IF B$="a" THEN PRINT:INPUT"KEYWORD NUMBER";B1:B$="":ELSE PRINT
 B$
8 IF A$<>"" THEN A1=ASC(A$)
9 IF B$<>"" THEN B1=ASC(B$)
10 A=PEEK(D)+PEEK(D+1)*256:B=PEEK(D+2)+PEEK(D+3)*256:C=(PEEK(166
33)+PEEK(16634)*256)-3
11 IF B<=34 THEN 19
12 PRINT B;
13 FOR J=D+4 TO A-1
14 :F=PEEK(J):IF F=A1,POKE J,B1:F=B1
15 :IF F=34 THEN GOSUB 20
16 :IF F>31 AND F<129 THEN PRINT CHR$(F);
17 :IF F>128 AND F<251 THEN PRINT K(F-128);
18 NEXT:PRINT
19 D=A:IF D<C THEN 10 ELSE RUN
20 PRINT CHR$(F);:J=J+1:F=PEEK(J):IF F<>34 THEN 20 ELSE RETURN
21 DATA FOR,RESET,SET,CLS,CMD,RANDOM,NEXT,DATA,INPUT,DIM
22 DATA READ,LET,GOTO,RUN,IF,RESTORE,GOSUB,RETURN,REM
23 DATA STOP,ELSE,TRON,TROFF,DEFSTR,DEFINT,DEFSNG,DEFDBL
24 DATA LINE,EDIT,ERROR,RESUME,OUT,ON,OPEN,FIELD,GET,PUT
25 DATA CLOSE,LOAD,MERGE,NAME,KILL,LSET,RSET,SAVE,SYSTEM
26 DATA LPRINT,DEF,POKE,PRINT,CONT,LIST,LLIST,DELETE,AUTO
27 DATA CLEAR,CLOAD,CSAVE,NEW,TAB,TO,FN,USING,VARPTR,USR
28 DATA ERL,ERR,STRING$,INSTR,POINT,TIME$,MEM,INKEY$,THEN
29 DATA NOT,STEP,+,-,*,/,[,AND,OR,>,=,<,SGN,INT,ABS,FRE
30 DATA INP,POS,SQR,RND,LOG,EXP,COS,SIN,TAN,ATN,PEEK,CVI
31 DATA CVS,CVD,EOF,LOC,LOF,MKI$,MKS$,MKD$,CINT,CSNG,CDBL
32 DATA FIX,LEN,STR$,VAL,ASC,CHR$,LEFT$,RIGHT$,MID$
```

Program Listing

SOFTWARE CATALOG NO. 9

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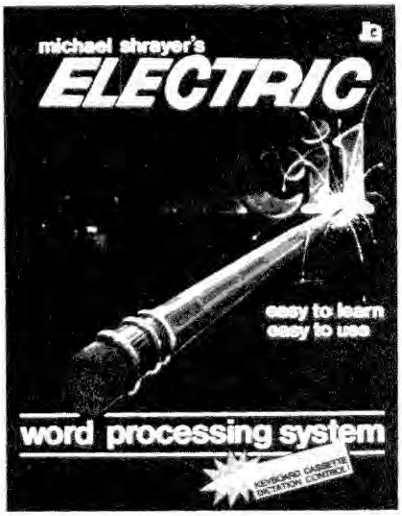

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- XHIT...CAN BE USED TO REPAIR A DISKETTE DIRECTORY
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Small Business Systems Group markets a complete line of software which interfaces the TRS-80™ with ANY computer that communicates in ASCII. This family of products offers both terminal and host capabilities to users with even the most minimal hardware configurations. There has been wide interest in these products from "comm buffs," the educational community, and **businesses and individuals who need to communicate on a regular basis.** Our systems are among the most versatile and comprehensive on the market today for TRS-80™ microcomputers.

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ST80-III™ -- The Ultimate Communications System

The "state of the art" in communications processors, designed for complex commercial applications. Included in this package is a set of programs that allow your TRS-80™ to talk to a timesharing computer, transfer files to and from your central business computer, and customize your ST80-III to your specific application.

Features include: Selectable RS232 Setting • Help Display • Echo Feedback • Job Log (LDOS Mod I, Mod III) • 2-User Translation Tables • Auto Logon • 10 Function Keys (Definable) • RUBOUT Key (Definable) • Warm Restart • Automatic I.D. • True Break • Direct Cursor Addressing • DOS Command Support • Transmit Line Feed • Printer Support • Video Display Modes: SCROLL, FORMAT, PAGE, REVERSE VIDEO (Mod II), CURSOR ON/OFF • Auto-answer • Autodial (certain modems) • Append to memory buffer • Big buffer for printer • Off hook / on hook • 10 predefined ASCII strings in translation tables, • Registered users include NASA, USN, UPS, Westinghouse, and many colleges, universities and major banks.

Minimum Requirements: One disk drive, RS232-C, 32K Model I or III, 64K Model II.

Model I or III **$150.00**
Model II **$250.00**

FORUM-80™ -- Communications Network

With Bill Abney's hot new communications product, you and your TRS-80™ can become part of one of the fastest growing communications networks in the country; your computer becomes an on-line bulletin board system: users can leave messages, get messages, swap information; exchange VisiCalc™ reports, charts, graphs or other correspondence with other computers.

Features Include: Security System • Constantly displayed time-in-use figure • User Friendly • User Configurable or can be modified for custom application • Future updates and upgrades available to register owners • Multiple command strings • Non-technical user and operator manuals.

Minimum Requirements: TRS-80™ (3-drive Mod I, 2-drive Mod III), 48K, RS232-C, Auto-answer modem.

Model I or III **$350.00**

ST-80-PBB™ -- Personal Bulletin Board

A small yet powerful bulletin board for the individual to gather and leave electronic mail. Messages reside in data base in memory, eliminating the problem of scanning magnetic media.

Features Include: Password Security System • Four levels of Access--Guest, Member, Owner, Operator • User Log • Four message types • Smart reverse scan to view messages from most recent to oldest.

Minimum Requirements: TRS-80™ (Mod I or III), 16K, Level II, Auto-answer modem, ST80-X10 Host Program ($50), RS232-C.

Model I or III **$50.00**

ST-80-CC™ -- Communications Center

More than a personal bulletin board, this is a complete communications system for low to moderate traffic. Like ST80-PBB™ it supports four levels of users and four levels of messages with text editing and reverse scan of messages.

Additional Features Include: Transmit same message to many individuals • Auto logon and multiple command scanning • Print messages on line printer, save messages in memory buffer, maintain database without user intervention.

Minimum Requirements: TRS-80™ (Mod I or III), Level II, 48K, one disk, Auto-answer modem, ST80-X10 Host Program ($50), RS232-C.

Model I or III **$100.00**

MouseNet™ -- Advanced Bulletin Board System

Designed to accommodate high volume traffic, to operate simply enough for novice users, yet is fast and powerful enough for experienced callers.

Features Include: Messages stored on disk in keyed file • Uses machine language subroutines for speed • Supports text editing commands • Help commands guide user • System bulletins display each time a user logs on • All messages are dated.

Minimum Requirements: TRS-80™ (Mod I or III), 48K, RS232-C, 3 Disks, Auto-answer modem, text editor (such as Scripsit).

Model I or III **$295.00**

DELUXE PERSONAL FINANCE For TRS-80™ Model II

This is a sophisticated and unique financial analysis package which can be readily customized to suit your personal financial situation. It will:

- Accept and apply transactions to user-formatted budget categories.
- Separate cash and check disbursements.
- Allows up to ten category disbursements per check.
- Credit income/deposits according to source.
- Search, correct or void checks.
- Maintain an accurate checking account balance.
- Cancel returned checks.
- Provide monthly summaries of income vs. expenses.
- Calculate profit/loss.
- Summarize data by categories.
- Provides up to ten savings account summaries.

Model II **$75.00**
Model I Version **$35.00**

ACCESSIBILITY

We are here to serve your after-purchase needs. You can read our Monthly Newsletter containing current information about SBSG's products. Our Newsletter is free to our customers and is available at a minimal cost to anyone interested in Microcomputers **or** call SBSG directly for Programming and Accounting Support. We have 8 incoming lines **or** call our COMM: Micronet Bulletin Board: ID # 70319236; FORUM-80™: (617) 692-3973; MouseNet™: (617) 692-8121; The Source: #TCC 413.

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or
TRS-80 MODEL II or 16
with 64K

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★ Each Module Is Accompanied By More Than 100 Pages Of Step-By-Step Documentation.
★ Manuals Available Separately. ($50 each) ★ Complete Sample Report Listings ($10)

$195 Per Module (Model I or Model III TRSDOS Version)
$295 Per Module (Model II TRSDOS Version)
$495 Per Module (Model II Peachtree CP/M Version)

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GENERAL LEDGER

Processes

★ Flexible design allows system to be easily adapted to both small businesses and also to firms performing client writeup services.
★ Add, change or delete records within the Chart of Accounts (Master) File.
★ List the Chart of Accounts File.
★ Key in transactions into the Transactions (Journal Entries) File.
★ List the Transactions File.
★ If other Peachtree Software packages are present, pass summary transactions from these packages to the General Ledger at the end of the accounting period.
★ At the end of an accounting period, print out the major reports:
(1) Trial Balance (Detail Report)
(2) Transaction Registers
(3) Balance Sheet
(4) Prior Year Comparative Balance Sheet
(5) Income Statement
(6) Prior Year Comparative Income Statement
(7) Department Income Statements

File Information

There are two main computer files maintained within the General Ledger System.

(1) The of Accounts File
Account Number
Description
Account Type
Balance Sheet Column Code
Current Amount
Year-To-Date Amount
Budget Amount
Prior Year Monthly Amounts

(2) The Transactions File
Account Number
Description
Source Code
Reference
Date
Amount

ACCOUNTS RECEIVABLE

Processes

★ Add, change or delete records within the Customer File.
★ List the entire Customer File, or any Customer within the File.
★ Enter invoices, payments, credits and adjustments.
★ Prepare invoices and statements.
★ Produce the following reports:
(1) Aged Accounts Receivable
(2) Invoice Register
(3) Payment, Credit and Adjustment Register
(4) Customer Account Status Report
★ At the end of a month, post the following items to the General Ledger:
(1) Invoiced Sales
(2) Freight Charges
(3) Sales Tax
(4) Service Charge Income
(5) Cash Payments
(6) Discounts Allowed
(7) Returns/Credits
(8) Income Adjustments
(9) Accounts Receivable

File Information

There are three main computer files maintained within the Accounts Receivable System, the Customer File, the Invoice File, and the Transaction File.

CUSTOMER FILE
Customer Account Number
Customer Name
Address
Phone
Type of Account
Credit Terms
Credit Limit
Tax Rate
Discount Rate
Date of Last Credit
Date of Last Debit
Amount of Last Credit
Amount of Last Debit
Current Balance
High Balance
Year-To-Date Sales
Year-To-Date Payments
Automatic Billing Amount

INVOICE FILE
Invoice Number
Invoice Date
Invoice Amount
Credit Terms

TRANSACTION FILE
Transaction Type
Transaction Date
Transaction Amount

ACCOUNTS PAYABLE

Processes

- ★ Add, change or delete records within the Vendor File.
- ★ List the Vendor File.
- ★ Enter vouchers.
- ★ Automatically determine which vouchers to pay.
- ★ Print checks and a Check Register.
- ★ Produce the following reports:
  - (1) Open Voucher Report.
  - (2) Accounts Payable Ageing Report.
  - (3) Cash Requirements.
- ★ At the end of a month, prepare the General Ledger Transfer File, passing the following information for each debit or credit transaction:
  - (1) Account Number
  - (2) Description
  - (3) Source Code
  - (4) Date
  - (5) Amount

File Information

There are two main computer files maintained within the Accounts Payable System, the Vendor File and the Voucher File.

VENDOR FILE
- Vendor Code
- Vendor Name
- Address
- Phone
- Year-To-Date Purchases
- Year-To-Date Payments
- Current Balance
- Last Payment
- Date of Last Payment
- Monthly Entry Flag
- Due Date of Month
- Debit Account Number
- Amount (Debit)
- Month Last Paid

This file may also contain information to enable generation of automatic vouchers for those items such as rent or bank payments that are paid every month.

VOUCHER FILE
- Voucher Code
- Voucher Date
- Amount Due
- Date Due
- Discount Percent
- Discount Amount
- Discount Date
- Invoice Number
- Invoice Date
- Status

Plus up to six account number-amount fields for General Ledger account numbers to which the amount due is to be distributed.

PAYROLL

Processes

- ★ Add, change or delete records within the Employee File.
- ★ List the Employee File.
- ★ Modify the Tax Information Files.
- ★ At the end of a pay period -
  - (1) Calculate Pay
  - (2) Print Checks
  - (3) Print Payroll Register
- ★ At the end of a month -
  - (1) Print the monthly summary
  - (2) Print the Unemployment Tax Report
  - (3) Prepare the General Ledger Transfer File, passing the following information:
    - Net Pay (Cash)
    - Employee FICA Withheld
    - Federal Tax Withheld
    - Insurance Deductions
    - Miscellaneous Dedutions
    - State Tax Withheld
    - Local Tax Withheld

  The gross pay for up to twenty payroll departments may also be passed to the General Ledger.
- ★ At the end of a quarter, print the 941A report information.
- ★ At the end of a year, print the W-2 forms.

File Information

There are two main computer files maintained within the Payroll System, the Employee Master File and the Tax File.

EMPLOYEE MASTER FILE
- Name
- Address
- Local Code
- State Code
- Marital Status
- Exemptions, Federal
- Exemptions, State
- Social Security Number
- Pay Period
- Pay Type
- Pay Rate
- Insurance Deduction
- Miscellaneous Deduction
- Date Employed
- Date Terminated
- Last Check Information

Payroll (con't)

And current, month-to-date, quarter-to-date and year-to-date totals for:
- Regular Earnings
- Overtime Hours/Earnings
- Other Hours Rate/Earnings
- Commission Earnings
- Miscellaneous Income
- FICA Deductions
- Federal Deductions
- State Deductions
- Local Deductions
- Insurance Deductions
- Miscellaneous Deductions

TAX FILE
- (for single and married persons)
- Federal Tax Information Tables
- State Tax Information Tables
- Local Withholding Tax Information Tables

INVENTORY SYSTEM

Inventory is probably the most speculative of all of a company's assets. A true measure of the effectiveness of management is the ability with which it supervises the inventory control function.

The Peachtree Software™ Inventory Management System is designed to (1) give you better merchandise control, (2) allow you to lower your dollar investment in inventory, and (3) improve customer service and response.

The System maintains detailed information on each inventory item including the part number, description, unit of measure, vendor and reorder data, item activity, and complete information on current item costs, pricing, and sales. Transactions effecting inventory (sales, receipts, adjustments) may be applied at any time to insure the inventory data is always up to date and accurate.

As with all Peachtree products, the system is interactive, simple to operate, and provides reports that are up to date and comprehensive.

Particular features of the Peachtree Software™ Inventory Management System include:

- Interactive, menu-driven programs
- Self-instructing user documentation
- Long item number - up to 15 characters
- Departmentalizing of items
- Multiple pricing levels
- Processes items on reserve (committed but still in stock)
- Online item query at any time
- Comprehensive management reporting
- Automatic month end file backup
- Recovery routines for hardware failures
- Sample data for demonstration and training

How the System is Designed

The Inventory Management System operates with an **Inventory Master File** which allows for the creation of each inventory item and for the recording of transactions (sales, receipts, returns, reserves, and adjustments) to each inventory item.

The Inventory Master File contains the item number, description and various other data on item costs, prices, reorder levels, vendor refereence, and activity. The items within the Master File are entered, changed, deleted, and queried through the **Inventory Master File Maintenance** program. All data on all items may be listed by using the **Detail Inventory Report** program.

Transactions may be applied at any time to the Master File through the **Enter Inventory Transactions** program. An **Update Report** automatically prints during this entry process to provide an audit trail of all inventory acitivity.

Several reports are available for the maintaining of stock, analysis, and forecasting. These reports include the **Physical Inventory Worksheet, Inventory Price List, Departmental Summary Report, Inventory Status Report,** the **Reorder Report** and the **Period-to-Date** and **Year-to-Date** reports.

At the end of an accounting period (usually a month), and then again at the end of a year, the **End of Period Processing** program is run to update current balances and clear previous balances.

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The finest Data Base Manager Available

Maxi Manager

JUST CHECK SOME OF THESE FEATURES

- Supports six different relational search techniques.
- Comes with programmer's interface.
- Over 93 pages of documentation.
- Supports up to 20 user defined fields of 40 characters each.
- Record length up to 800 characters.
- Files can be up to four disks in length.
- Compatable 35, 40, 77 & 80 track drives.
- Has calculated equation fields.
- Complete report generator.
- Data can be merged into letters.

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MAXI MANAGER for TRS-80 Models 1 & 3
Requires 48K of RAM and 1 Disk Drive Minimum.

DATA MANAGEMENT PROGRAM COMPARISON CHART

	CCA DATA MANAGER	AIDS III with CALS	MAXI MANAGER	RADEX 10	PROFILE
FILE CAPACITY & FORMAT					
Maximum # of disks per file	1	1	4	31	4
Maximum # of records per file	2450	Note 1	32,767	10,199	65,535
Maximum record length	249	254	800	255	255
Maximum # of characters per field	249	254	40	254	255
Maximum # of fields	24	20	20	127	153
Maximum # of characters per field label	15	10	19	12	765
Variable length records (pack sectors)	No	Note 2	Yes	No	No
FIELD TYPES					
Alphanumeric	Yes	Yes	Yes	Yes	Yes
Numeric	Yes	Yes	Yes	Yes	No
Fixed decimal numeric	Note 4	Yes	Yes	No	No
Date (MM/DD/YY)	Yes	No	Yes	No	No
Extended date (MM/DD/YYYY)	No	No	Yes	No	No
Calculated equation	Note 5	Note 6	Yes	No	No
Permanent fields	Yes	No	No	No	No
SORTING					
Machine language assisted	No	Yes	Yes	Note 7	Yes
Sort by any field	Yes	Yes	Yes		Yes
Number of Sort Key files	1	1	5		1
Numeric sort	Yes	Yes	Yes		No
Ascending sort	Yes	Yes	Yes		Yes
Descending sort	Yes	Yes	Note 11		Yes
Sort within a selected range	No	No	Yes		No
Sort multiple fields simultaneously	Yes	Yes	No		No
FILE MAINTENANCE					
Fixed length input fields	Yes	Yes	Yes	Yes	Yes
Single key entry of common data	No	No	Yes	No	No
Single field EDIT selection	Yes	Yes	Yes	Yes	Yes
Skip record (next or previous)	Yes	Yes	Yes	No	Yes
Search & EDIT record	No	Yes	Yes	No	Yes
Search & DELETE record	No	Yes	Yes	No	No
Auto rejection of alphanumeric data in numeric field	Yes	No	Yes	No	No
RECORD SELECTION TECHNIQUES					
Record number	Yes	Yes	Yes	Yes	No
Binary search (high speed)	No	No	Yes	No	No
Maximum # of simultaneous keys	1	4	10	31	1
RELATIONAL COMPARISONS					
Equal	No	Yes	Yes	Yes	Yes
Not equal	No	Yes	Yes	No	Yes
Greater than	No	Yes	Yes	Yes	Yes
Less than	No	Yes	Yes	Yes	Yes
Instring	Yes	No	Yes	Yes	No
AND / OR	No	No	Yes	Yes	No
Wild card masking	No	No	Yes	No	No
PRINTING					
User specified page title	Note 8	Yes	Yes	No	Note 10
User specified column headings	No	No	Yes	No	Yes
Automatic page numbering	Yes	Yes	Yes	Yes	Yes
Right justification	No	Yes	Yes	No	No
User defined column widths	Yes	No	Yes	Yes	Yes
User defined column separators	No	No	Yes	No	No
Keyboard entered columnar values	No	No	Yes	No	No
Merge data into form letters	No	No	Yes	No	No
Form filling applications	No	No	Yes	No	No
Columnar totals	Yes	Yes	Yes	No	No
Columnar subtotals generated upon change in a specific field	Yes	Yes	Yes	No	No
Built in screen print	No	No	Yes	No	No
MISCELLANEOUS					
Cost	$75.00	$94.90	$99.95	$99.00	$79.95
Punctuation allowed within data fields	Yes	?	Yes	Yes	Yes
Upper / Lower case	Note 3	Note 3	Yes	Note 3	Note 3
Built in RS-232-C driver	Note 3	Note 3	Yes	Note 3	Note 3
Built-in TRS-232 driver	Note 3	Note 3	Yes	Note 3	Note 3
Programmer's interface	Note 9	Note 9	Yes	No	Note 9
Sample DATA disk	No	No	Yes	No	No
Documentation (# of pages)	?	?	93	38	29

$99.95

NOTE 1: File size is dependant on memory size.
NOTE 2: Sequential files only.
NOTE 3: User must apply own driver routine.
NOTE 4: Hard copy print out only
NOTE 5: Four functions (+ - * /) only
NOTE 6: Same as note #5 with a maximum of two calculated fields.
NOTE 7: Available as a separate program for $99.95.
NOTE 8: 120 character maximum.
NOTE 9: Data structures defined in manual.
NOTE 10: 132 characters maximum.
NOTE 11: User option (files can be read from ascending or descending order).

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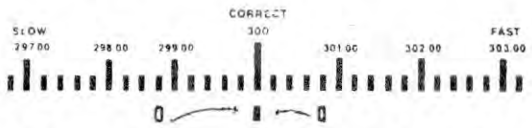

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Fine-tune disc drive motor speed yourself. All you need is DDT, two screwdrivers, and five minutes' time.

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Diskette and Complete Manual

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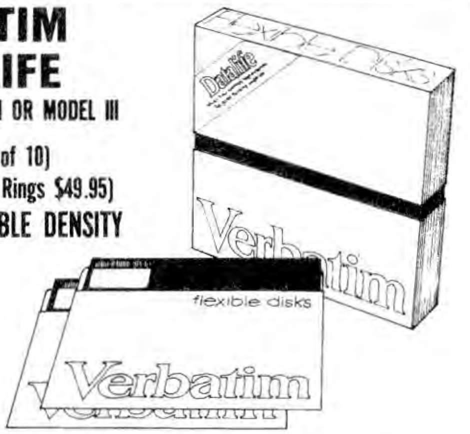

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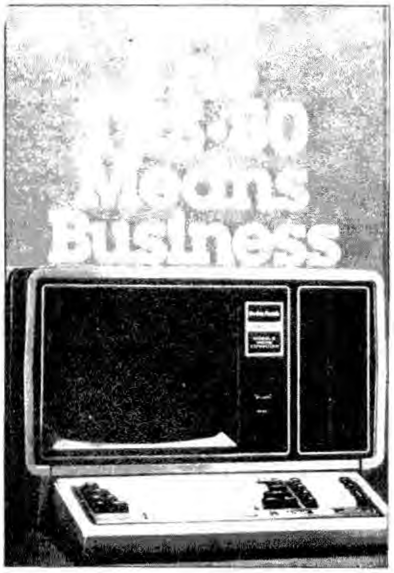

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Bob Albrecht, Don Inman & Ramon Zamora, all of Dymax Corporation

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MORE TRS-80™ BASIC
By Don Inman, Ramon Zamora, and Bob Albrecht

Here is an exciting new interactive programming guide to advanced functions. A sequel to the author's highly popular book, TRS-80 BASIC, MORE TRS-80 BASIC helps you build on your fundamental knowledge of Level II Basic with scores of practical applications that are both recreational and educational. It explains all TRS-80 Level II BASIC statements, commands, and features not covered in their previous best seller.

Along with an exploration of the PEEK and POKE functions, you'll get a clear demonstration of several different methods to display graphics, including little known "super graphics" techniques. Graphics become both fascinating and fun when you learn how to use TRS-80 string operations and functions like SET, POKE, and CHR$ to animate characters, games, and drawings.

You'll explore vital concepts in information processing and master file handling techniques that apply to both cassette and disk files. You'll also discover many "universal" applications easily adaptable to specific problems.

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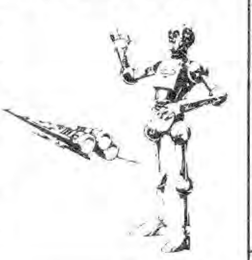

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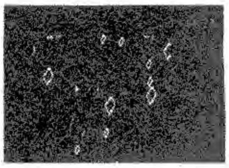

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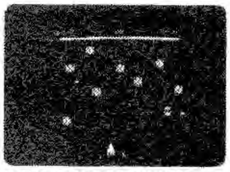
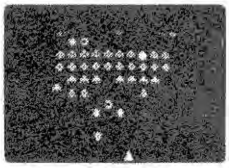
COSMIC FIGHTER©

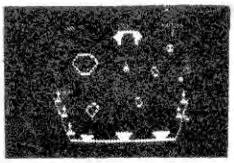


With thousands of stars whizzing by you, your **SPACE DESTROYER** ship comes out of hyperspace directly under a convoy of aliens. Almost effortlessly, you skillfully destroy every last one. But before you can congratulate yourself, another set appears. These seem to be slightly more intelligent than the first set. Quickly you eliminate all of them, too. But your fuel supply is rapidly diminishing. You must still destroy two more sets before you can dock with your space station. All right! The space station is now on your scanners! Oh no! Intruders have overtaken the station! You must skillfully fire your neutron lasers to eliminate the intruders from the station before your engines run out of fuel and explode! With sound!



GALAXY INVASION©

The sound of the klaxon is calling you! Cruel and crafty invaders have been spotted in battle formation warping toward Earth at an incredible speed. Suddenly, your ship materializes just below the huge flock of invaders. Quickly and skillfully you shift right and left as you carefully fire your lasers at them. But watch out! A few are breaking out of the convoy and flying straight at you! As the whine of their engines gets louder, you place your finger on the fire button knowing all too well that this shot must connect—or your mission will be permanently over! With sound effects!



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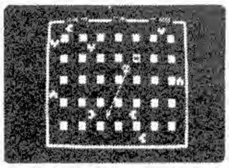

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Your TRS-80 screen has been transformed into a maze-like playfield for this game. As your ship appears on the bottom of the screen, eight alien ramships appear on the top. All of them are traveling at flank speed directly at you! Quickly and boldly you move toward them and fire missiles to destroy them. But the more aliens you destroy, the faster the remaining ones become. If you get too good you must endure the wrath of the keeper of the mazefield: the menacing "Flagship". You must destroy him fast because, as you will find out, that guy's accurate! With sound effects!

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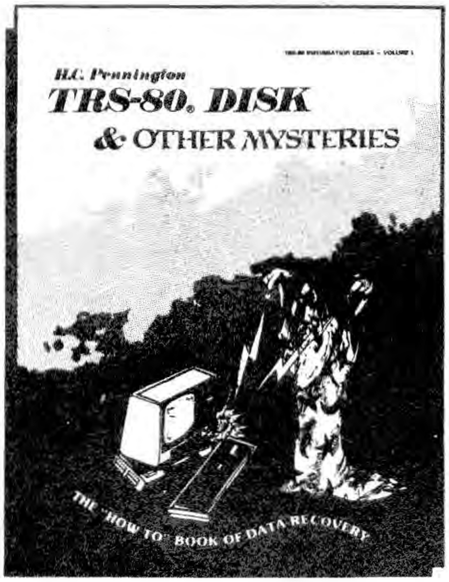

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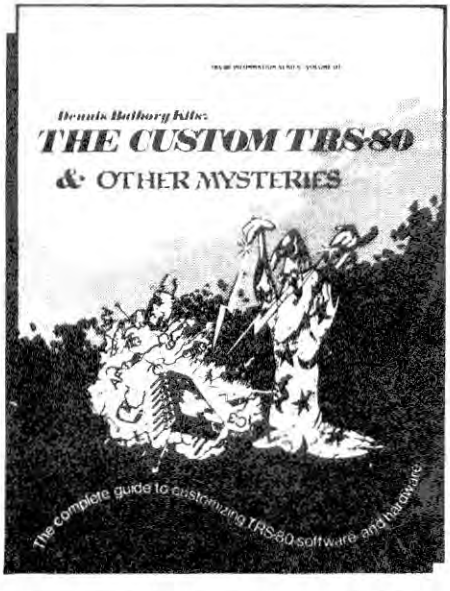

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The rating also indicates the purse size of the race in which the horse is likely to win if fit and ready. This means that a horse running in a race with a lower purse value than his rating represents a real "drop down" and a potentially strong bet. A horse with a lower rating than the purse value, however, is moving up in class and will seldom be a serious contender.

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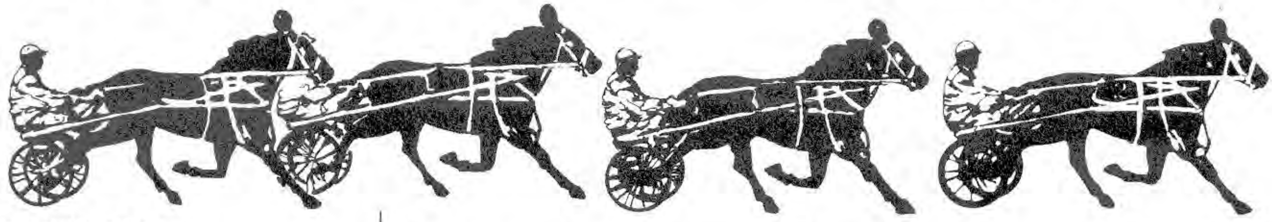


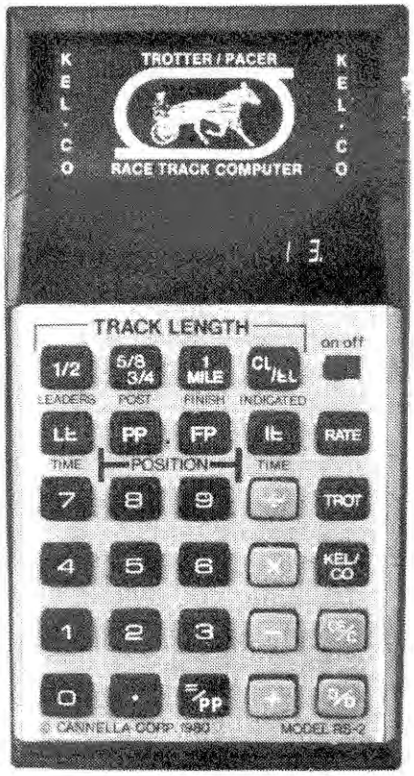
INTRODUCTION

The *Kel-Co Trot Computer* is a scientifically engineered special purpose computer designed to provide an accurate and rapid means for obtaining the Kel-Co ratings for harness race horses. These ratings, together with a few basic rules, provide a statistically proven handicapping method.

The unit has two modes of operation: the "computer mode" and a "calculator mode." The computer mode contains the programmed formulas for the Kel-Co Trot ratings using a special Texas Instrument microprocessor chip (TMS 1100/MP3490N-1). In the calculator mode the unit operates as a standard calculator.

The novice will find his lack of experience no problem. He need only know how to read the track program, and this information is found within each program. The instruction manual is complete, it tells what races to avoid, what horses to eliminate, how to rate the horses, and how to play the various types of wagers.

This computer is an outgrowth of the original Kel-Co Trot Calculator (Slide Rule) first marketed in 1969. Although based on the same general principles, it has undergone extensive refinements in theory. In addition, by its very nature, the electronic computer is much easier to use, more accurate, and much faster than the slide rule calculator.



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Can you figure out the secret code?

Fortran Puzzler

Richard A. Yehle
8952 Autumnwood Drive
Sacramento, CA 95826

One of the problems presented as part of a Fortran programming course I recently completed was quite challenging, and took many hours of work to complete. The problem is presented below along with my solution. The reader might attempt a solution prior to inputting the program.

The program runs on a 32K, two disk TRS-80 Model I using the Radio Shack Fortran Language Compiler. The problem is from a textbook entitled *Fortran for Humans*, Second Edition, by Rich Didday and Rex Page, West Publishing Company.

"The 57th Street Whiz Kids" (a tough gang) have found it necessary to contact one another in secret code. A member must write his message on a scrap of paper. Under each character (including spaces and punctuation marks), he places an integer between 0 and 42 according to the following scheme: 0–25 for A–Z respectively; 26–42 for the characters blank . , - ( ) ' 0 1 2 3 4 5 6 7 8 9 respectively. Then he adds each pair of numbers and writes the result below the pair with the convention that if the sum is 43 or more, he subtracts 43 from it first so that each number written will be between 0 and 42. He then decodes the numbers into characters, again using the above scheme. For example:

- Written message MEET JIM 10 P.M.
- Integers 12 04 04 19 26 09 08 12 26 34 33 26 15 27 12 27
- Added Integers 16 08 23 02 35 17 20 38 17 24 16 41 42 39 39
- Coded message QIXC2RU5RYQ966

The coded message has 15 characters, whereas the original message has 16. With this code system the original message always has one more character than the coded message. To decode their message, the Whiz Kids agreed that the original message should always end

Program Listing

```
C     WRITTEN BY:  RICHARD A. YEHLE
C     SACRAMENTO, CA  95826      11-80
C     PURPOSE - TO DECODE A SECRET MESSAGE
C
C     FOUR LEVELS ARE NEEDED TO ARRIVE AT A DECODED MESSAGE
C          1.  CODED MESSAGE
C          2.  ADDED INTEGERS
C          3.  INTEGERS
C          4.  WRITTEN (DECODED) MESSAGE
C
C     LIST OF VARIABLES -
C          I( )    -   ARRAY WHICH CONTAINS CODED MESSAGE AS READ
C          J       -   INDEX TO VARIOUS DO LOOPS
```

Program Listing Continues

with a period.

The program reads coded messages from cards in the Format 80A1 and Prints the decoded message. The coded message has fewer than 500 characters and the end of the coded message will be marked with a slash (/). The slash should not be used in decoding the message. You may use the above message to test your program.

The program is well documented to make it easy to follow. The hardest part is typing in the coded messages without errors. It took me several tries for each one.

For those unfamiliar with the Fortran compiler, I suggest several easy steps:

- Insert disk number one. Type Edit.
- To the question File, input your file name (LAB01/FOR). If it's a new file hit Break, if used prior depress Enter.
- When the asterisk appears depress the I key and input the program. Place C (for comment) in the first available column. Otherwise place the line number markers in columns two, three, four. In the case of lines 3200–3400 on the program supplied the one, two, or three is in column six. I found that instead of finding column seven for the program itself, it was easier to hit the right arrow (tab).
- When finished hit Break then the letter E, for exit, and the name of the file. It will be saved on disk.
- Type F80 FILE,FILE = FILE which will create the object file (/REL) and Listing File (/LST) generated from the Fortran File (/FOR).
- Using disk number two, type L80 FILE-N,FILE-E which will generate a command file (/CMD) which can be executed from TRSDOS by typing the File Name and entering.

Most of the above can be found in the Fortran user's manual supplied with the TRS-80 Fortran package. It helps to know the Fortran language to work with Fortran programs, naturally, but with the above information and a Fortran compiler, it should be easy to make this program function. ■

Program Listing Continued

```
01400 C             J1     -   INDEX TO DO LOOPS USING THE Q ARRAY
01500 C             K( )   -   ARRAY USED TO STORE THE ADDED INTEGERS
01600 C             L      -   USED TO CALCULATE SUBSCRIPTS FROM END OF ARRAY
01700 C             L1     -   COUNT OF CHARACTERS IN CODED MESSAGE
01800 C             L2     -   PREVIOUS SUBSCRIPT FOR CALCULATIONS OF INTEGERS
01900 C             MESS   -   MESSAGE COUNTER USED FOR OUTPUT
02000 C             N( )   -   ARRAY WHICH CONTAINS INTEGER VALUES
02100 C             NUM    -   EQUALS ADDED INTEGER OR Q SUBSCRIPT LESS ONE
02200 C             Q( )   -   ARRAY WHICH STORES MASTER CHARACTERS
02300 C             R      -   INITIAL VALUE FOR J IN READ IMPLIED DO LOOP
02400 C             S      -   TERMINAL VALUE FOR J IN READ OR WRITE LOOPS
02500 C
02600         INTEGER Q(44),R,S
02700         DIMENSION I(500),K(500),N(500)
02800 C
02900 C       INPUT MASTER CHARACTER SET INTO ARRAY AND ZERO VARIABLES
03000 C
03100         DATA Q/1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,1HL,1HM,
03200      1          1HN,1HO,1HP,1HQ,1HR,1HS,1HT,1HU,1HV,1HW,1HX,1HY,1HZ,
03300      2          1H ,1H.,1H,,1H-,1H(,1H),1H',1H0,1H1,1H2,1H3,1H4,1H5,
03400      3          1H6,1H7,1H8,1H9,1H//,
03450      4          N/500*0/,K/500*0/,MESS/0/,I/500*1H /
03500 C
03600 C
03700 C       PRINT HEADER AND READ CODED MESSAGE INTO I( )
03800 C
03900         WRITE(2,2)
04000 2       FORMAT(1H0,'THE FOLLOWING ARE CODED AND DECODED MESSAGES')
04100 C
04200 3       L1=0
04300 4       R=L1+1
04400         S=R+79
04500         READ(5,10,END=999)(I(J),J=R,S)
04600 10      FORMAT(80A1)
04700 C
04800 C       COUNT OF CHARACTERS IN CODED MESSAGE UP TO SLASH MARK
04900 C
05000         DO 200 J=R,S
05100         IF(I(1).EQ.Q(44))GOTO995
05200         IF(I(J).EQ.Q(44))GOTO300
05300         IF(J.EQ.500.AND.I(J).NE.Q(44))GOTO998
05400         L1=L1+1
05500 200     CONTINUE
05600         GOTO4
05700 998     WRITE(2,34)
05800 34      FORMAT(1H0,'NEXT MESSAGE DID NOT END WITH A  /')
05900 C
06000 C       PRINT HEADER AND/OR ERROR MESSAGE THEN CODED MESSAGE
06100 C
06200 300     MESS=MESS+1
06300         WRITE(2,30)MESS
06400 30      FORMAT(1H0,'CODED MESSAGE NUMBER',I3,' WAS ')
06500         GOTO 350
06600 995     MESS=MESS+1
06700         WRITE(2,32)MESS
06800 32      FORMAT(1H0,'NO. INPUTS FOUND FOR MESSAGE NUMBER ',I3)
06900         GOTO3
07000 350     WRITE(2,40)(I(J),J=1,L1)
07100 40      FORMAT(1H ,60A1)
07200 C
07300 C       COMPARE FINAL CHARACTER TO Q( ) TO OBTAIN FINAL ADDED INTEGER
07400 C
07500         R=L1+1
07600         DO 400 J1=1,43
07700         IF(I(L1).EQ.Q(J1))NUM=J1-1
07800         IF(I(L1).EQ.Q(J1))GOTO450
07900         IF(J1.EQ.43.AND.I(L1).NE.Q(J1))GOTO997
08000 400     CONTINUE
08100 C
08200 C       CALCULATE VALUE OF INTEGER PRIOR TO FINAL PERIOD
08300 C
08400 450     N(L1)=NUM-27
08500         IF(N(L1).LT.0)N(L1)=N(L1)+43
08600         L=L1
08700         N(L)=N(L1)
08800 C
08900 C       CALCULATE INTEGER VALUES, PLACE IN ARRAY N( )
09000 C
09100         DO 500 J=2,L1
09200         L=L1-J+1
09300         12=L1-J+2
09400                 DO 600 J1=1,43
09500                 IF(I(L).EQ.Q(J1))NUM=J1-1
09600                 IF(I(L).EQ.Q(J1))GOTO650
09700                 IF(J1.EQ.43.AND.I(L).NE.Q(J1))GOTO997
09800 600             CONTINUE
09900 650     N(L)=NUM-N(L2)
10000         IF(N(L).LT.0)N(L)=N(L)+43
10100 500     CONTINUE
10200 C
10300 C       TRANSLATE INTEGERS IN N( ) TO DECODED MESSAGE K( )
10400 C
10500         DO 700 J=1,L1
10600         J1=N(J)+1
10700         K(J)=Q(J1)
10800 700     CONTINUE
10900         K(R)=Q(28)
11000 C
11100 C       PRINT HEADER AND UNCODED MESSAGE
11200 C
11300         WRITE(2,50)
11400 50      FORMAT(1H0,'UNCODED MESSAGE IS: ')
11500         WRITE(2,60)(K(J),J=1,R)
11600 60      FORMAT(1H ,60A1)
11700         GOTO3
11800 C
11900 C       HEADER PRINTED IF UNRECOGNIZED CHARACTERS WERE ENCOUNTERED
12000 C
12100 997     WRITE(2,70)MESS
12200 70      FORMAT(1H ,'BAD CHARACTER IN MESSAGE -',I3,' -- NOT TRANSLATED')
12300         GOTO3
12400 C
12500 C
12600 999     STOP
12700 C
12800         END
```

The Key Box

Basic Level II
Direct Couple Modem

Built with parts gathering dust in the basement.

Modem Auto-Answer

Don Westbrook
5532 Hutton Avenue
Baltimore, MD 21207

My greatest brainstorms always happen late Saturday; Sunday finds me searching electronic stores for parts not yet invented. I decided my next project would use the parts gathering dust in the basement.

My new Radio Shack direct couple modem let me run up quite a large telephone bill calling bulletin boards. I decided to build an auto answering device for the Radio Shack direct couple modem. The parts are not critical: Use almost any relay, SCR, or bridge diode. The capacitor in the circuit detecting the ring must be rated high enough (100WV dc).

Answering

After playing with my meter on the phone line I discovered it had 50 V across the lines until it rang, when about 90 V came across. The computer answers the phone when a relay signals a voltage greater than 60 or 70 across the line. Since I wanted the current traveling in the same direction I put in a diode bridge (see Fig. 1). Bingo! Every time the phone rang, the relay latched on.

To connect the modem to the phone line I latched another relay to the first circuit. I kept the modem on constantly. The circuit in Fig. 2 keeps the relay latched after the ringing stops by locking the SCR after a voltage is applied to its gate.

I found the perfect power pack in an old calculator. I attached this circuit across the contacts of the answering circuit's relay. I added a relay along the circuit to reset the SCR and hang up the phone. I used the cassette port on/off switch to control the last relay, wired to be in the closed position until the cassette port switch closed the circuit to the coil. This opened the circuit across the relay contacts. By sending "Out 255,4" several times in a loop, the circuits reset themselves and hang up the phone. The computer is then ready for the next caller.

By examining the value at the modem status register the computer could determine if someone is on the line and if a carrier signal is coming over. That port is 0E8H(232). Use the interrupts to check this port frequently for carrier signals; if one is not found the computer will hang up the phone. I hope a talented reader will address this problem. In the meantime have your program check this address occasionally and take the proper action, or make sure that your friends log off by calling a pro-

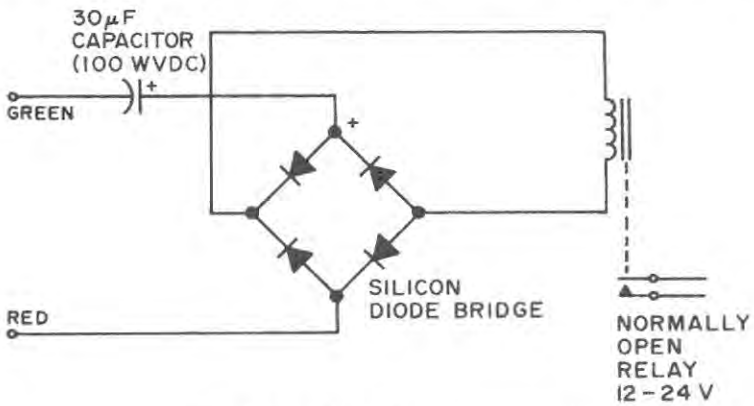

Fig. 1. Diode bridge answering circuit

Resistors:
- R1 1000 Ohms
- R2 380 Ohms

Capacitors:
- C1 30 μf (100WV dc)

Diode Bridge:
- 100 PIV

Relays:
- RY1 12-24V N.O.
- RY2 12V N.O. DPST Reed relay, RS#275-229
- RY3 9-12V N.C. relay

Switch:
- SW1 N.C. push to open switch

Silicon Controlled Rectifier:
- SCR 100 PIV RS#(276-1152)

Subminiature jack
9V power source
Modular telephone jack
Modular telephone plug if desired

Table 1. Parts List

```
SAMPLE INKEY$ ROUTINE FOR CHECKING PORT
  (0E8H) FOR SIGNALS


10 a$ = inkey$:gosub1000:ifa$ = ""then 10

1000if inp(232) = 191 then 1005 else return '191 = NO
  CARRIER
1005 c = 0      'set counter
1010 for T = 1 TO 30
1020 if inp(232) = 191 then c = c + 1   '191 is no carrier
1030 next
1040 if c>10 then 1050 else return   'buffer out a glitch
1050 for t = 1 to 100
1060 out 255,4   'RESET ANSWER CIRCUIT
1070 next
1080 return
```

Program Listing

"Sunday finds me searching electronics stores for parts not yet invented."

gram or subroutine with the proper "Out 255,4" loop. I found it best to repeat this about 100 times in the loop.

Place the circuits on a small perfboard no bigger than a cassette. A modular phone jack plugs the modem right into the circuit. A modular plug makes the answering device easy to place and remove from the phone jack.■

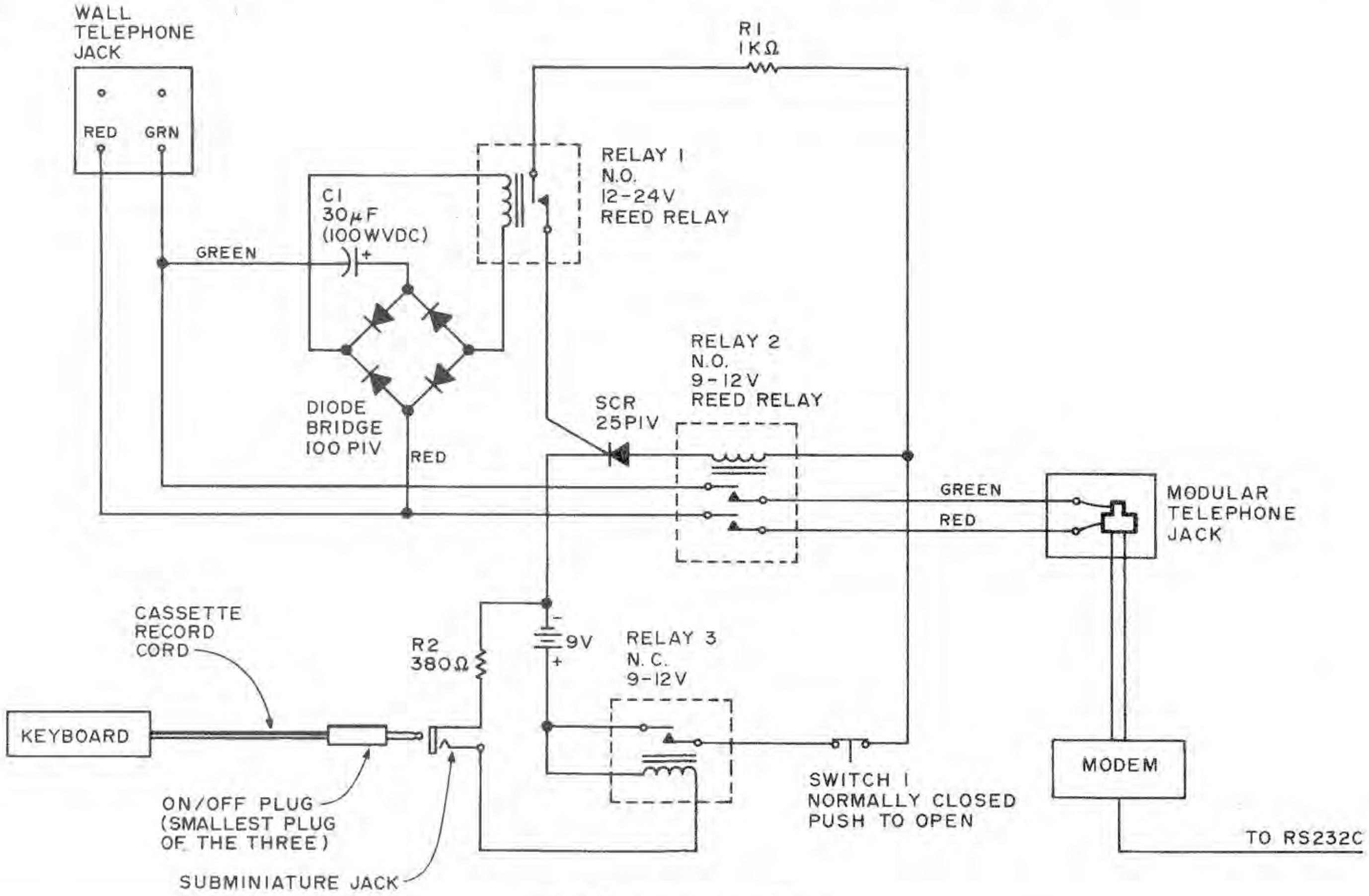

Fig. 2. Modem connect circuit

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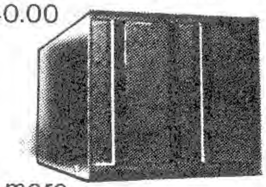

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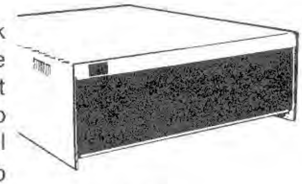

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An exercise using pseudo-code.

Stepwise Refinement

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700 North Wendy #700
Newbury Park, CA 91320

In recent years the software industry has preached the virtues of structured programming. Several compilers and language pre-processors supply the constructs for block structuring and enforce such concepts as "picture on a page" and the absence of GOTO's. These concepts have value not only in coding, but also in program design. This article presents the technique of stepwise refinement, as well as a utility I wrote via the procedure.

First Things First

Before starting the design, let's list some definitions and set several simple rules. *Design language* is a series of statements in the sequence the program will execute them. The statements of the design are called *control structures*. I restrict the design here to only five control structures listed below.

● *Statement—Statement.* This construct, called a *sequence*, consists of two statements executed in order. Any statement in a sequence may be replaced by any other control structure (including another sequence). See Fig. 1.

● *If predicate—Then statement 1—Else statement 2.* This allows selection of the path of execution, based on logical evaluation of the predicate of the If statement. See Fig. 2.

● *Case selector—state1: statement 1 state 2 : statement 2 ... staten : statementn—End.* This control structure works like a compound If...Then...Else. Only the statement which satisfies the selector and state is executed; others are skipped. End is only used to mark the scope of the Case. See Fig. 3.

● *Until predicate—Do sequence—End.* The Until control structure executes the sequence until the predicate is satisfied. Because the test of the predicate is performed at the End statement, the sequence will be executed at least once. See Fig. 4.

● *While predicate—Do sequence—End.* The While control structure tests the predicate and executes the sequence

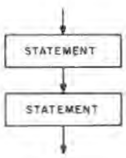

Figure 1

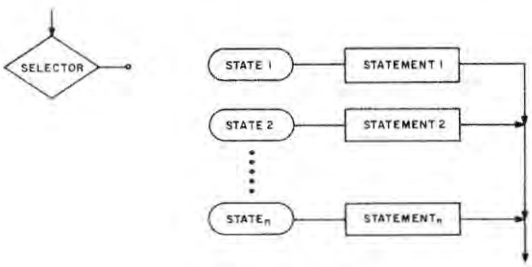

Figure 3

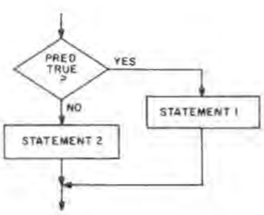

Figure 2

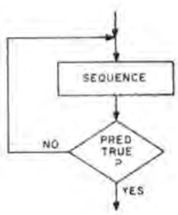

Figure 4

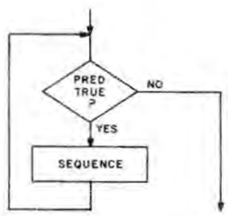

Figure 5

The Key Box

Basic Level II
Model I
16K RAM
1 Disk Drive

```
Initialize
Until 'Quit' is selected on keyboard Do
   Display menu
   Read selection from menu
   Case keyboard selection =
      1 : Read a sector
      2 : Modify buffer contents
      3 : Write a sector
      4 : Quit
      Other : Continue
   End
End
```

Fig. 6. Initial design language

while the predicate is true. If the predicate is not true from the start, the sequence will not be executed. See Fig. 5.

Design a Program

Let's consider an easy-to-use disk repair program. I wrote SIMPLZAP to read any sector on a disk, modify the data, and write the modified data to any sector. Program requirements are straightforward and involve no algorithm (transformation of input data to output data). I began by stating program requirements formally:

- Read and display any sector on a disk
- Modify data read
- Write the modified data to any sector on a disk.

To write any program, state requirements in design language as completely as possible. Express functions using logical abstractions and postpone the introduction of detail until you understand the entire program sufficiently. Then expand each statement to contain more detail and continue refinement until the program is fully described for coding. Although the temptation to fully define and start coding one section of a program is great, I promise a better-designed, more easily coded and more error-free program if design is complete before implementation begins.

For SIMPLZAP, the initial design language is in Fig. 6. Actually, it doesn't look bad. The design contains all functional requirements plus statements included to add operational convenience.

Now let's expand the detail of each statement and repeat the process until there is sufficient design detail to code.

```
• Read selection from keyboard
     Wait for any key
     Selection = Pressed key
• Read a sector
     Query disk address parameters
     Read disk
     Display buffer
     Wait for any key
• Modify buffer contents
     Display buffer
     Modify buffer
• Write a sector
     Clear screen
     Query disk address parameters
     Write disk
• Quit
     Return to DOS
```

Fig. 7. First refinement

First Refinement

- Initialize
  Disable interrupts
  Plug up Basic exits

I don't need interrupts and don't want time interrupts interfering with disk processing; I'll disable them. Because I will use Basic subroutines and don't want Basic to take DOS or Disk Basic exits I added line 2. If I think of other initialization functions I will come back and add them.

The second line of the program is sufficient. There is no need to expand it at this time, so I'll go to the third line.

- Display Menu
  Clear screen*
  Write title and instruction lines*
  Write four function description lines*
  Display the traditional '?'*

I ended each statement of this section with an * to remind myself that a Basic subroutine does this function.

Now, I will expand the rest of the program one line at a time until the first refinement is complete (see Fig. 7). You are probably wondering if this is worthwhile, but I now have a better basis for further refinement. Let's see what the whole thing would look like if the first refinement were inserted into the program design (see Fig. 8). Original statements are enclosed in slash marks; expansion statements are beneath the originals.

```
/Initialize/
Disable interrupts
Plug up Basic exits
/Until 'Quit' is selected on keyboard Do/
   /Display menu/
   Clear screen*
   Write instruction line*
   Display the traditional '?'*
   /Read selection from menu/
   Wait for any key (C)
   Selection = Pressed key
   Case keyboard selection =
      1 : /Read a sector/
            Query disk address parameters (C)
            Read disk
            Modify buffer contents (C)
      2 : /Modify buffer contents/
            Display buffer
            Modify buffer
      3 : /Write a sector/
            Clear screen*
            Query disk address parameters (C)
            Write disk
      4 : /Quit/
            Return to DOS
   End
End
```

Fig. 8. First refinement inserted

Notice that "Query disk address parameters" and "Modify buffer contents" each appear twice. Even at this early stage of the design that suggests a subroutine; I annotated the statement with a (C) for Call. I had included a statement for displaying the buffer immediately after the read. Now I realize that the most common action after reading is to modify the buffer or (if no editing is to be done) to simply exit. I altered the design to edit automatically after reading the disk.

Second Refinement

The first few statements look detailed enough for now. Let's start with the sequence replacing "Wait for any key." See Fig. 9.

Let's decide on the display format. The buffer will be 256 bytes (one sector). That suggests 16 lines of 16 bytes. It is also handy to display ASCII when legitimate ASCII characters are contained in the buffer. So I will make each display line look like this:

```
00 0010203 30313233 04050607 41424344
                ....0123....ABCD
```

Now things are starting to shape up. It almost looks like a program. Let's expand on undefined statements and think about writing the code.

Third Refinement

At some point detail the data and storage required. For this program there are no complex data structures, so I will omit that part of the design. Some programs require design of the data base and of input and output data before logic design or early in the process. See Fig. 10 for the program as it now stands.

Final Design

It is time to look at the entire program (see Fig. 11). Listing the entire program is not necessary for refinement, but it usually helps to have a copy of the expansion at all levels of refinement.

Am I ready to code this program? That is a matter of opinion, but I think so. Another person may have gone to more or less detail. The important thing is that I have gone through a formal design exercise before getting bogged down in coding details. There is another benefit from this discipline—the design process produces detailed documentation for records, maintenance or extension of the program.

The Final Product

SIMPLZAP is menu-driven. The main menu allows selection of the three functions which the program performs: Read, Modify, and Write. A Quit option returns to DOS. If Read or Write are selected, a secondary menu asks for the track and sector on which the operation is to be performed. INKEY$ input is used throughout SIMPLZAP. The Enter key has a special purpose. When Read or Write are selected, use the previous inputs for track or sector address or both by hitting the Enter key. For most applications, Write uses the same track and sector that was used for Read. In Modify operation, Enter returns you to the main menu. The general rule in SIMPLZAP is that all inputs are made using two-digit hexadecimal numbers.

When a Read operation is selected and the track and sector has been input, the program automatically executes the Modify operation. When in Modify, the entire sector is displayed in hexadecimal dump format with possible ASCII values in the right margin. A blinking block cursor marks the buffer position for any modifications. The cursor is moved with the keyboard arrows, or by making entries into the buffer. Buffer modifications are immediate—if you make a mistake and cannot remember how to correct it, leave the Modify function and read the sector again. The Modify function is terminated by hitting Enter.

The Write function writes and returns to the main menu. Usually, the track and sector for Write are the same as for Read, but sector data may be initialized (not formatted) or copied using the Write command.

The program listing for SIMPLZAP is in three parts. The program overflows the text buffer in my modified version of EDTASM. The way it is segmented, under 1000H bytes of text buffer are used for each section. I also put ORG statements at strate-

```
• Wait for any key
    While no key pressed
      Read keyboard*
    End
• Query disk address parameters
  Until converted input < 23H or Enter input
    Display two-line query*
    Read and convert keyboard response (C)
  End
  If input was not Enter
    Then store track number
    Else (previous track number will be used)
  Until converted input < 0AH or Enter input
    Display two-line query*
    Read and convert keyboard response (C)
  End
  If input was not Enter
    Then store sector number
    Else (previous sector number will be used)
• Read disk
    Start disk motor
    Delay*
    Seek to track and set sector (C)
    Set read command in controller command register
      Until Status = DRQ Do
        Continue
      End
      Move a byte from data register to buffer
    End
• Display buffer
    Clear screen*
    Set byte counter to zero
    Set hex conversion pointer to top of buffer
    Set ASCII conversion pointer to top of buffer
    Until 16 lines are displayed Do
      Convert and display (byte counter) (C)
      Leave a couple spaces
      Until four bytes have been displayed Do
        Leave a couple spaces
        Until four bytes have been displayed Do
          Convert and display (byte from hex conversion pointer) (C)
          Bump hex conversion pointer
        End
      End
      Display ASCII characters (C)
    End
• Modify buffer
    Turn off regular cursor display*
    Set buffer pointer to top of buffer
    Set cursor value to video location of first byte
    Until Enter input Do
      Convert and display (byte from buffer pointer) (C)
      Read and execute keyboard commands
      Display block symbol over byte at cursor
    End
    Display ASCII characters (C)
• Write disk
    Start disk motor
    Delay*
    Seek to track and set sector (C)
    Set Write command in controller command register
    Until 256 bytes read Do
      Until Status = DRQ Do
        Continue
      End
      Move a byte from buffer to data register
    End
```

Fig. 9. Second refinement

- Assemble Part 1 of SIMPLZAP and write the object code to disk with the filename PART1/CMD. Do the same with Parts 2 and 3, calling them PART2/CMD and PART3/CMD, respectively.
- From the DOS Ready prompt, type LOAD PART1/CMD<Enter>. After PART1/CMD has loaded, do the same with PART2/CMD and PART3/CMD.
- Type: DUMP SIMPLZAP/CMD:0 (START=X'8000',END=X'8873',TRA=X'8000')<Enter>. The object code for SIMPLZAP/CMD will be written to disk.
- SIMPLZAP/CMD is ready for use.

Table 1

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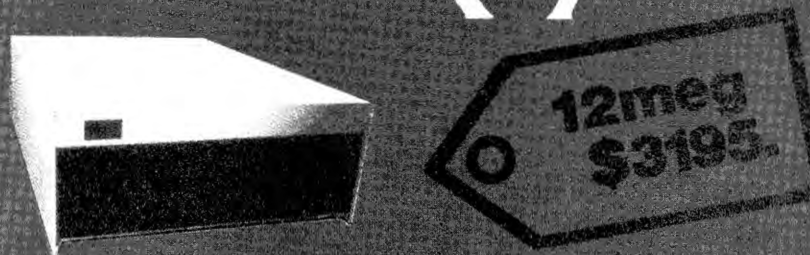

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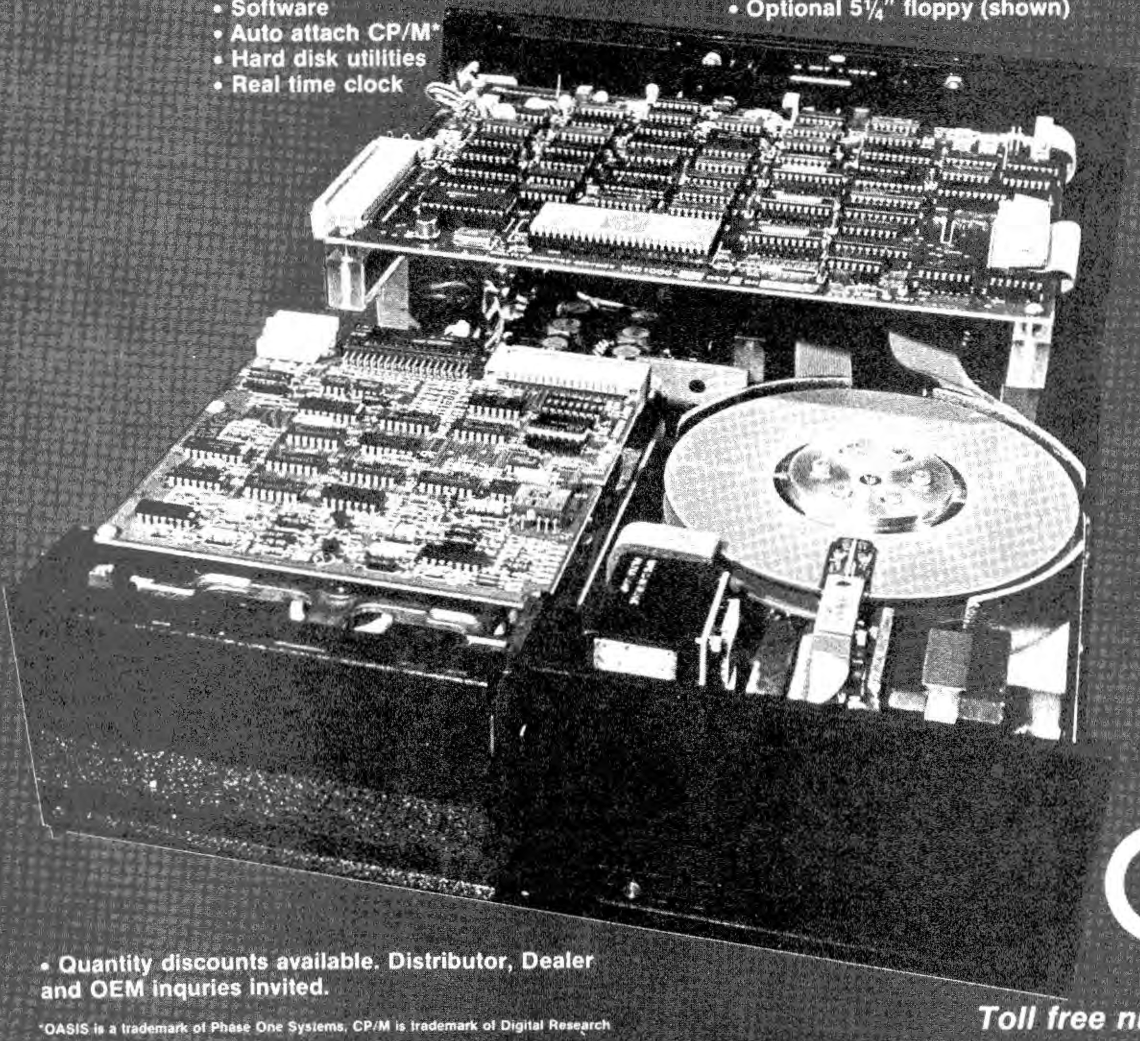

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Program Listing 1

```
                 00100 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
                 00200 ;                                         ;
                 00300 ;        SIMPLZAP                         ;
                 00400 ;                                         ;
                 00500 ;        COPYRIGHT (C)                    ;
                 00600 ;                                         ;
                 00700 ;        B. BOASSO                        ;
                 00800 ;        700 N. WENDY #700                ;
                 00900 ;        NEWBURY PARK, CA 91320           ;
                 01000 ;                                         ;
                 01100 ;  PERMISSION TO COPY GRANTED             ;
                 01200 ;        TO READERS OF                    ;
                 01300 ;  80 MICROCOMPUTING MAGAZINE.            ;
                 01400 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
                 01500 ;        PART 1                           ;
                 01600 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
                 01700 ;
                 01800 ; A PROGRAM FOR READING ANY SECTOR ON A DISKETTE,
                 01900 ; MODIFYING THE DATA FROM THAT SECTOR, AND
                 02000 ; WRITING THE (MODIFIED) DATA TO ANY SECTOR ON DISKETTE.
                 02100 ;
                 02200 ;
8200             02300 MODIFY  EQU     8200H
8500             02400 WRITE   EQU     8500H
87B0             02500 MENU0   EQU     87B0H
8000             02600         ORG     8000H
                 02700 ;
                 02800 ;
                 02900 ;       INITIALIZATION
                 03000 ;
                 03100 ;
8000 F3          03200 SMPLZP  DI                      ;DISABLE INTERRUPTS
8001 3100B0      03300         LD      SP,0B000H
                 03400 ;
                 03500 ;
                 03600 ;       PLUG UP BASIC EXITS SO THAT BASIC SUBROUTINES
                 03700 ;       CAN BE USED BY THIS PROGRAM.
                 03800 ;
                 03900 ;
8004 3EC9        04000         LD      A,0C9H          ;PLUG UP BASIC EXITS
8006 320C40      04100         LD      (400CH),A
8009 21A641      04200         LD      HL,41A6H
800C 0615        04300         LD      B,15H
800E 77          04400 PLOOP   LD      (HL),A
800F 23          04500         INC     HL
8010 23          04600         INC     HL
8011 23          04700         INC     HL
8012 10FA        04800         DJNZ    PLOOP
                 04900 ;
                 05000 ;
                 05100 ;       DISPLAY MENU
                 05200 ;
                 05300 ;
8014 CDC901      05400 ZAPP    CALL    01C9H           ;CLS
8017 21B087      05500         LD      HL,MENU0        ;INSTRUCTION LINE
801A CD4780      05600         CALL    PRSTR           ;PRINT STRING
                 05700 ;
                 05800 ;
                 05900 ;       READ KEYBOARD FOR MENU SELECTION
                 06000 ;
                 06100 ;
801D CD5080      06200 RKEY    CALL    WAITKY          ;WAIT FOR KEY
8020 FE31        06300         CP      '1'             ;TEST 'READ' SELECTED
8022 2005        06400         JR      NZ,TRYMOD
8024 CD0081      06500         CALL    READ
8027 18EB        06600         JR      ZAPP
8029 FE32        06700 TRYMOD  CP      '2'             ;TEST 'MODIFY' SELECTED
802B 2005        06800         JR      NZ,TRYWRI
802D CD0082      06900         CALL    MODIFY
8030 18E2        07000         JR      ZAPP
8032 FE33        07100 TRYWRI  CP      '3'             ;TEST 'WRITE' SELECTED
8034 2005        07200         JR      NZ,TRYQUI
8036 CD0085      07300         CALL    WRITE
8039 18D9        07400         JR      ZAPP
803B FE34        07500 TRYQUI  CP      '4'             ;TEST 'QUIT' SELECTED
803D 20DE        07600         JR      NZ,RKEY         ;KEEP TRYING
803F 3EC3        07700         LD      A,0C3H          ;JUMP INSTRUCTION
8041 320C40      07800         LD      (400CH),A       ;RESTORE
8044 C32D40      07900         JP      402DH
                 08000 ;
                 08100 ;
                 08200 ;       PRINT STRING
                 08300 ;
                 08400 ;
8047 7E          08500 PRSTR   LD      A,(HL)          ;CHARACTER FROM STRING
8048 B7          08600         OR      A               ;SET FLAGS
8049 C8          08700         RET     Z               ;END OF STRING
804A CD3A03      08800         CALL    033AH           ;PRINT CHAR/MOVE CURSOR
804D 23          08900         INC     HL
804E 18F7        09000         JR      PRSTR
                 09100 ;
                 09200 ;
                 09300 ;       WAIT FOR KEY TO BE PRESSED
                 09400 ;
                 09500 ;
8050 CD5B03      09600 WAITKY  CALL    035BH           ;READ KEYBOARD ASCII
8053 FE00        09700         CP      0               ;TEST NO KEY PRESSED
8055 28F9        09800         JR      Z,WAITKY        ;NO KEY - KEEP TRYING
8057 C9          09900         RET
                 10000 ;
                 10100 ;
                 10200 ;
```

Program Listing 1 Continues

gic spots to allow minor modifications without changing the equated values in the program.

Notice that the program ignores all errors except a Seek error. This allows the buffer to be filled even if CRC errors occur. In some cases, merely re-writing a bad sector will repair it.

One modification is required by those who have other than 35-track disk drives. The instruction at 8120H checks the maximum track number when the track query is answered. Change the immediate value in the instruction to accommodate your drives. The immediate value must be the number of tracks on the drive, not the maximum address. Also, the constant DRIVNO, at 8717H, is coded for operation on drive zero. To use the program on any other drive address, change the value of DRIVNO to 2**DRIVE-ADDRESS.

SIMPLZAP should prove helpful, but I hope you will not have to use it often! ■

Mr. Boasso, a self-employed software consultant, enjoys dining in very expensive restaurants.

```
• Read and convert keyboard response
    Until this is done twice or Enter is pressed Do
      While a key is not pressed Do
        Read keyboard*
      End
      Until key value = 0-9 or A-F Do
        Read keyboard*
      End
    End
    Convert two hex ASCII entries into one byte
• Convert and display
    Extract high four bits of byte
    Shift into low four bits
    Index into hex ASCII number list
    Display ASCII at cursor
    Extract low four bits of byte
    Index into hex ASCII number list
    Display ASCII at cursor
• Display ASCII characters
    Until 16 characters have been displayed
      If byte value is in ASCII range
        Then display byte
        Else display '.'
      Bump ASCII conversion pointer
    End
• Seek to track and set sector
    Move sector number to controller sector register
    Move track number to controller data register
    Set Seek command in controller CMD register
    Until Status <> Busy Do
      Continue
    End
    If Status = Seek error
      Then recalibrate
• Read and execute keyboard commands
    Read keyboard switches
    Case key On =
      Up arrow : Move cursor up
      Down arrow : Move cursor down
      Left arrow : Move cursor left
      Right arrow : Move cursor right
      Other : Continue
    End
    Read keyboard ASCII*
    Case key pressed =
      Enter : Flag Enter pressed
      No key : Continue
      Other key : Do
        Read and convert keyboard response*
        Store into buffer
      End
    End
• Recalibrate
    Set Recalibrate command in controller CMD register
    Until Status <> Busy Do
      Continue
    End
    Seek to track and set sector (C)
```

Fig. 10. Third refinement

Fig. 11. The final product

```
/Initialize/
Disable interrupts
Plug up Basic exits
/Until 'Quit' is selected Do/
    /Display menu/
    Clear screen*
    Write instruction line*
    Display the traditional '?'*
    /Read selection from menu/
    /Wait for any key (C)/
    While no key pressed
      Read keyboard*
    End
    Selection = Pressed key
    Case keyboard selection =
      1 : /Read a sector/
        /Query disk address parameters (C)/
        Until converted input < 23H or <Enter input
          Display two-line query*
          /Read and convert keyboard response (C)/
          Until this is done twice or Enter is pressed Do
            While a key is not pressed Do
              Read keyboard*
            End
            Until key value = 0-9 or A-F Do
              Read keyboard*
            End
          End
          Convert two hex ASCII entries into one byte
        End
        If input was not Enter
          Then store track number
          Else (previous track number will be used)
        Until converted input < 0AH or Enter input
          Display two-line query*
          Read and convert keyboard response (C)
        End
        If input was not Enter
          Then store sector number
          Else (previous sector number will be used)
        /Read disk/
        Start disk motor
        Delay*
        /Seek to track and set sector (C)/
        Move sector number to controller sector register
        Move track number to controller data register
        Set Seek command in controller CMD register
        Until Status <> Busy Do
          Continue
        End
        If Status = Seek Error
          Then /Recalibrate/
            Set Recalibrate command in controller CMD register
            Until Status <> Busy Do
              Continue
            End
            Seek to track and set sector (C)
        Set Read command in controller command register
        Until 256 bytes read Do
          Until Status = DRQ Do
            Continue
          End
          Move a byte from data register to buffer
        End
        Modify buffer contents (C)
      2 : /Modify buffer contents/
        /Display buffer/
        Clear screen*
        Set byte counter to zero
        Set hex conversion pointer to top of buffer
        Set ASCII conversion pointer to top of buffer
        Until 16 lines are displayed Do
          /Convert and display (byte counter) (C)
          Extract high four bits of byte
          Shift into low four bits
          Index into hex ASCII number list
          Display ASCII at cursor
          Extract low four bits of byte
          Index into hex ASCII number list
          Display ASCII at cursor
          Leave a couple spaces
          Until four groups have been displayed Do
            Leave a couple spaces
            Until four bytes have been displayed Do
              Convert and display (byte from hex conversion pointer) (C)
```

Fig. 11 continues

Fig. 11 continued

```
            Bump hex conversion pointer
          End
            End
            /Display ASCII characters/
            Until 16 characters have been displayed
              If byte value is in ASCII range
                Then display byte
                Else display '.'
              Bump ASCII conversion pointer
            End
          End
          /Modify buffer/
          Turn off regular cursor display*
          Set buffer pointer to top of buffer
          Set cursor value to video location of first byte
          Until Enter input Do
            Convert and display (byte from buffer pointer) (C)
            /Read and execute keyboard commands/
            Read keyboard switches
            Case key On =
              Up arrow : Move cursor up
              Down arrow : Move cursor down
              Left arrow : Move cursor left
              Right arrow : Move cursor right
              Other : Continue
            End
            Read keyboard ASCII*
            Case key pressed =
              Enter : Flag Enter pressed
              No key : Continue
              Other key : Do
                Read and convert keyboard response*
                Store into buffer
              End
            End
            Display block symbol over byte at cursor
          End
          Display ASCII characters (C)
      3 : /Write a sector/
          Clear screen*
          Query disk address parameters (C)
          /Write disk/
          Start disk motor
          Delay*
          Seek to track and set sector (C)
          Set Write command in controller command register
          Until 256 bytes read Do
            Until Status = DRQ Do
              Continue
            End
            Move a byte from buffer to data register
          End
      4 : /Quit/
          Return to DOS
    End
  End
```

Program Listing 1 Continued

```
                 10300 ;
8100             10400         ORG     8100H
8600             10500 BUFFER  EQU     8600H
8700             10600 BUFADD  EQU     8700H
8702             10700 BADDR   EQU     8702H
8715             10800 TRAKNO  EQU     8715H
8716             10900 SECTNO  EQU     8716H
83A0             11000 KBMOD   EQU     83A0H
8730             11100 READ1   EQU     8730H
8770             11200 READ2   EQU     8770H
8717             11300 DRIVNO  EQU     8717H
                 11400 ;
                 11500 ;
                 11600 ;       READ A SECTOR INTO BUFFER
                 11700 ;
                 11800 ;
8100             11900 READ    EQU     $
8100 CDC901      12000         CALL    01C9H           ;CLS
8103 CD1081      12100         CALL    QUERRY
8106 CD3F81      12200         CALL    READIT
8109 CD0082      12300         CALL    MODIFY
810C C9          12400         RET
                 12500 ;
                 12600 ;
                 12700 ;       QUERRY DISK ADDRESS PARAMETERS
                 12800 ;
                 12900 ;
8110             13000         ORG     8110H
8110 213087      13100 QUERRY  LD      HL,READ1        ;TWO LINE TRACK QUERRY
8113 CD4780      13200         CALL    PRSTR           ;PRINT STRING
8116 CD5B03      13300         CALL    035BH           ;READ TRACK FROM KYBD
8119 CDA083      13400         CALL    KBMOD           ;READ & CONVERT RESPPONSE
811C FEFF        13500         CP      0FFH            ;TEST <ENTER>
811E 2807        13600         JR      Z,CONTRD        ;<ENTER> - SAME TRACK
8120 FE23        13700         CP      23H             ;TEST ANSWER > 23H TRACKS
8122 30EC        13800         JR      NC,QUERRY       ;TRY AGAIN
8124 321587      13900         LD      (TRAKNO),A      ;STORE TRACK NUMBER
8127             14000 CONTRD  EQU     $
8127 217087      14100         LD      HL,READ2
812A CD4780      14200         CALL    PRSTR           ;PRINT STRING
812D CD5B03      14300         CALL    035BH           ;READ KEYBOARD
8130 CDA083      14400         CALL    KBMOD           ;CONVERT SECTOR
8133 FEFF        14500         CP      0FFH            ;TEST <ENTER>
8135 2807        14600         JR      Z,CONSR2        ;<ENTER> - SAME SECTOR
8137 FE0A        14700         CP      0AH             ;TEST LEGIT SECTOR
8139 30EC        14800         JR      NC,CONTRD
813B 321687      14900         LD      (SECTNO),A      ;SET SECTOR NUMBER
813E C9          15000 CONSR2  RET
                 15100 ;
                 15200 ;
                 15300 ;       READ DISK I/O ROUTINE
                 15400 ;
                 15500 ;
813F 210086      15600 READIT  LD      HL,BUFFER       ;BUFFER ADDRESS
8142 3A1787      15700         LD      A,(DRIVNO)      ;DRIVE NUMBER
8145 32E137      15800         LD      (37E1H),A       ;SELECT DRIVE/START MOTOR
8148 010000      15900         LD      BC,0            ;DELAY APPROX 3 SEC
814B CD6000      16000         CALL    60H
814E CDA081      16100         CALL    SEEK
8151 3E8C        16200         LD      A,8CH           ;READ OPCODE
8153 32EC37      16300         LD      (37ECH),A       ;.. TO CMD REG
8156 0606        16400         LD      B,6             ;DELAY
8158 10FE        16500         DJNZ    $
815A 0600        16600         LD      B,0             ;256 BYTES
815C 3AEC37      16700 RDWT1   LD      A,(37ECH)       ;READ STATUS
815F CB4F        16800         BIT     1,A             ;DRQ?
8161 28F9        16900         JR      Z,RDWT1
8163 3AEF37      17000         LD      A,(37EFH)       ;DATA BYTE
8166 77          17100         LD      (HL),A          ;.. INTO BUFFER
8167 23          17200         INC     HL
8168 10F2        17300         DJNZ    RDWT1
816A C9          17400         RET
                 17500 ;
                 17600 ;
                 17700 ;       SEEK
                 17800 ;
                 17900 ;
81A0             18000         ORG     81A0H
81A0 3A1587      18100 SEEK    LD      A,(TRAKNO)      ;TRACK NUMBER
81A3 57          18200         LD      D,A
81A4 3A1687      18300         LD      A,(SECTNO)      ;SECTOR NUMBER
81A7 5F          18400         LD      E,A
81A8 ED53EE37    18500         LD      (37EEH),DE      ;SECTOR TO SECTOR REG
                 18600                                 ;TRACK TO DATA REG
81AC 3E1F        18700         LD      A,1FH           ;SEEK OP CODE (VERIFY)
81AE 32EC37      18800         LD      (37ECH),A       ;.. TO CMD REG
81B1 0606        18900         LD      B,6             ;DELAY
81B3 10FE        19000         DJNZ    $
81B5 3AEC37      19100 SEEKWT  LD      A,(37ECH)       ;READ STATUS
81B8 CB47        19200         BIT     0,A             ;TEST BUSY
81BA 20F9        19300         JR      NZ,SEEKWT
81BC CB67        19400         BIT     4,A             ;TEST SEEK ERROR
81BE C4C281      19500         CALL    NZ,RECAL
81C1 C9          19600         RET
                 19700 ;
                 19800 ;
                 19900 ;       RECALIBRATE
                 20000 ;
                 20100 ;
81C2 3E03        20200 RECAL   LD      A,03            ;RECAL OP CODE
81C4 32EC37      20300         LD      (37ECH),A       ;.. INTO CMD REG
81C7 0606        20400         LD      B,6
```

Program Listing 1 Continues

Program Listing 1 Continued

```
81C9 10FE       20500          DJNZ    $
81CB 3AEC37     20600 RECLWT   LD      A,(37ECH)        ;READ STATUS
81CE CB47       20700          BIT     0,A
81D0 20F9       20800          JR      NZ,RECLWT
81D2 CDA081     20900          CALL    SEEK
81D5 C9         21000          RET
0000            21100          END
00000 TOTAL ERRORS
```

Program Listing 2

```
                00100 ;;;;;;;;;;;;;;;;;;;;;;;;;;;
                00200 ;             SIMPLZAP        ;
                00300 ;             PART 2          ;
                00400 ;;;;;;;;;;;;;;;;;;;;;;;;;;;
8200            00500          ORG     8200H
8600            00600 BUFFER   EQU     8600H
8700            00700 BUFADD   EQU     8700H
8702            00800 BADDR    EQU     8702H
8703            00900 BUFASC   EQU     8703H
8705            01000 HEXNO    EQU     8705H
                01100 ;
                01200 ;
                01300 ;        MODIFY BUFFER SUBROUTINE
                01400 ;
                01500 ;
8200            01600 MODIFY   EQU     $
8200 CDFD83     01700          CALL    DISPL
8203 CD0782     01800          CALL    MOD
8206 C9         01900          RET
                02000 ;
                02100 ;
                02200 ;        MAIN EDIT LOOP SUBROUTINE
                02300 ;
                02400 ;
8207 210086     02500 MOD      LD      HL,BUFFER        ;POSITION AT TOP
820A 220087     02600          LD      (BUFADD),HL      ;.. OFBUFFER
820D 220387     02700          LD      (BUFASC),HL      ;BUFFER ADDR FOR ASCII
8210 3E0F       02800          LD      A,0FH            ;TURN OFF CURSOR DISPLAY
8212 CD3A03     02900          CALL    033AH
8215 21063C     03000          LD      HL,3C06H         ;FIRST BYTE VIDEO POSN
8218 222040     03100          LD      (4020H),HL       ;SET CURSOR VALUE
821B 2A0087     03200 BLINK    LD      HL,(BUFADD)      ;BUFFER POSN VALUE
821E 7E         03300          LD      A,(HL)           ;FETCH BYTE FROM BUFFER
821F CD6784     03400          CALL    CONVA            ;CONVERT & DISPLAY
8222 CD3E82     03500          CALL    BACKSP           ;BACKSPACE TWO
8225 CD8C84     03600          CALL    DELAY
8228 CD4782     03700          CALL    READKB           ;READ KEYBOARD
822B 3810       03800          JR      C,ENDMOD         ;CARRY = SIG TO QUIT
822D 3E8F       03900          LD      A,8FH            ;BLOCK CURSOR
822F CD3A03     04000          CALL    033AH
8232 CD3A03     04100          CALL    033AH
8235 CD3E82     04200          CALL    BACKSP
8238 CD8C84     04300          CALL    DELAY
823B 18DE       04400          JR      BLINK
823D C9         04500 ENDMOD   RET
                04600 ;
                04700 ;
                04800 ;        BACKSPACE SUBROUTINE
                04900 ;
                05000 ;
823E 3E18       05100 BACKSP   LD      A,18H            ;BACKSPACE CONTROL
8240 CD3A03     05200          CALL    033AH
8243 CD3A03     05300          CALL    033AH
8246 C9         05400          RET
                05500 ;
                05600 ;
                05700 ;        READ KEYBOARD/EXECUTE COMMANDS SUBROUTINE
                05800 ;
                05900 ;
8247            06000 READKB   EQU     $
8247 3A4038     06100          LD      A,(3840H)        ;KEY SWITCHES
824A E678       06200          AND     78H              ;TEST CURSOR CONTROL
824C 2812       06300          JR      Z,RDMOD          ;NO - TEST OTHER KEYS
824E E670       06400          AND     70H              ;TEST UP ARROW
8250 CA8F82     06500          JP      Z,UP
8253 E660       06600          AND     60H              ;TEST DOWN ARROW
8255 CAD382     06700          JP      Z,DOWN
8258 E640       06800          AND     40H              ;TEST LEFT ARROW
825A CA1983     06900          JP      Z,LEFT
825D C35383     07000          JP      RIGHT
8260 CD5B03     07100 RDMOD    CALL    035BH            ;READ KEYBOARD
8263 FE00       07200          CP      0                ;TEST NO KEY
8265 C8         07300          RET     Z
8266 FE0D       07400          CP      13               ;TEST <ENTER>
8268 CA8E83     07500          JP      Z,ENTER
826B CDA083     07600          CALL    KBMOD            ;LOOK FOR BUFFER EDIT
826E 2A0087     07700          LD      HL,(BUFADD)      ;BUFFER ADDRESS
8271 77         07800          LD      (HL),A           ;MODIFY BUFFER VALUE
8272 DD2A0387   07900          LD      IX,(BUFASC)
8276 2A2040     08000          LD      HL,(4020H)       ;CURSOR VALUE
8279 E5         08100          PUSH    HL
827A 112E00     08200          LD      DE,46            ;DISPL OF ASCII AREA
827D 7D         08300          LD      A,L
827E E6C0       08400          AND     0C0H
8280 6F         08500          LD      L,A
8281 19         08600          ADD     HL,DE            ;CURSOR VALUE ASCII AREA
8282 222040     08700          LD      (4020H),HL
8285 CD4E84     08800          CALL    ASCPRT
8288 E1         08900          POP     HL               ;RESTORE CURSOR VALUE
```

Program Listing 2 Continues

Program Listing 2 Continued

```
8289 222040         LD      (4020H).HL
                ;   CONTINUE THIS SUBROUTINE
                ;   BY ENTERING THE 'RIGHT' SUBROUTINE
828C C35383         JP      RIGHT           ;MOVE CURSOR
                ;
                ;
                ;   UP ARROW SECTION OF READKB
                ;
                ;
828F 2A2040     UP      LD      HL,(4020H)      ;CURSOR VALUE
8292 114000         LD      DE,40H          ;VALUE OF 1 LINE
8295 ED52           SBC     HL,DE           ;SET CURSOR 1 LINE LESS
8297 222040         LD      (4020H).HL
829A 11003C         LD      DE,3C00H        ;TEST IN VIDEO RANGE
829D ED52           SBC     HL,DE
829F 301C           JR      NC,OKCUP        ;RANGE OK
82A1 2A2040         LD      HL,(4020H)      ;CURSOR VALUE
82A4 110004         LD      DE,400H         ;POSN TO LAST LINE
82A7 19             ADD     HL,DE
82A8 222040         LD      (4020H).HL
82AB 2A0087         LD      HL,(BUFADD)     ;OLD BUFFER POSITION
82AE 11F000         LD      DE,0F0H         ;POINT TO LAST LINE
82B1 19             ADD     HL,DE
82B2 220087         LD      (BUFADD).HL
82B5 2A0387         LD      HL,(BUFASC)
82B8 19             ADD     HL,DE
82B9 220387         LD      (BUFASC).HL
82BC C9             RET
82BD 111000     OKCUP   LD      DE,10H          ;BUF VALUE OF 1 LINE
82C0 2A0087         LD      HL,(BUFADD)
82C3 ED52           SBC     HL,DE
82C5 220087         LD      (BUFADD).HL     ;SET BUFFER POINTER
82C8 2A0387         LD      HL,(BUFASC)     ;START OF LINE
82CB ED52           SBC     HL,DE
82CD 220387         LD      (BUFASC).HL
82D0 C39183         JP      ENDRDK          ;RETURN
                ;
                ;
                ;   DOWN ARROW SECTION OF READKB
                ;
                ;
82D3 2A2040     DOWN    LD      HL,(4020H)      ;CURSOR VALUE
82D6 114000         LD      DE,40H          ;1 LINE CURSOR VALUE
82D9 19             ADD     HL.DE           ;NEW CURSOR VALUE
82DA 222040         LD      (4020H).HL
82DD 110040         LD      DE,4000H        ;TEST VIDEO RANGE
82E0 ED52           SBC     HL,DE
82E2 3821           JR      C,OKCDN         ;VIDEO RANGE OK
82E4 110004         LD      DE,400H         ;ADJUST TO TOP LINE
82E7 2A2040         LD      HL,(4020H)
82EA ED52           SBC     HL.DE
82EC 222040         LD      (4020H).HL
82EF 2A0087         LD      HL,(BUFADD)     ;OLD BUFFER ADDRESSSS
82F2 11F000         LD      DE,0F0H         ;SET TO TOP LINE
82F5 ED52           SBC     HL.DE
82F7 220087         LD      (BUFADD).HL
82FA 2A0387         LD      HL,(BUFASC)     ;START OF LINE
82FD ED52           SBC     HL,DE
82FF 220387         LD      (BUFASC).HL
8302 C39183         JP      ENDRDK
8305 2A0087     OKCDN   LD      HL,(BUFADD)
8308 111000         LD      DE,10H
830B 19             ADD     HL.DE
830C 220087         LD      (BUFADD).HL
830F 2A0387         LD      HL,(BUFASC)
8312 19             ADD     HL,DE
8313 220387         LD      (BUFASC).HL
8316 C39183         JP      ENDRDK
                ;
                ;
                ;   LEFT ARROW SECTION OF READKB
                ;
                ;
8319 2A2040     LEFT    LD      HL.(4020H)      ;CURSOR VALUE
831C 2B         MOVELF  DEC     HL              ;MOVE IT LEFT
831D 2B             DEC     HL              ;..TWO SPACES
831E 7E             LD      A,(HL)          ;LOOK AT CHAR THERE
831F FE20           CP      20H             ;BLANK?
8321 2023           JR      NZ,OKCLF        ;NO - OK. MOVE IT
8323 7D             LD      A,L             ;LSB CURSOR VALUE
8324 E604           AND     04H             ;TEST START OF LINE
8326 FE04           CP      04H
8328 20F2           JR      NZ,MOVELF       ;NO - KEEP TRYING
832A 7D             LD      A.L
832B E63B           AND     3BH
832D 20ED           JR      NZ,MOVELF
832F 112600         LD      DE,26H
8332 19             ADD     HL,DE           ;MOVE TO END OF LINE
8333 222040         LD      (4020H).HL      ;SAVE IN CURSOR
8336 2A0087         LD      HL.(BUFADD)     ;ADJUST BUFFER POINTER
8339 111000         LD      DE,10H
833C 19             ADD     HL.DE
833D 220087         LD      (BUFADD).HL
8340 CD8F82         CALL    UP              ;GO TO NEXT LINE
8343 2A2040         LD      HL,(4020H)
8346 222040     OKCLF   LD      (4020H).HL
8349 2A0087         LD      HL,(BUFADD)
834C 2B             DEC     HL
834D 220087         LD      (BUFADD).HL
8350 C39183         JP      ENDRDK
                ;
                ;
                ;   RIGHT ARROW SECTION OF READKB
```

Program Listing 2 Continues

Program Listing 2 Continued

```
                       ;
                       ;
8353 2A2040     RIGHT   LD      HL,(4020H)      ;CURSOR VALUE
8356 23         MOVERT  INC     HL
8357 23                 INC     HL
8358 7E                 LD      A,(HL)          ;LOOK AT CHAR THERE
8359 FE20               CP      20H             ;BLANK?
835B 2025               JR      NZ,OKCRT        ;NO - OK FOR MOVE
835D 7D                 LD      A,L             ;LSSB VIDEO ADDR
835E E62C               AND     2CH             ;TEST END OF LINE
8360 FE2C               CP      2CH
8362 20F2               JR      NZ,MOVERT
8364 7D                 LD      A,L
8365 E613               AND     13H
8367 20ED               JR      NZ,MOVERT       ;NO - KEEP TRYING
8369 112600             LD      DE,26H          ;YES - GO TO START OF LINE
836C ED52               SBC     HL,DE
836E 222040             LD      (4020H),HL
8371 2A0087             LD      HL,(BUFADD)     ;ADJUST BUFFER POINTER
8374 111000             LD      DE,10H
8377 ED52               SBC     HL,DE
8379 220087             LD      (BUFADD),HL
837C CDD382             CALL    DOWN            ;GO TO NEXT LINE
837F 2A2040             LD      HL,(4020H)      ;RELOAD CURSOR VALUE
8382 222040     OKCRT   LD      (4020H),HL      ;STORE CURSOR
8385 2A0087             LD      HL,(BUFADD)     ;MOVE BUFFER POINTER
8388 23                 INC     HL
8389 220087             LD      (BUFADD),HL
838C 1803               JR      ENDRDK
                       ;
                       ;
                       ;        ENTER KEY SECTION OF READKB
                       ;        SET CARRY FLAG AS <ENTER> SIGNAL
                       ;
                       ;
838E AF         ENTER   XOR     A
838F D601               SUB     1               ;SET CARRY
8391 C9         ENDRDK  RET
                       ;
                       ;
                       ;        READ AND CONVERT KEYBOARD RESPONSE SUBROUTINE
                       ;        <A> CONTAINS KEYBOARD INPUT
                       ;
                       ;
83A0                    ORG     83A0H
83A0            KBMOD   EQU     $
83A0 2A2040             LD      HL,(4020H)      ;CURSOR VALUE
83A3 0602               LD      B,2             ;DO THIS TWICE
83A5 FE00       TRYLET  CP      0               ;TEST NO KEY
83A7 CAF083             JP      Z,RD2ND         ;READ 2ND CHAR
83AA FE0D               CP      0DH             ;TEST <ENTER>
83AC 2005               JR      NZ,CONTKB       ;NO, GO ON
83AE 3EFF               LD      A,0FFH          ;<ENTER> FLAG
83B0 C3EF83             JP      KBRET
83B3 FE47       CONTKB  CP      47H             ;TEST > 'F'
83B5 D2F683             JP      NC,RET2ND
83B8 FE40               CP      40H             ;TEST < 'A'
83BA 3803               JR      C,TRYNUM        ;NOT A-F TRY A NUMBER
83BC C3C983             JP      NLOOP
83BF FE3A       TRYNUM  CP      3AH             ;TEST > '9'
83C1 D2F683             JP      NC,RET2ND
83C4 FE2F               CP      2FH             ;TEST < '0'
83C6 DAF683             JP      C,RET2ND
83C9 77         NLOOP   LD      (HL),A          ;DISPLAY
83CA 23                 INC     HL
83CB CD5B03             CALL    035BH           ;READ KEYBOARD AGAIN
83CE 10D5               DJNZ    TRYLET
                       ;        CONVERT TO HEX ASCII
                       ;        DISPLAY 2 BYTES/BYTE
83D0 2B         MODBUF  DEC     HL
83D1 2B                 DEC     HL
83D2 7E                 LD      A,(HL)
83D3 FE40               CP      40H
83D5 3802               JR      C,MODNUM
83D7 D607               SUB     7
83D9 E60F       MODNUM  AND     0FH
83DB CB27               SLA     A
83DD CB27               SLA     A
83DF CB27               SLA     A
83E1 CB27               SLA     A
83E3 4F                 LD      C,A
83E4 23                 INC     HL
83E5 7E                 LD      A,(HL)
83E6 FE40               CP      40H
83E8 3802               JR      C,MODNU2
83EA D607               SUB     7
83EC E60F       MODNU2  AND     0FH
83EE B1                 OR      C
83EF C9         KBRET   RET
                       ;
                       ;
83F0 CD5B03     RD2ND   CALL    035BH           ;NO KEY YET - READ AGAIN
83F3 C3A583             JP      TRYLET
                       ;
                       ;
83F6 3E02       RET2ND  LD      A,2             ;TEST FIRST CHAR TYPED
83F8 B8                 CP      B
83F9 C8                 RET     Z
83FA C3F083             JP      RD2ND
                       ;
                       ;
                       ;        DIISPLAY BUFFER CONTENTS SUBROUTINE
                       ;
                       ;
```

Program Listing 2 Continues

Program Listing 2 Continued

```
83FD CDC901        DISPL   CALL  01C9H         ;CLS
8400 AF                    XOR   A
8401 320287                LD    (BADDR),A     ;RELATIVE BUFFER ADDR
8404 0610                  LD    B,10H         ;LINE COUNTER = 16
8406 210086                LD    HL,BUFFER     ;BUFFER ADDRESS
8409 DD210086              LD    IX,BUFFER     ;USED FOR ASCII DISPLAY
840D C5            LINE    PUSH  BC
840E 3A0287                LD    A,(BADDR)     ;BUFFER COUNTER
8411 CD6784                CALL  CONVA         ;CONVERT TO ASCII (HEX)
8414 CD4584                CALL  SPACE         ;LEAVE A COUPLE OF SPACES
8417 0604                  LD    B,4           ;NUMBER OF GROUPS
8419 C5            GROUP   PUSH  BC
841A CD4584                CALL  SPACE
841D 0604                  LD    B,4           ;NUMBER BYTES/GROUP
841F 7E            BYTE    LD    A,(HL)        ;FETCH A BYTE
8420 CD6784                CALL  CONVA
8423 23                    INC   HL
8424 10F9                  DJNZ  BYTE
8426 C1                    POP   BC
8427 10F0                  DJNZ  GROUP
8429 CD4584                CALL  SPACE
842C CD4E84                CALL  ASCPRT
842F C1                    POP   BC
8430 78                    LD    A,B           ;TEST FOR LAST LINE
8431 FE01                  CP    1
8433 280D                  JR    Z,NOCR        ;SKIP CR/LF ON LAST LINE
8435 3A0287                LD    A,(BADDR)     ;INCR BUFFER COUNTER
8438 C610                  ADD   A,10H
843A 320287                LD    (BADDR),A
843D 3E0D                  LD    A,0DH         ;CR/LF AFTER LINE
843F CD3A03                CALL  033AH
8442 10C9          NOCR    DJNZ  LINE
8444 C9                    RET
                   ;
                   ;
                   ;       LEAVE A COUPLE OF SPACES SUBROUTINE
                   ;
                   ;
8445 3E19          SPACE   LD    A,19H         ;SPACE CONTROL CHAR
8447 CD3A03                CALL  033AH
844A CD3A03                CALL  033AH
844D C9                    RET
                   ;
                   ;
                   ;       PRINT ASCII SUBROUTINE
                   ;       <IX> CONTAINS ADDR OF START OF LINE IN BUFFER
                   ;
                   ;
844E 0610          ASCPRT  LD    B,10H         ;16 BYTES IN LINE
8450 DD7E00        DISASC  LD    A,(IX)        ;ADDR OF START OF LINE
8453 FE1F                  CP    1FH           ;TEST < 'BLANK'
8455 3002                  JR    NC.ASCOK1     ;NO - CONTINUE
8457 3E2E                  LD    A,'.'         ; DISPLAY PERIOD
8459 FE80          ASCOK1  CP    80H           ;TEST > 'LO CASE'
845B 3802                  JR    C,ASCOK2
845D 3E2E                  LD    A,'.'         ;DISPLAY PERIOD
845F CD3A03        ASCOK2  CALL  033AH
8462 DD23                  INC   IX
8464 10EA                  DJNZ  DISASC
8466 C9                    RET
                   ;
                   ;
                   ;       CONVERT A BYTE TO HEX-ASCII AND
                   ;       DISPLAY
                   ;       <A> CONTAINS INPUT
                   ;
                   ;
8467 E5            CONVA   PUSH  HL
8468 210587                LD    HL,HEXNO      ;ADDR OF HEX CHARACTERS
846B 4F                    LD    C,A           ;SAVE PARAMETER
846C E6F0                  AND   0F0H          ;HI NIBBLE
846E CB3F                  SRL   A             ;SHIFT TO LO NIBBLE
8470 CB3F                  SRL   A
8472 CB3F                  SRL   A
8474 CB3F                  SRL   A
8476 1600                  LD    D,0           ;CLEAR <D> OF <DE>
8478 5F                    LD    E,A           ;<DE> IS INDEX INTO HEXNO
8479 19                    ADD   HL,DE         ;ADDR OF HEX NUMBER
847A 7E                    LD    A,(HL)
847B CD3A03                CALL  033AH
847E 79                    LD    A,C           ;RESTORE PARAMETER
847F E60F                  AND   0FH           ;LO NIBBLE
8481 5F                    LD    E,A
8482 210587                LD    HL,HEXNO
8485 19                    ADD   HL,DE
8486 7E                    LD    A,(HL)
8487 CD3A03                CALL  033AH
848A E1                    POP   HL
848B C9                    RET
                   ;
                   ;
                   ;       DELAY SUBROUTINE
                   ;
                   ;
848C 010010        DELAY   LD    BC,1000H
848F 0B            DL2     DEC   BC
8490 78                    LD    A,B
8491 B1                    OR    C
8492 20FB                  JR    NZ,DL2
8494 C9                    RET
                   ;
                   ;
0000                       END
00000 TOTAL ERRORS
```

Program Listing 3

```
                ;;;;;;;;;;;;;;;;;;;;;;;;;
                ;       SIMPLZAP        ;
                ;       (PART 3)        ;
                ;;;;;;;;;;;;;;;;;;;;;;;;;
                ;
                ;
                ;       WRITE A SECTOR
                ;
                ;
8500                    ORG     8500H
8600            BUFFER  EQU     8600H
8717            DRIVNO  EQU     8717H
81A0            SEEK    EQU     81A0H
8110            QUERRY  EQU     8110H
                ;
                ;
8500 CDC901     WRITE   CALL    01C9H           ;CLS
8503 CD1081             CALL    QUERRY
8506 CD0A85             CALL    WRITIT
8509 C9                 RET
                ;
                ;
                ;       WRITE I/O SUBROUTINE
                ;
                ;
850A 210086     WRITIT  LD      HL,BUFFER       ;BUFFER ADDRESS
850D 3A1787             LD      A,(DRIVNO)      ;DRIVE NUMBER VALUE
8510 32E137             LD      (37E1H),A       ;START MOTOR/SELECT DRIVE
8513 010000             LD      BC,0            ;DELAY
8516 CD6000             CALL    60H
8519 CDA081             CALL    SEEK
851C 3EAC               LD      A,0ACH          ;WRITE OP CODE
851E 32EC37             LD      (37ECH),A       ;.. TO CMD REG
8521 0606               LD      B,6
8523 10FE               DJNZ    $               ;DELAY
8525 0600               LD      B,0             ;256 BYTES
8527 3AEC37     WRWT1   LD      A,(37ECH)       ;READ STATUS REG
852A CB4F               BIT     1,A             ;DRQ?
852C 28F9               JR      Z,WRWT1         ;NO - LOOP UNTIL DRQ
852E 7E                 LD      A,(HL)          ;DATA BYTE FROM BUFFER
852F 32EF37             LD      (37EFH),A       ;..INTO DATA REG
8532 23                 INC     HL
8533 10F2               DJNZ    WRWT1
8535 C9                 RET
                ;
                ;
                ;       DATA AND STORAGE
                ;
                ;
8600                    ORG     8600H
0100            BUFFER  DEFS    256
0002            BUFADD  DEFS    2
0001            BADDR   DEFS    1
0002            BUFASC  DEFS    2
8705 30         HEXNO   DEFM    '0123456789ABCDEF'
8715 00         TRAKNO  DEFB    0
8716 00         SECTNO  DEFB    0
8717 01         DRIVNO  DEFB    1
8730                    ORG     8730H
8730 53         READ1   DEFM    'SIMPLZAP'
8738 0D                 DEFB    0DH
8739 0D                 DEFB    0DH
873A 45                 DEFM    'ENTER TRACK NUMBER'
874C 0D                 DEFB    0DH
874D 4F                 DEFM    'OR <ENTER> IF SAME TRACK'
8765 0D                 DEFB    0DH
8766 3F                 DEFM    '? '
8768 00                 DEFB    0
8770                    ORG     8770H
8770 0D         READ2   DEFB    0DH
8771 45                 DEFM    'ENTER SECTOR NUMBER'
8784 0D                 DEFB    0DH
8785 4F                 DEFM    'OR <ENTER> IF SAME SECTOR'
879E 0D                 DEFB    0DH
879F 3F                 DEFM    '? '
87A1 00                 DEFB    0
87B0                    ORG     87B0H
87B0 53         MENU0   DEFM    'SIMPLZAP - A DISKETTE REPAIR UTILITY'
87D4 0D                 DEFB    0DH
87D5 0D                 DEFB    0DH
87D6 43                 DEFM    'COPYRIGHT (C)'
87E3 0D                 DEFB    0DH
87E4 42                 DEFM    'B. BOASSO'
87ED 0D                 DEFB    0DH
87EE 37                 DEFM    '700 N. WENDY #7'
87FD 0D                 DEFB    0DH
87FE 4E                 DEFM    'NEWBURY PARK, CA. 91320'
8815 0D                 DEFB    0DH
8816 0D                 DEFB    0DH
8817 53                 DEFM    'SELECT PROCESSING OPTION'
882F 0D                 DEFB    0DH
8830 0D                 DEFB    0DH
8831 31                 DEFM    '1 - READ A SECTOR'
8842 0D                 DEFB    0DH
8843 32                 DEFM    '2 - MODIFY BUFFER'
8854 0D                 DEFB    0DH
8855 33                 DEFM    '3 - WRITE A SECTOR'
8867 0D                 DEFB    0DH
8868 34                 DEFM    '4 - QUIT'
8870 0D                 DEFB    0DH
8871 3F                 DEFM    '? '
8873 00                 DEFB    0
0000                    END
```


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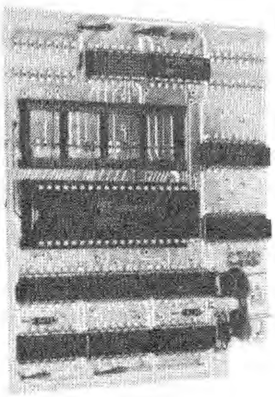

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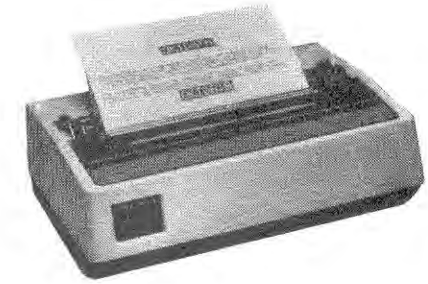

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LOAD 80

This telemarketing program will cut down your company's overhead.

Survey

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As the price of energy escalates beyond everyone's guesses, businesses continue to trim the high cost of travel. The current cost of a personal sales call approaches $200; a solution is Telemarketing, replacing face-to-face sales calls with the telephone.

A low-cost microcomputer can simplify any telemarketing program, including selling, market research and fund drives.

Three Basic programs are included in this system. The main program (Survey) reads input from two other files, created using the other two Basic programs, (Loadfile/BAS and Question/BAS).

Survey (Program Listing 1) reads telephone numbers from one file and questions from another file. After dialing the number for you (using about $10 worth of hardware), the program displays appropriate questions on the screen. As you input answers, the next question is displayed; irrelevant questions are automatically skipped to avoid confusion and save time. The auto-dial saves additional time and money through accurate dialing.

You can program up to thirty screens (questions and statements) in a 16K system. With each screen, up to seven different responses guide you to the next question. After the question routine all the answers are written to an output file where they can be processed further to include mailing lists, order entry and statistical analysis.

The question set development

The Key Box

Basic Level II
Model I or II
16K RAM
Telephone dialing interface

Program Listing 1. Survey

```
10 CLEAR 10000
20 DIM TN$(18), TC$(18), CF$(18), NUM(20), A$(30)
30 DIM QS(30, 3), AAS(30, 7), NA(30), AP(30, 7)
40 DEFINT A-Z
50 CLS
60 PRINT @ 347,"SURVEY"
70 PRINT @ 408,"RODGER WELLS";
80 PRINT @ 471,"COPYRIGHT 1980";
90 FOR X=1 TO 500
100 NEXT
110 CLS
120 INPUT"DO YOU NEED INSTRUCTIONS (Y/N)";A$
130 IF LEFTS(A$, 1)="Y" GOSUB 1570
140 X=0
150 CLS
160 IF LEFT$(TIME$, 2)="00" PRINT"SET CLOCK & DATE...": END
170 GOSUB 1690
180 CLS
190 INPUT"ENTER TELEPHONE NUMBER FILE";FS$
200 OPEN"R",1, FS$
210 INPUT"AREA CODE FROM WHICH CALLS ARE BEING MADE";AC$
220 INPUT"NUMBERS TO PREFIX TO CALLS";PD$
230 INPUT"MUST '1' BE USED TO PLACE LONG DISTANCE CALLS";DD$
240 INPUT"ENTER OUTPUT (RESULTS) FILE NAME";FS$
250 OPEN"O",2, FS$
260 INPUT"QUESTION FILE NAME";FQ$
270 OPEN"I",3, FQ$
280 GOSUB 930
```

Program Listing 1 continues

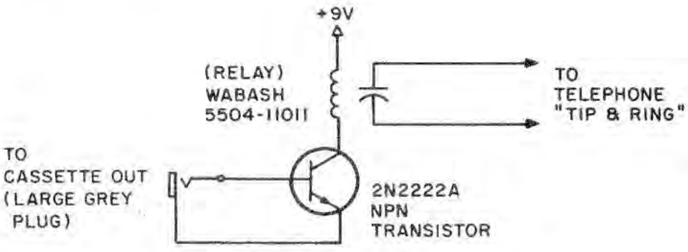

Fig. 1. Telephone dialing relay

requires much thought. You must consider every possible response and plan the appropriate next question. Plan the question set logic with flowchart diagrams to assure that every path is correct before you load the files.

Survey Development

After defining your objectives and your target market and laying out your questioning process, assemble your question file by running Question/BAS (Program Listing 2). You can also modify a similar question file. The program prompts you to input each screen. Use any combination of characters to lay out the screen. The down arrow allows multiple input lines.

"If you purchase a customer list, get one readable by your computer."

You can input three lines for each screen; if you do not need that much space, respond to the prompt with Enter. The maximum input is three 255-character lines, probably more than is ever necessary for a single screen.

After each screen input you are asked how many responses can be expected, determining the steering action to the next question. Straightforward questions such as name and address have only one response.

After stating how many responses (maximum of seven) are possible, input those answers into the file. They act as a menu when you are running Survey. Finally, you will be asked to steer each response to another screen. Careful planning allows specialized messages to be delivered with thirty screens.

You will now be shown a review of the screen. Any item can be changed at this time. When final, the detail is written to your question file to be accessed by Survey.

Create a random access customer file with Loadfile/BAS (Program Listing 3). The file contains three pieces of information for every client: telephone number, a counter to show how many times this number has already been called, and a flag to show if this number is blocked or completed. Loadfile/BAS prompts you for each number. If you enter too many or too few digits, input any non-numerics, or if the second digit of a ten-digit (long distance) number is not a zero or a one, the program will reject it. If you purchase a customer list, get one readable by your computer. A separate program can easily transform the numbers into the correct format.

You now have your audience and questions defined and your numbers loaded into a file. Before going into production, build the simple telephone dialing interface in Fig. 1 to allow Survey to dial your calls through the cassette output port. It does *not* use the cassette on/off relay.

Survey Use

Set the time and date in your system using the DOS Time and Date commands. The output logs start and stop time for analysis. Load Basic and run Survey. You can review instructions in the program itself. You are asked the names for the various files. Enter the telephone area code from which the calls are to originate and any prefix digits (such as 9). You are also asked if 1 must be dialed to place a long distance call. The first telephone number in the file that is not completed will be displayed and you will be asked whether you want to dial it. Answer yes, and the call will be dialed. Press Enter to display your screens. At the end of the call, the answers are written to your outfile and the next number is referenced.

The output file can be used to generate a mailing list, to cut an order or to be statistically studied.

If you plan to reuse the file, save a copy of the original. ■

Program Listing 1 continued

```
290 'FIELD INPUT BUFFER
300 FOR X=Ø TO 18
310 FIELD 1,(X*13) AS DU$, 10 AS TN$(X), 2 AS TC$(X), 1 AS CF$(X
)
320 NEXT
330 NN=1
340 IF EOF(1)PRINT"AT END OF CUSTOMER FILE.": CLOSE: END
350 GET 1, NN
360 FOR X=Ø TO 18
370 IF VAL(TN$(X))=Ø THEN 1420
380 IF CF$(X)="C" THEN 1420
390 IF TN$(X)="" THEN 1420
400 CLS
410 PRINT"NEXT TELEPHONE NUMBER IS...";TN$(X)
420 A$(N+1)=TN$(X)
430 PRINT"THIS NUMBER HAS BEEN TRIED ";TC$(X);" TIMES."
440 A$=""
450 PRINT
460 INPUT"<ENTER> TO PLACE CALL OR 'N' FOR NEXT NUMBER";A$
470 IF LEFT$(A$, 1)="N" THEN 1460
480 IF LEFT$(TN$(X), 3)=AC$THEN TN$(X)=RIGHT$(TN$(X), 7) 'STRIPS
 AREA CODE
490 IF DD$="Y" AND LEN(TN$(X))=10 THEN TN$(X)="1" +TN$(X) 'PREFI
X 1
500 IF DD$="Y" AND LEN(TN$(X))=7 THEN INPUT"MUST '1' BE DIALED F
OR THIS NUMBER (Y/N)";Q2$:IF Q2$="Y" THEN TN$(X)="1" +TN$(X)
510 IF PD$<>"" THEN TN$(X)=PD$+TN$(X)
520 FOR XX=1 TO LEN(TN$(X))
530 T=ASC(MID$(TN$(X), XX, 1))
540 IF T<48 OR T>57 PRINT"BAD NUMBER - SKIPPING": LSET CF$(X)="B
": GOTO 1380
550 NUM(XX)=VAL(MID$(TN$(X), XX, 1))
560 IF NUM(XX)=Ø THEN NUM(XX)=10
570 NEXT XX
580 CLS
590 PRINT"DIALING..."
600 OUT 255, 1
610 FOR Z=1 TO 350
620 NEXT
630 PRINT TN$(X)
640 PRINT"PRESS <ENTER> TO ABORT DIALING."
650 FOR XX=1 TO LEN(TN$(X))
660 IF NUM(XX)=10 PRINT"Ø"; ELSE PRINT NUM(XX);
670 FOR Y=1 TO NUM(XX)
680 OUT 255, Ø
690 B$=INKEY$
700 IF B$<>"" GOTO 1460
710 FOR Z=1 TO 8
720 NEXT 'DIAL PULSE TIMING
730 OUT 255, 1
740 FOR Z=1 TO 8
750 NEXT
760 NEXT Y
770 FOR Z=1 TO 100
780 OUT 255, 1
790 NEXT   'INTERDIGIT TIMING
800 NEXT XX
810 PRINT" "
820 OUT 255, 1
830 PRINT"LIFT HANDSET AND WAIT FOR CONNECTION..."
840 FOR XX=1 TO 1000
850 NEXT
860 OUT 255, Ø
870 PRINT"PRESS <ENTER> WHEN PARTY ANSWERS OR 'N' IF NOT ANSWERE
D"
880 B$=INKEY$
890 IF B$="" THEN 880
900 IF B$="N" THEN PRINT"CALL CANCELLED - HANG UP PHONE": LSET T
C$=MKI$(CVI(TC$(X))+1): GOTO 1460
910 A$(Ø)=TIME$
920 GOTO 1060
930 'READ QUESTIONS FROM FILE
940 IF EOF(3)THEN 1050
950 N=N+1
960 FOR X=1 TO 3
970 LINE INPUT#3, Q$(N, X)
980 NEXT
990 INPUT#3, NA(N)
1000 FOR X=1 TO NA(N)
1010 INPUT#3, AA$(N, X)
1020 INPUT#3, AP(N, X)
1030 NEXT
1040 GOTO 940
1050 RETURN
1060 Q=1
1070 CLS
1080 PRINT
1090 FOR I=1 TO 3
1100 IF Q$(Q, I)<>"" PRINT Q$(Q, I)
1110 NEXT
1120 PRINT
1130 FOR I=1 TO NA(Q)
1140 PRINT I;". ";AA$(Q, I)
1150 NEXT
1160 INPUT A$(Q)
1170 IF NA(Q)=1 THEN V=1: GOTO 1200
1180 V=VAL(A$(Q))
1190 IF V=Ø THEN V=1
1200 NQ=AP(Q, V)
1210 Q=NQ
1220 IF Q<>Ø THEN CLS: GOTO 1080 'V/Q=Ø AT END OF SEQUENCE
1230 CLS
1240 PRINT
1250 PRINT"THANK YOU FOR YOUR TIME."
1260 PRINT
1270 PRINT
1280 PRINT
1290 PRINT"<<   HANG  UP  PHONE  NOW  >>"
1300 A$(Ø)=A$(Ø)+RIGHT$(TIME$, 9)
1310 FOR A=Ø TO N+1
1320 PRINT#2, A$(A)
1330 NEXT A
1340 PRINT
1350 PRINT
1360 INPUT"PRESS <ENTER> TO GO TO NEXT NUMBER";A
```

Program Listing 1 continues

Program Listing 1 continued

```
1370 LSET TC$(X)=MKI$(CVI(TC$(X))+1)
1380 LSET CF$(X)="C" 'COMPLETED CALL
1390 FOR A=0 TO N
1400 A$(A)=""
1410 NEXT
1420 NEXT X
1430 PUT#1, NN
1440 NN=NN+1
1450 GOTO 340
1460 OUT 255, 0
1470 PRINT"CALL HAS BEEN CANCELLED"
1480 PRINT"ENTER (1) TO REDIAL"
1490 PRINT"       (2) SKIP FOR NOW"
1500 PRINT"       (3) BLOCK THIS NUMBER"
1510 INPUT A
1520 ON A GOTO 520, 1420, 1550
1530 PRINT"1 - 3 ONLY"
1540 GOTO 1460
1550 LSET CF$(X)="B"
1560 GOTO 1420
1570 CLS
1580 PRINT"THIS PROGRAM AND YOUR PERSONAL COMPUTER WILL SIMPLIFY
AND SPEED UP A SURVEY OF ANY LARGE NUMBER OF LOCATIONS. YOU MUST
HAVE LOADED A DISK WITH 'FILES' CONTAINING TELEPHONE NUM-
BERS AND THE QUESTIONS TO BE ASKED."
1590 PRINT
1600 PRINT"YOU WILL BE ASKED TO SUPPLY THE FILE NAME FOR THIS IN
PUT
INFORMATION. YOU WILL ALSO BE ASKED TO NAME AN OUTPUT FILE
WHERE YOUR INFORMATION CAN BE STORED."
1610 IF LEFT$(TIME$, 2)<>"00" THEN 1660
1620 PRINT
1630 PRINT" THE COMPUTER WILL BE KEEPING TRACK OF THE TIME TAKEN
TO
GATHER THIS INFORMATION. THE INTERNAL CLOCK MUST BE RUNNING TO
ASSURE ACCURATE INFORMATION. SET THE TIME AND DATE NOW, AND RE-
RUN THE PROGRAM. IF YOU DO NOT KNOW HOW TO DO THIS, SEE"
1640 PRINT"YOUR SUPERVISOR."
1650 END
1660 PRINT @ 970,"PRESS <ENTER> WHEN READY TO GO ON.";
1670 INPUT A$
1680 RETURN
1690 INPUT"DO YOU WANT TO TURN ON THE CLOCK DISPLAY";A$
1700 IF LEFT$(A$, 1)="Y" THEN CMD"CLOCK"
1710 RETURN
```

Program Listing 2. Question/BAS

```
10 CLEAR 10000
20 DEFINT A-Z
30 DIM Q$(30, 3), NA(30), A$(30, 7), AP(30, 7)
40 CLS
50 PRINT @ 340,"QUESTIONNAIRE BUILDER"
60 FOR X=1 TO 500
70 NEXT
80 CLS
90 PRINT"THIS PROGRAM WILL CONSTRUCT A SEQUENTIAL FILE TO BE USE
D
BY 'SURVEY' PROGRAM. YOU MAY EITHER CONSTRUCT A NEW FILE
OR MODIFY AN EXISTING FILE."
100 PRINT
110 INPUT"(1) CREATE NEW FILE
(2) MODIFY EXISTING FILE
";Q
120 ON Q GOTO 140, 740
130 GOTO 100
140 INPUT"DO YOU NEED FURTHUR EXPLANATION (Y/N)";Q1$
150 IF LEFT$(Q1$, 1)="Y" GOSUB 1040
160 N=N+1
170 CLS
180 PRINT"QUESTION/SCREEN # ";N
190 PRINT"(ENTER MESSAGE NOW..UP TO THREE COMPLETE INPUTS. ";CHR
$(92);" CAN BE USED.)"
200 FOR X=1 TO 3
210 LINE INPUT Q$(N, X)
220 IF X=1 AND Q$(N, X)="" THEN 570
230 NEXT X
240 IF F=1 THEN 400
250 PRINT"HOW MANY POSSIBLE RESPONSES TO THIS MESSAGE";
260 INPUT NA(N)
270 IF NA(N)<2 THEN NA(N)=1: A$(N, 1)="(NEXT SCREEN)": AP(N, 1)=
N+1: PRINT"WILL ASSUME PROGRESSION TO SCREEN # ";N+1: FOR X=1 TO
 500: NEXT: GOTO 400
280 FOR X=1 TO NA(N)
290 PRINT"ENTER RESPONSE MESSAGE FOR # ";X;
300 INPUT A$(N, X)
310 NEXT
320 IF F=1 THEN 400
330 CLS
340 PRINT"YOU NOW MUST DIRECT EACH RESPONSE TO THE NEXT QUESTION
/SCREEN."
350 FOR X=1 TO NA(N)
360 PRINT"IF THE RESPONSE IS ";CHR$(34); A$(N, X); CHR$(34);", W
HERE NEXT";
370 INPUT AP(N, X)
380 IF AP(N, X)>HS THEN HS=AP(N, X)
390 NEXT X
400 CLS
410 PRINT"REVIEW OF QUESTION/SCREEN # ";N
420 FOR X=1 TO 3
430 IF Q$(N, X)<>"" PRINT Q$(N, X)
440 NEXT X
450 PRINT
460 PRINT"     ANSWER",,"NEXT SCREEN"
470 FOR X=1 TO NA(N)
480 PRINT X;".";A$(N, X),,AP(N, X)
490 NEXT
```

Program Listing 2 continues

Program Listing 2 continued

```
500 F=0
510 INPUT"IS THIS CORRECT (Y/N)";Q1$
520 IF LEFT$(Q1$, 1)="Y" THEN N=N+1:IF N1>0 THEN 990 ELSE GOTO 1
70
530 INPUT"WHICH IS INCORRECT...
(1) QUESTION
(2) ANSWER(S)
(3) NEXT QUESTION POINTER
";Q
540 F=1
550 ON Q GOTO 170, 250, 350
560 GOTO 530
570 IF N=HS PRINT"THIS SCREEN IS CONTAINED IN YOUR DISPLAY LOGIC
...
CHECK CAREFULLY.": INPUT Z
580 N=N-1
590 IF N<HS THEN N=N+1: GOTO 160
600 INPUT"FILENAME FOR QUESTIONNAIRE DATA";FS$
610 OPEN"O",1, FS$
620 FOR X=1 TO N
630 FOR K=1 TO 3
640 PRINT#1, Q$(X, K)
650 NEXT
660 PRINT#1, NA(X)
670 FOR K=1 TO NA(X)
680 PRINT#1, A$(X, K)
690 PRINT#1, AP(X, K)
700 NEXT
710 NEXT X
720 CLOSE
730 END
740 CLS
750 INPUT"FILE TO RETRIEVE";FS$
760 OPEN"I",1, FS$
770 N=1
780 IF EOF(1)THEN 890
790 FOR X=1 TO 3
800 LINE INPUT#1, Q$(N, X)
810 NEXT X
820 INPUT#1, NA(N)
830 FOR X=1 TO NA(N)
840 INPUT#1, A$(N, X)
850 INPUT#1, AP(N, X)
860 NEXT
870 N=N+1
880 GOTO 780
890 CLOSE
900 N=N-1
910 CLS
920 PRINT"THERE ARE ";N;" QUESTION/SCREENS IN ";FS$
930 FOR X=1 TO 500
940 NEXT
950 N1=N
960 N=1
970 FOR XX=1 TO N1
980 GOTO 400
990 NEXT XX
1000 N=N-1
1010 INPUT"DO YOU WISH TO ADD ADDITIONAL SCREENS (Y/N)";Q1$
1020 IF LEFT$(Q1$, 1)="N" THEN 600
1030 GOTO 160
1040 CLS
1050 PRINT"QUESTIONAIRRE BUILDING PROGRAM"
1060 PRINT
1070 PRINT"THIS PROGRAM WILL CONSTRUCT A SET OF QUESTIONS THAT A
RE USED
BY THE MAIN PROGRAM 'SURVEY'. THE MAIN PROGRAM IS DESIGNED TO
PROMPT AN OPERATOR THROUGH A SERIES OF QUESTIONS (SCREENS)"
1080 PRINT"TO BE USED DURING A TELEPHONE SURVEY OR SALES CALL.

FOR EACH QUESTION/SCREEN, UP TO SEVEN DIFFERENT 'BANDS' OR
'TYPES' OF ANSWERS CAN BE ACCEPTED. THEN, BASED ON THE ANS-
WER RECEIVED, THE PROGRAM WILL STEP TO THE CORRECT NEXT
SCREEN."
1090 GOSUB 1320
1100 PRINT"FOR EXAMPLE, SUPPOSE IF FOR QUESTION #2 YOU ARE ASKIN
G,
'HOW OLD ARE YOU?', YOU MIGHT WANT TO CLASSIFY THE ANSWERS IN
'BANDS' SUCH AS:
(1) 0-10
(2) 11-20
(3) 21 -"
1110 PRINT
1120 PRINT"BASED ON AN ANSWER, THE APPROPRIATE NEXT QUESTION WIL
L BE
DISPLAYED...BECAUSE YOU MIGHT NOT ASK THE SAME QUESTION TO
EVERYBODY YOU SURVEY!"
1130 GOSUB 1320
1140 PRINT"IT IS MOST IMPORTANT THAT YOU HAVE CAREFULLY THOUGHT
THROUGH THE QUESTIONS YOU PLAN TO USE BEFORE YOU BUILD A FILE!
IT IS BEST IF YOU LAY OUT THE QUESTIONS USING A 'FLOW CHART' TO
ASSURE THAT ALL PATHS ARE COMPLETE."
1150 PRINT
1160 PRINT"BE ABSOLUTELY SURE THAT YOU HAVE TESTED THE ENTIRE SE
T OF
QUESTIONS BEFORE YOU BEGIN YOUR QUESTIONNAIRE BUILDING!!

"
1170 GOSUB 1320
1180 PRINT"THE LAYOUT OF THE SCREEN QUESTIONS CAN INCLUDE ANY CH
ARACTERS (,;). YOU CAN EVEN USE THE ";CHR$(92);" TO GIVE YOU A N
EW LINE!
UP TO THREE 255 CHARACTER LINES ARE PERMITTED
WITH EACH SCREEN."
1190 PRINT"EVEN IF YOU DO NOT NEED THIS MUCH SPACE, THE 'ENTER'
KEY
MUST BE PRESSED THREE TIMES TO COMPLETE EACH SCREEN."
1200 GOSUB 1320
1210 PRINT"AS PREVIOUSLY MENTIONED, UP TO SEVEN DISTINCT ANSWER
'TYPES'
ARE POSSIBLE FOR EACH QUESTION/SCREEN. YOU MUST FIRST TELL THE
PROGRAM HOW MANY TYPES TO ACCEPT, THEN YOU MUST ENTER EACH ONE."
1220 PRINT
1230 PRINT"AS THE SYSTEM OPERATES, EACH OF THESE ENTRIES WILL BE
 DISPLAYED
AS CHOICES TO THE OPERATOR."
```

Program Listing 2 continues

✓See List of Advertisers on page 386

Program Listing 2 continued

```
1240 GOSUB 1320
1250 PRINT"FINALLY, FOR EACH OF THE POSSIBLE ANSWERS, YOU MUST
INSTRUCT THE COMPUTER WHICH QUESTION/SCREEN # IS TO BE DISPLAYED
NEXT. NOTE THAT WHENEVER ONLY ONE ANSWER IS POSSIBLE, YOU WILL
AUTOMATICALLY PROGRESS TO THE NEXT ";
1260 PRINT"SEQUENTIAL SCREEN.
WHEN YOU HAVE ENTERED AN INSTRUCTION FOR EACH CHOICE, YOU WILL
BE SHOWN THE ENTIRE SEQUENCE TO REVIEW."
1270 PRINT
1280 PRINT"IF NECESSARY, ANY OF THE ITEMS CAN BE CHANGED AT THIS
 POINT.
(ANOTHER FEATURE WILL PERMIT THIS EDITING CAPABILITY TO MODIFY
A FILE THAT IS CLOSE TO YOUR NEEDS.)"
1290 PRINT"WHEN COMPLETED, THE QUESTION MATERIAL IS WRITTEN TO A
 FILE THAT
YOU SPECIFY. YOU WILL USE THIS FILE NAME WHEN RUNNING 'SURVEY'.
"
1300 GOSUB 1320
1310 RETURN
1320 PRINT @ 980,"PRESS ENTER TO CONTINUE";
1330 INPUT Z
1340 CLS
1350 RETURN
```

```
10 '  FILE LOADER FOR SURVEY PROGRAM
20 CLEAR 1000
30 DIM TN$(18), TC$(18), CF$(18)
40 CLS
50 PRINT @ 335,"SURVEY FILE LOADER";
60 FOR X=1 TO 400
70 NEXT
80 CLS
90 INPUT"DO YOU WANT INSTRUCTIONS (Y/N)";A$
100 IF LEFT$(A$, 1)="Y" GOSUB 630
110 CLS
120 INPUT"FILE NAME FOR TELEPHONE NUMBERS";FS$
130 OPEN"R",1, FS$
140 FOR X=0 TO 18
150 FIELD 1,(X*13)AS DUMMY$, 10 AS TN$(X), 2 AS TC$(X), 1 AS CF$
(X)
160 NEXT 'FIELD RANDOM FILE BUFFER
170 IF EOF(1) THEN 210
180 N=N+1
190 GET 1, N
200 GOTO 170
210 FOR X=0 TO 18
220 IF VAL(TN$(X))<>0 THEN K=K+1: NEXT X
230 PRINT"THERE ARE NOW ";(N*19)+K;" NUMBERS IN ";FS$
240 PRINT
250 INPUT"FROM WHAT AREA CODE WILL CALLS BE MADE";AC$
260 IF K=19 THEN N=N+1: K=0
270 FOR X=K TO 18
280 T$=""
290 PRINT"NUMBER ";(N*19)+X+1;
300 INPUT T$
310 IF T$="" THEN 500
320 GOSUB 550
330 IF BF<>0 THEN 280
340 IF LEN(T$)=7 THEN LSET TN$(X)=T$: GOTO 370
350 IF LEFT$(T$, 3)=AC$THEN LSET TN$(X)=RIGHT$(T$, 7): GOTO 370
360 LSET TN$(X)=T$
370 NEXT X
380 PRINT
390 PRINT
400 PRINT"  ***  WRITING BLOCK TO FILE ***"
410 PRINT"       ***** WAIT PLEASE *****"
420 N=N+1
430 PUT 1, N
440 CLS
450 K=0
460 IF F=0 GOTO 270
470 PRINT"FILE ";FS$;" NOW HOLDS ";(N*19)+X;" NUMBERS."
480 CLOSE
490 END
500 FOR Y=X TO 18
510 LSET TN$(Y)=""
520 NEXT
530 F=1
540 GOTO 380
550 BF=0
560 FOR KK=1 TO LEN(T$)
570 T=ASC(MID$(T$, KK, 1))
580 IF T<48 OR T>57 THEN PRINT T$;" - BAD INPUT CHARACTER. DO NO
T USE ";CHR$(T): BF=1: GOTO 620
590 NEXT KK
600 IF LEN(T$)=10 THEN Z1=VAL(MID$(T$, 2, 1)):IF Z1>1 PRINT"BAD
AREA CODE": BF=1: GOTO 620
610 IF LEN(T$)<>10 AND LEN(T$)<>7 PRINT"ERROR ** WRONG NUMBER OF
 DIGITS ***": BF=1
620 RETURN
630 PRINT
640 PRINT"THIS PROGRAM WILL ALLOW MANUAL ENTRY OF TELEPHONE NUMB
ERS
INTO A RANDOM DATA FILE TO BE ACCESSED BY RODGER WELLS' SURVEY
PROGRAM. YOU MAY EITHER CREATE A NEW FILE OR ADD TO AN EXISTING"
650 PRINT"ONE. DURING THE ACTUAL SURVEY, YOU MAY BLOCK OUT ANY N
UMBER(S)
THAT ARE INVALID. ALL NUMBERS ARE ENTERED AS SEVEN OR TEN DIGIT
NUMBERS WITHOUT HYPHENS OR OTHER SEPARATORS."
660 PRINT"EXAMPLES OF VALID ENTRIES ARE '3773954' AND '201555121
2
FOR 7 & 10D RESPECTIVELY. IF LOCAL NUMBERS ARE ENTERED WITH
AREA CODES, THE PROGRAM WILL STRIP THEM OFF."
670 PRINT
680 INPUT"PRESS << ENTER >> TO CONTINUE.";A
690 RETURN
```

Program Listing 3. Loadfile/BAS

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BUSINESS

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NOW!

The Ultimate in Mailing Packages

POSTMAN MASS MAILING SYSTEM

For the serious businessman who has as little as 100 name mailing list or 200,000 names, THERE IS ONLY ONE SYSTEM FOR YOU!

FEATURES OF THE NEW POSTMAN MASS MAILING SYSTEM

The Postman system (version 2) is an almost COMPLETE rewrite, rethink, redesign of the original POSTMAN. The many features of the new POSTMAN system are quickly outlined below:

MULTI-DRIVE – True multi-drive operation is possible. POSTMAN will search all drives for address files and connect them together into one large file for the duration of that session. Once POSTMAN has found the data files on the disks, the operator "sees" just ONE CONTIGUOUS sorted list of addresses. The operator does not need to tell POSTMAN when to "switch" drives or manually "swap" sections of the data file in and out of the computer's memory. This is the foremost among the list of features because of its relative uniqueness among mail list handlers written for the TRS-80.

LARGE LIST SUPPORT – The multi-drive operation allows the user to access data files on ALL configured drives CONCURRENTLY (at the SAME time) for truly large mailing lists. Files need not be sectioned into smaller "byte size" chunks to fit into memory.

HARD DISK SUPPORT – (HARD DISK POSTMAN only) The FULL utilization of the space and speed of the new hard disk drives is possible with POSTMAN. For example, a 7.5 megabyte drive can be configured to hold almost 60,000 labels. Multiple hard drives can be accessed CONCURRENTLY allowing 200,000++ entry mailing lists.

FORM LETTER CAPABILITY – With the purchase of the separate POSTRITE program, the user is provided with an easy to use form letter generator which will merge a generalized letter produced from a word processing system (i.e. LAZY WRITER, etc.), with the name and address information from the POSTMAN MASS MAILER data base. POSTWRITER allows the user to insert any field from a POSTMAN label entry anywhere in the letter.

MENU OPERATION – As you would in a restaurant, choose your dinner from a list (or MENU). POSTMAN will allow you to direct its actions by selecting from various menus that it will display. A complete discussion of each menu is presented in the manual.

INSERT – New names can be quickly added to your list at any time. The new addresses are placed into the file in their proper sorted order eliminating the need for a separate sort operation after entering a stack of new names. POSTMAN will allow the operator to enter a "batch" of labels without returning to the control menu between each label insertion, thus speeding entry and reducing the aggravation of extra menu control keystrokes.

DELETE – Names can be removed at any time when they are no longer needed.

EDIT – Information in any name entry can be quickly changed at will with "word processor" ease. A "transparent" cursor simply is moved to the label displayed on the computer screen and corrections are just typed over the existing label. If you happen to change a field which is also used as a sort key, POSTMAN will automatically move the changed label to its correct position in the list to maintain the sorted arrangement of the labels.

OVERLAY – When identical changes are needed on many addresses, the OVERLAY feature can make them with one keystroke. The needed changes which are common to many labels are entered into the "overlay mask". When you wish to apply these common changes to any label, one command will do it.

SORT – Arrange your list in any alphabetic or numeric order. The ordering may use one or more fields to control the sort. A machine language heap sort assures fast execution. The sort need only be performed once, the sorted list will stay sorted through all subsequent insertions, deletions, and changes to existing labels. NO NEED to leave the POSTMAN program to use a separate program to sort your data. Your data is sorted quickly and after sort completion, POSTMAN is ready for your next command!

SPECIAL STREET ADDRESS SORT – For the user with many addresses on the same street, POSTMAN will sort your entries by the house NUMBER after grouping those on the same street together. Local city lists can be quickly sorted to aid post office dispatching.

PURGE – Unwanted duplicate addresses can be removed from your list automatically or under operator control.

SEARCH – Any address in your list can be quickly found with fast search and positioning commands. Three different types of searches are provided. A "fast" search which uses a hashing technique, a "selective sequential" search for labels with common fields, and "quick" positioning using the first or major sort field to get you into the general "ball park" of a label or sequence of labels.

LABEL PRINTING – One, a few or all addresses in your list can be printed on standard or non-standard label stock. Up to 6 labels across can be printed with a format YOU can easily control. TWO user definable 'ATTN' lines are provided for any use. Labels can be printed from many of POSTMAN's menus, search, edit, or during label insertion.

EFFICIENCY – POSTMAN is written in the machine's native language to gain the full advantage of the microcomputer's speed. Extensive use of program segmentation reduces the amount of use RAM needed to hold the program, allowing a greater number labels to be kept in core, resulting in faster operation. Little used routines need only be brought into memory when they are needed and once through with their task, release their space back to POSTMAN.

REPORT LISTINGS – A special program to produce columnar listings of address data from your label data base is provided. You can easily specify the information to be printed.

DATA DISK MERGING – Labels can be quickly transferred from one disk to another with the PSTMERGE program callable from the main POSTMAN SYSTEM menu. Source and destination drives needed not be separate drives, prompts to exchange diskettes if the same drive is used, are provided.

DATA DISK PREPARATION UTILITY – Provided with POSTMAN is the DPREP program which allows the user to prepare a floppy/hard disk for use with POSTMAN. This easy to use utility can be told to prepare any portion of the available space on a disk.

DATA INTEGRITY – All data transfers to the disk files are made using special write commands which instructs the operating system to check the validity of EACH write to the disk.

DATA GUARD' – is a special programming technique only offered by Soft Sector Marketing, Inc. If by chance your machine resets while writing information to the disk, you only lose the information that you were writing. Your files are always protected from the danger of losing all the work that you have put in that day. NO OTHER PROGRAM ON THE MARKET OFFERS THIS PROTECTION. If you reset with ANYBODY'S MAILING PACKAGE DURING WRITING you would destroy your ENTIRE data disk. We can't stop your machine from failing but we can protect your data.

IDEAL SYSTEM

Mod III 48K 1-40 Track Drive • 2-80 Track Dual Headed Drives • Dosplus or Newdos-80 Operating Systems

Gives space for over 11,000 names - 5 second average name insertion - time sorts all 11,000 names in less than 4 minutes

*Special version to work on Dosplus 4.0 Hard Disk operating system.

– Overview Available –

The POSTMAN system requires Mod I or Mod III, 48K, 2 disk drives minimum.

Standard Version	Standard Version with POSTWRITER form letter writer	For DOSPLUS Hard Disk 4.0 Operating System
Only **$125.00**	**$175.00**	**$225.00**

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One school district's story.

CIE—Computers in Education

Stephen Radin
751 Bard Ave.
Staten Island, NY 10310

Community School District 22 in New York City has 26 schools: five middle and 21 elementary, and more than 23,000 students. It enjoys successes and suffers problems like other school districts of this size. Its needs and problems are typical of those in schools everywhere.

The district supervisors have concluded that computer illiterates would be ill prepared for their futures. School officials everywhere are reaching the same conclusion.

Because the microcomputing field is so new, a district's entry into it can be frustrating and bewildering. The many experts tell us different things. The hardware and software manufacturers freely criticize their competitors' work and really good user groups for computer educators do not exist yet.

Computers are entering schools by the thousands in an uncoordinated and disjointed fashion all over America. They have found their way into elementary and high school classes and in some school districts machines figure prominently in kindergarten and nursery schools.

No major scientific institution has studied classroom computing's benefits or dangers to our children even though the machines are an unusually powerful force. This is due to the newness of the field and to the people's lack of awareness of just how powerful they are as educational tools.

Teachers are beginning to experiment with this new force. They are using the machines as: computer aided instruction (CAI) devices, with preprogrammed materials to drill or practice; instruments to heighten computer awareness, (children are learning they can control computers and that computers will work for them); teacher's servants to reduce the mundane clerical chores and free them to teach; devices to experiment with "Teaching By Computer." Systems like LOGO appear to allow students to *learn* and not merely practice. These are largely unexplored and have made little impact in classrooms to this date.

One problem with the lack of coordination is that all over the country teachers are re-inventing the wheel. Many are developing software to create a C.A.I. environment, purchasing and testing commercial hardware and software (some good and some mediocre), and rethinking logical patterns that others have already concluded. Little thought and almost no structural organization—groups, periodicals, or research and training centers—provide the sharing of ideas necessary to make strides.

Hardware manufacturers and book publishers are showing interest in this area but if their track record is any sign of the future they will hawk their wares and cut throats in the traditional money-first way until one or two giants control what we can buy.

Recognizing the potential for instructional improvement inherent in this new medium, New York City's Community School District 22 initially developed a four-pronged approach designed to tap this resource. I suspect many districts will move in similar directions during the next 10 years.

District 22's Initial Goals

Computer awareness was the primary component in this district effort. We wanted to expose youngsters in all schools and with varying academic abilities to computers. The overriding philosophy was that computers are controllable much like bikes and television sets. Children would be programming computers to do their bidding and we would train teachers so that they could transmit this philosophy to their students. They would learn about the historical sequence which spawned computers, the physical characteristics of the most common machines and some of the most important consequences of computing in our society as well as how to program their machines. Breaking down fear became a paramount thrust.

The district would develop C.A.I. software in the areas of mathematics and reading and eventually in the other academic areas. Our TRS-80 Model III microcomputer equipment is suited to subjects as diversified as physical coordination and music composition.

The district would develop software packages to help school administrators refine attendance follow-up procedures and maintain parent lists. We would add report cards and other clerical mass data storage functions at a later stage.

The District would regularly examine and test the ideas and products proliferating in the marketplace. We would try LOGO and Pascal with our students and we would experiment with different texts. We decided to attend conferences and coordinate a district-wide sharing of ideas.

We Begin

Community School District 22 began with the hiring of a full time teacher who had 20 years of teaching and supervisory experience including 11 years in the computer education field to coordinate its computer education efforts. Any district, to suc-

SAVE 10%

UTILITIES

This Month Only

TAPE COPY 2

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

Only **$14.95**

*Mod I loads and saves at 500 Baud only.

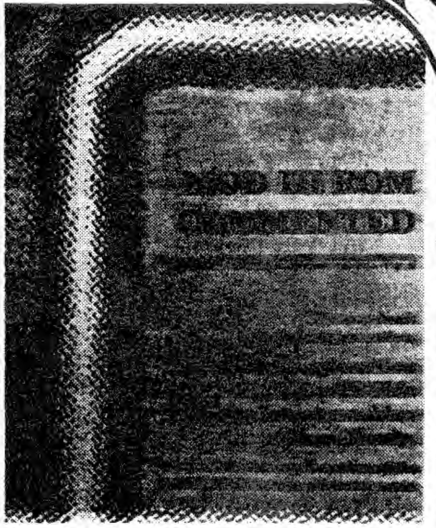
BOSS III

The **B**ASIC **O**PERATED **S**INGLE **S**TEPPER

©1981 Soft Sector Marketing, Inc. For Mod III

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

Cassette (goes to disk) **$18.95**



Do you reap only mysteries from your TRS-80 ROMs?

Your book has arrived!

MOD II ROM COMMENTED

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Not just a rehash of old information, but detailed comments on the ROMs in the latest machine from Tandy.

List **$22.50**

Super Utility Plus SPECIAL

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Mod I & III Version

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TRS-DOS* COMMENTED

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Mod III Radio Shack operating system. Comments on every system files, with a chapter on how to use some of the DOS calls.

Fixes for your TRS-DOS users. Helpful reference guide for experienced machine language programmers.

A MUST FOR EVERY MOD III OWNER!

List $29.95

Introductory Special

$19.95

BUG+

©1981 by James Limkemann

A Self-relocating Machine Language Monitor for MOD I & III

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

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

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

Mod III has all the commands of the Mod I version plus it gives you the ability of reading or writing 1500 baud or 500 baud tapes. You can read at one rate and write at another. Mod I or III. 4K both on same tape.

Cassette **$14.95**

NEW

ZAPSIT

©1981 by Soft Sector Marketing, Inc.

Written for TRS-DOS & DOSPLUS by Larry Ashmun

Requires 32K Disk - Mod III

Zapsit is a stand alone machine language program that lets you examine, modify, copy disk sectors and much more. It does not use any of the resident DOS routines so that you are not limited to the restrictions of the particular DOS that you normally use. You do not have to have a system disk in DRIVE 0 once Zapsit is running.

Currently there are two versions of Zapsit – one for use with TRSDOS* and one for use with DOSPLUS**. They are the same except in the way that they format a disk and the way that they write DATTA ADDRESS MARKS. Because of the diffeneces, they are not interchangable. Writing to a TRSDOS diskette with the DOSPLUS version (or vice-versa) could make the diskette written too unuseable.

For all disk operations you will be asked a series of questions. Each question can be answered by pressing the ENTER Key or by entering a specific value. Pressing the ENTER Key will cause the DEFAULT value to be used. All default values are indicated on the screen at the time the question is asked.

When entering a specific numberic value it is assumed to be DECIMAL unless and H is appended to the number. When and H is appended, the number is assumed to be hexadecimal (base 16).

CAPABILITES

Display/Modify Disk Sectors/Memory. Print to screen, print sector to printer. Modify in Hex. Modify in ASCII.

Change Track & Sector Limits. Single density read and write. Double density read and write for 1-80 track, from 0-18 sectors. Single and dual sided drives.

Format a Disk. S=Standard Format. W=Format without Erase. If you press ENTER or S you will be asked which drive, what density. After answering these questions Zapsit will format the disk using the parameters specified. As each tract is formatted all of the sectors are checked for readability before the next track if formatted. Any unreadable sectors are reported but the operation will not be aborted.

If you type W you will be asked which drive, what density to use and if you want any bad sectors reported to the printer. Before each track is formatted each readable sector on the track is read into a holding area. Unreadable sectors are reported and their holding area is zeroed. After all of the sectors for a track are stored, the track is reformatted and the data in the holding areas written to the appropriate sectors.

Verify a Disk. Verify a disk does just that. It verifies that every sector is readable. Any unreadable sectors are reported. You will be asked if you want the unreadable sectors reported to the printer. Now you can verify that the format of your diskette is in good shape before you copy your important files to a diskette. This prevents loosing your data that you are trying to back up.

Copy Disk Sectors. Copy disk sectors allows you to: Copy sectors (Single or Double Density) from a disk to different sectors on the same disk. Copy sectors from a Double Density disk to a different Double Density disk. Copy sectors from a Single Density disk to a different Single Density disk. Copy sectors from a Single Density disk to a Double Density disk. Copy sectors from a Double Density disk to a Single Density disk. All copying to a Different disk must be done on a Two Drive System.

Zero Disk Sectors. Zero disk sectors allow you to write a value of your choice to the sectors specified.

Read a Track. Reading a track allows you to read an entire track into memory, with all of the address marks and information that you don't normally see with a sector read. The output can be to either the screen or printer.

List $24.95 – **Introductory Special $19.95**

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The Quality Continues

ceed, will have to make a similar personnel commitment. This coordinator should assume responsibility for the development and maintenance of the entire program, including on-site teacher training, curriculum development, hardware aquisition and coordination as well as software development and other related educational functions.

Within two months nine of the 26 schools in the district had teachers in a training phase intended to prepare them to develop computer awareness in their students. This included all five of its middle schools and four of its elementary schools. In six of those schools, student instruction began after six weeks. By the end of four months the other three schools were teaching programming. Fourteen more elementary schools then came on line with their own equipment and teacher training began in those schools. The average period of initial training (before a school can expect to begin teaching children) is approximately six weeks. The district offers continuing instruction on-site to help teachers develop their own curriculum. The last three schools have no plans to participate at this time.

"The overriding philosophy was that computers are controllable . . ."

The initiation process is a quick one providing sufficient commitment is made and support is given.

Minimum Requirements

In the area of computer literacy one microcomputer for every two elementary school classrooms seems a reasonable minimum. Considerable pupil exposure is possible with this commitment. This, coupled with a centrally located teacher trainer and a little relief time for the staff during their approximately fifteen hours of training, serves well. In our experience, middle schools require more equipment and generally cover more ground. They require more hands-on time for each student; a well-functioning lab can be outfitted with five computers which will serve the needs of most medium-sized (1200 student) middle schools.

District 22 has developed a library of hundreds of C.A.I. programs covering areas as diversified as music and math. This is by no means a minimum requirement as many schools find that one or two well-written programs can help solve some of their most severe remediation problems. The same machine requirements apply to this function as well. These programs generally serve a remedial function primarily for the slowest students—youngsters who fail to meet minimum competency standards. Many C.A.I. programs allow students to review modern languages as well as some of the more advanced science concepts and it appears that C.A.I. can enable students of varying ability to use the equipment for remediation during hours when it is not needed to develop a meaningful district-wide C.A.I. program.

To be effective C.A.I. requires a library. This central function requires coordination and a friendly, sharing, non-threatening atmosphere. I suspect that many districts will need to hire a

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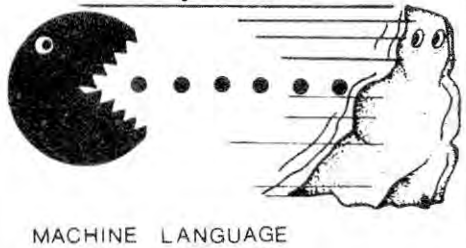

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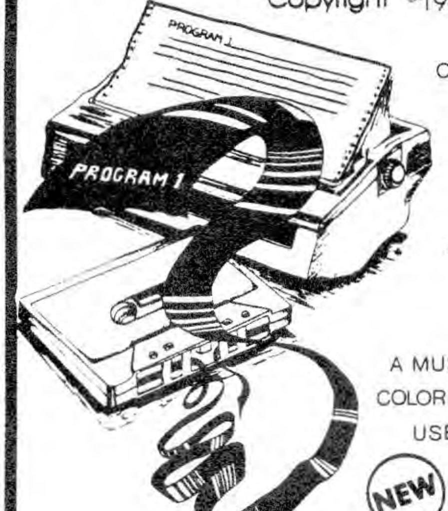

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A MUST FOR ALL COLOR COMPUTER USERS!

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The Quality Continues . . .

central coordinator for this and related functions. Those who cannot afford one will be unable to develop a meaningful C.A.I. program.

A full set of programs exists in the District 22 library to allow for administrative functions such as word processing, label printing and form filing at our schools. We have downplayed this function because if the equipment serves this purpose our classroom-based activities will suffer. When equipment use becomes more regularized the machines will perform tasks such as maintenance of P.T.A. lists, sending absence cards, grades maintenance, and class reorganization. A library must be maintained and someone must be on hand to train personnel and develop new resources.

Minimum Configuration

The minimum single classroom machine allows typewriter keyboard access to a CPU and a Basic language interpreter. It has 16K of memory and has an associated storage device like a tape cassette machine. It displays output on a C.R.T. screen, has RS-232 capability and includes a 300 baud interface as a standard expansion possibility.

"These programs serve a remedial function for the slowest students . . ."

It would be more important for it to be inexpensive ($1,000 in 1981 dollars) than have provision for color or refined graphics. Support is essential. Schools should look for companies with extensive software libraries and numerous repair outlets.

The minimum office machine includes one disk drive (5¼-inch size) and 32K RAM. The same machine could do classroom duty since school office personnel would probably not use the machine for more than about one hour per day.

A dot matrix printer is also needed in each school's office.

Color, hi-resolution graphics and sound are not essential but are a pretty addition in a school environment, and some schools will pay more for them (but not a lot more).

Software is needed at all sites and vendors who can supply a complete range of remedial and drill software will have a great edge in the school marketplace of the future. Ignorance has caused much wasteful buying, (vis. recent lawsuits by dissatisfied computer purchasers), but future buyers will be more wisely advised.

Untapped Resources

Community School District 22 has not made any effort to tap the vast data bases like CompuServe or the nationally available networks like PLATO. While some districts no doubt will, I feel that they will be in the minority for many years. Ten years from now those data bases will include enough to make it worth the expense and I believe that library books will be replaced with terminals in many districts by 1990 when these resources will probably be a great deal less expensive and considerably more comprehensive.

In many districts C.A.I. is the only function computers serve. This is because some considerable staff training is required before a staff member can teach programming, and in most districts that have no trained staff

C.A.I. can be managed with a minimum of training—less than 15 minutes in most cases. This is changing as many more colleges and universities are including computer training in their elementary and secondary teacher training programs. Within ten years, many districts will have enough trained teachers to offer programming to their students. In those districts C.A.I. will be important but it will fall into second place. Computer aided teaching (via a LOGO-like medium) will be more prevalent and this will tend to reduce the C.A.I. further.

New Ideas

We have begun to experiment with LOGO and Pascal and are considering both for future expansion with younger students and those whose needs our current activities are not meeting. We are studying new hardware including the TRS-80 Color Computer, the Atari, Texas Instruments machines and I.B.M. personal computers and we are enlarging our district library of software and texts. We have developed a computer newsletter to keep our district users abreast of the changing software and hardware climate and as a medium for sharing ideas and software.

Community School District 22 will decide in the near future about implementing new languages as well as new hardware.

Similar plans would be appropriate for most moderate or large size school districts. Program implementation for smaller communities would probably have to include a liaison with one or more businesses or higher education institutions. This has already occurred in a number of states and there is every indication that the process will continue. ■

Stephen Radin is a school district computer education coordinator and author of two books in the field. He teaches computer education on the college level.

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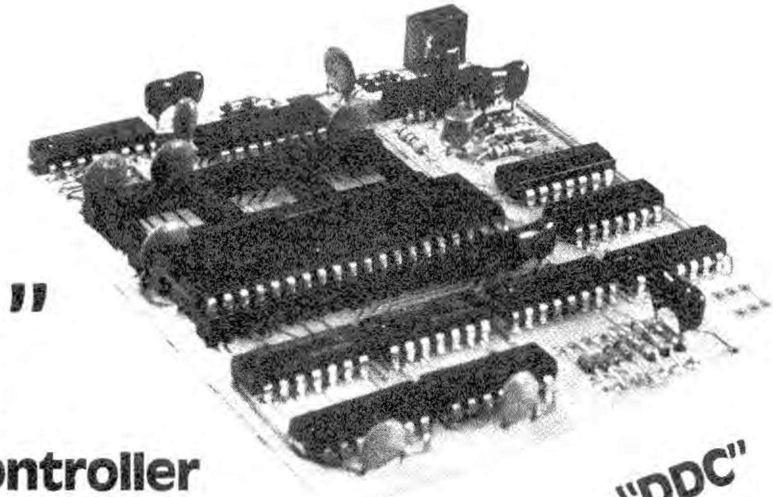

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Tests were conducted on AEROCOMP'S "DDC", Percon… …d LNW's "LNDoubler"** using a Radio Shack TRS80*** Model I, Level 2, 48 K with T… …om TFD100* disk drive (Siemens Model 82). Diskette was Memorex 3401. T… …sed piece of media to determine performance under adverse conditions. The… …ere installed sequentially in the expansion interface.
The test consisted of formatting 40 tracks on th… …pattern on all tracks. The 6DB6 pattern was chosen because it is recommended as… …turers of drives and diskettes. An attempt was then made to read each sector on the di… …ng system was Newdos/80, Version 1.0, with Double Zap, Version 2.0. Unreadable sectors were… …. The test was run ten times with each double density controller and the data averaged. Test res… …the table.

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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

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Specials will be prorated. Shipping $2.00 in Cont. US. See opposite page for details.

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The advances that make the "DDC" great are incorporated in the new AEROCOMP Single Den… …and Double Density Data Separator ("DDS").

★ Has your original manufacturer left you holding the bag?

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MFR. & PRODUCT	SECTORS LOCKED OUT WITHOUT "DDS"	SECTORS LOCKED OUT 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.
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★ "DDS" $49.95
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I don't often write letters such as this, but I feel I should in this case . . . I am suprised and pleased with your DDS. It is not often a product is better than one expects . . . This (these) test (s) used a Percom Doubler "A". (Test without DDS installed showed many errors). (With DDS) not one error!!! After ten (10) tests of formatting and verifing and zeroing NOT ONE FAILURE OR LOCK OUT. Great!!!

Phil Gnadt
Kansas City, Kansas
Phil Gnadt

See opposite page ▸▸▸▸▸▸

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Lockheed Corp.'s Data Base.

Dialog

Dialog Information Retrieval Service
Lockheed Corporation
Palo Alto, CA

Alan Neibauer
11138 Hendrix Street
Philadelphia, PA 19116

Hopefully, people no longer doubt the business and personal advantages accompanying microcomputer ownership. The wide range of excellent software available, as well as the ease with which an individual can program in Basic, should be the best advertisements for the little technical wonders. If not, Dialog Information Retrieval Service, part of the giant Lockheed Corporation, certainly should do the trick.

Dialog's sole purpose is to provide specific information on almost any subject to businesses, individuals and families.

Having over 200 data bases covering some 55 million records, the service provides the computer user with an easy means of searching for and retrieving information. Bases currently on line include listings from medicine to music, legal resources to geology, chemicals to complete listings of grant and foundation sources. History, U.S. Patents, most current periodicals, biographies, agriculture and energy are all subjects open to research (see Table 1).

Dialog is a giant clearinghouse for data bases from both private and governmental areas. Additional bases are always being added; one of the most recent is the Career Placement Registry, a file containing the names of graduates from over 1400 colleges and universities. The scholastic records of graduates can be searched and their resumes ordered so that unique and qualified individuals can be found almost effortlessly.

Searching

Of course, just having all this data available is not enough. Making Dialog most attractive is the wide range of search techniques and aids available to the researcher. You may search for specific information using certain key words found in the reference's title, subject index or abstract. Most data bases also provide additional indexes of searchable fields such as author, date of publication, language, journal name or classification code. The Historical Abstract file, for example, allows searching through fields such as document type, historical period (starting or ending dates), publisher and update. Each data base provides a complete list of particular search fields.

To find specific references, Boolean operators can be used. If you are looking for records dealing with solar energy, for instance, you may search under the descriptor "Solar" or under "Energy." In addition, you may specify records which contain both through the use of "Solar and Energy." The "and," "or" and "not" operators make search expressions such as "children and television and violence" possible.

Through the Search and Save feature of Dialog, you may formulate a search pattern which is stored on the system and automatically performed as data base updates are made. This enables the busy executive to retrieve regular search reports as new records are added.

The search itself is performed with several Basic commands. Each specifies terms to be searched for and compiles a list of sets in which the particular descriptor is found. Once the operator is satisfied that appropriate references have been found, they can be displayed on a CRT or output to a printer in several formats. Dialog can also print results on its own high-speed printers and mail them to the researcher. If complete documents are desired, a Dialorder service places orders with any number of private retrieval services (see Table 2).

With the growing use of CRT terminals, Dialog has made it easier for terminal users without printers. Video line width can be set by the researcher and information displayed one screen at a time by specifying the number of lines. Formerly, a Type command would output to the CRT and printer continuously until the end was reached. This was fine for those with printers but made searching difficult when only a screen was available. Thanks to Dialog's new Display and Page commands this is no longer a problem.

Figure 1 is a sample search made on the Dialog system. Upon signing on to the system and requesting the data base to be searched, Dialog estimates sign-on cost. In fact, each time a new data base is selected the system presents a cost analysis, making it easy for information suppliers to keep track for billing purposes. In this case, the Dialog charge was 20 cents and a 5 cent charge by Telenet for the hook-up time.

I requested file 58; the name and inclusive dates of the file are displayed. File 58 is Geoarchive, a data base published in England by Geosystems Inc. It indexes over 100,000 references per year and currently holds over 300,000 individual citations on geoscience.

Using the Select command, I requested a search for the word "silicon." Dialog responded, placing 111 references with the word into Set 1.

I have a friend who is interested in computers and would like to use them in his geology hobby. He wanted to find out how microprocessors have been used in field work to record and manipulate data. I thus selected "microprocessor" as the next search term and found 19 references. These were placed into Set 2. To reference any citation for additional searching, printing or ordering the Set number is used.

The third term selected was "field." Here the computer found 8299 citations and placed them into Set 3.

Finally, since this was not meant to be an exhaustive search, I asked Dialog to find citations with both the terms "microprocessor" and "field." Two of these were found and placed into Set 4.

You can request that citations be printed on line in several formats. These include

"Dialog is a giant clearinghouse for data bases . . ."

just the Dialog accession number, a full record (usually including an abstract), a bibliographic citation alone, or just the title and indexing information. Each data base varies in the types of format available.

Since I have a printer and wanted the full record without an abstract I commanded TYPE 4/2/1. This directed Dialog to print on my screen and printer the first item of Set 4 in format 2. Requests can be made for any number of items at one time. Users without a printer can use the "Display" command in the same manner. Even if you request to display multiple records, just one will be displayed at a time. The Page command brings the next citation to the screen.

To get a copy of these citations, reenter the same data using the Print command. Citations will be printed by Dialog and mailed to your address on record. When my printer is down I've used this feature and find delivery quick.

Count the Cost

Since I had a reference my friend was interested in reading, I entered Logoff and received the off time and accounting. My search cost $1.58.

By carefully planning your search strategy before logging on, you can find specific information quickly and with the least expense. Unlike CompuServe, which charges a flat hourly rate, the on line charges vary with each data base selected on Dialog. While the average search only takes about 10 minutes if planned in advance, hourly rates can be rather high and a large bill quickly develops if you are not careful.

Rates range from $15 per hour for several practice data bases (called Ontap) to $300 per hour. The average hourly rate, however, ranges from $35 to $70. In addition, a per record charge for printouts made off line and mailed to the researcher varies per data base but ranges from 10 cents to 30 cents with a few exceptions. All but 19 of more than 200 bases make no charge for records printed on line.

One final additional charge is $6.00 per hour connect charge, made by either Telenet or Tymnet. Of course, you can dial Dialog direct to avoid these extra communications charges. (For most of us, long distance calls to California are just too expensive.)

While these hourly rates may seem high they must be placed in perspective. First, the average search time when planned before hand is only about 10 minutes. When doing research for business applications these costs are borne by the client. Second, while the most expensive hourly rate is $300 there are only a few bases with rates over $90. Third, having the research power of Dialog at your keyboard saves the time and expense of other research techniques. In the long run Dialog can save a great deal of money.

Dialog's excellent, and unique, customer service softens the blow of long searches.

Each month active customers receive a free newsletter explaining Dialog changes, new data bases and search tips. Usually included are announcements of free time provided on at least one data base each month. Dialog also operates a series of training seminars in principal cities all over the

ABI/INFORM—Covering the period August 1971 to the present (134,636 records), this data base provides information on all phases of business management and administration. Some 400 primary publications are scanned for articles to be abstracted.

ARTBIBLIOGRAPHIES MODERN—Over 50,000 references to modern art and design.

BIOSIS PREVIEWS—Citations from both *Biological Abstracts* and *Biological Abstracts/RRM* from 8000 primary journals concerning the life sciences.

CA SEARCH—Bibliographic data for all documents covered by Chemical Abstract Service. Almost 5 million records are maintained with biweekly updates.

CHEMNAME, CHEMSEARCH AND CHEMSIS—Listings of all chemical substances, including their molecular formula, ring data, available synonyms and other information. Over 2 million records are in these three bases.

EXCERPTA MEDICA—Over 1 million abstracts and citations of articles from some 3,500 biomedical journals throughout the world.

FOODS ADLIBRA—Up-to-date information on food technology, nutritional and toxicology subjects. Significant developments in processing methods and packaging are included.

FOUNDATION DIRECTORY and FOUNDATION GRANT INDEX—Two files which together contain information on 4000 foundations providing grants.

INTERNATIONAL PHARMACEUTICAL ABSTRACTS—Some 63,000 citations (growing at a rate of 3000 new entries per year) on the development and use of drugs, and on professional pharmaceutical practice.

MAGAZINE INDEX—A broad on line data base of general magazines. Covers some 370 popular magazines in all areas. Monthly updates are made to the already half million citations.

Table 1. Sample Data Bases

↙See List of Advertisers on page 386

". . . Boolean operators can be used."

world. For the serious researcher these seminars are well worth the price since learning how to plan search strategies can save hundreds of dollars in connect time.

While I use Dialog for some business applications, I also find it useful for personal reasons. Since Dialog only charges for connect time, there is no annual fee. This instant library in my home is a valuable asset. ■

Mr. Neibauer, a Philadelphia, PA, school teacher, works part time configuring word and data processing systems and writing business application programs.

For a complete list of Dialog data bases, contact:
Dialog Information Retrieval Services, Inc.
3460 Hillview Avenue
Palo Alto, CA 94304

Begin	Starts a search in a particular file and resets Set numbers to 1.
Expand	Displays related terms from an online thesaurus. Shows words with similar spelling to search term.
Select	Requests postings to sets to be retrieved from the index. Can be used with single words, combined with Boolean operators, prefix codes or limited to specific areas (such as a particular language or source).
Select Steps	Requests postings as above with Boolean operators but places each search element in its own distinct set.
Combine	Used with Boolean operators to relate previously established sets.
Type	Displays records on line to both CRT and printer if available.
Display	Displays records on the CRT. Page length and video width can be specified.
Print	Orders off line prints of specified records.
Logoff	Terminates current connect session and gives cost estimate.

Table 2. Commands

```
? BEGIN   58
        29sep81    14:33:49 User xxxxx
  $0.20 .008 Hrs. File1
  $0.05 Telenet
  $0.25 Estimated Total Cost
  File58: Geoarchive — 74-81/May
        Set    Items    Description

______________________________________

? SELECT SILICON
        1      111       Silicon
? SELECT MICROPROCESSOR
        2      19        Microprocessor
? SELECT FIELD
        3      8299      Field
? COMBINE 2 AND 3
        4      2         2 AND 3
? TYPE 4/2/1
4/2/1
565064      GA479000866
A SIMPLE MICROPROCESSOR SYSTEM FOR FIELD DATA ACQUISITION AND DISPLAY
Ross, PJ
Tech Pap Div Soils CSIRO (Melbourne) 40 17P 1979 JRNL
Code: TPDSCI
LANGUAGE: ENGLISH
DESCRIPTORS: COMPUTER SYSTEMS; FIELD METHODS; PEDOLOGY
DESCRIPTOR CODES: 831000; 815000; 741000

?LOGOFF
        29sep81 14:35:50 User XXXXX
$1.58 .035 Hrs File58 4 Descriptors
$0.40 Telenet
$1.98 Estimated Total Cost
LOGOFF 14:35:54
```

Figure 1. Sample Session

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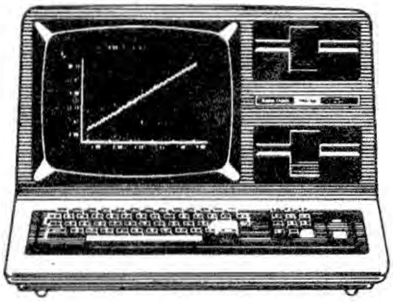

16K	$825
48K	$849
48K 1 DRIVE	$1499
48K 2 DRIVE	$1749

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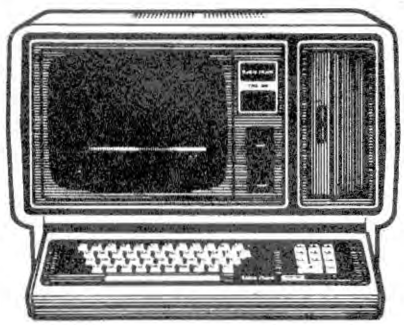

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16K RAM NOW ONLY $16.95

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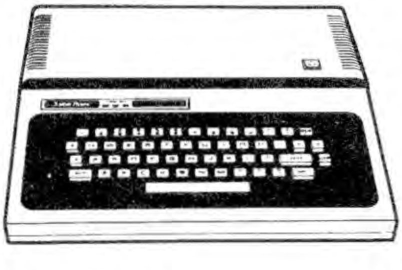

4K LEVEL 1	$318
16K LEVEL I	$335
16K EXT. BASIC	$435
32K EXT. BASIC	$520
DRIVE I	$499
DRIVE 2, 3, 4	$250

American Small Business Computers is not an authorized Radio Shack Dealer. We do not offer a Radio Shack 90 Day Warranty on our computers. Instead, we offer the American Small Business Computers **180 Day Warranty.** If you have a problem with your computer, return it to us for about 48 hours. If we can't fix it, we'll replace it!

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217

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Bigger, better and faster than Level II.

Extended Color Basic

Franklyn D. Miller
8871 Falmouth Drive
Cincinnati, OH 45231

Extended Color Basic for the Color Computer is a powerful language rivaling Disk Basic in its repertoire while lacking some features of Level II. All arithmetic functions are carried out in nine significant figures. It is amazingly fast, especially in graphics functions. You can draw a rectangle in a few tenths of a second and fill it with a different color in two seconds or less.

Since 8K Color Basic has been described before, we will only look at the additional instructions for Extended Color Basic.

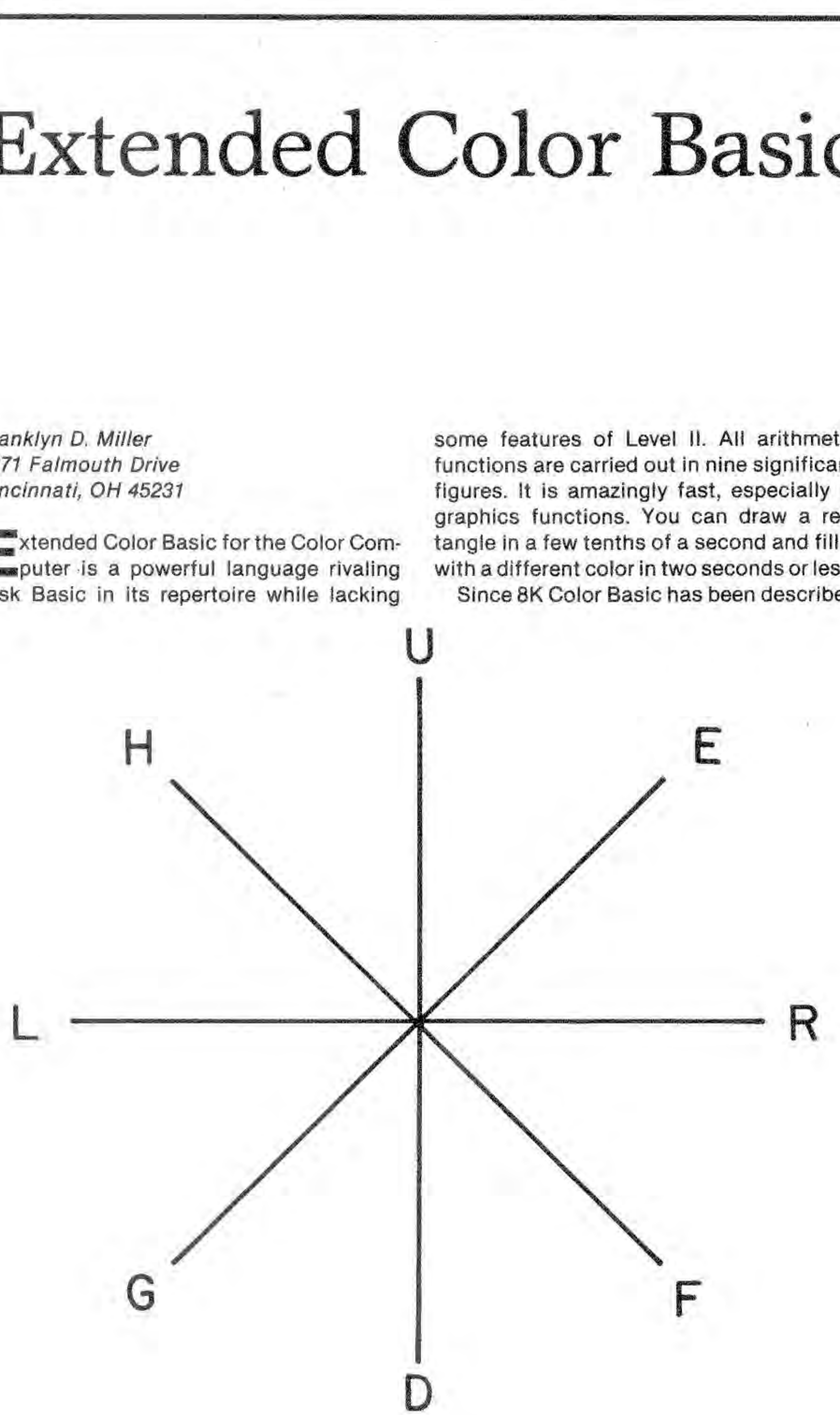

Figure 1

New Color Basic Functions

ATAN (same as Level II).

CIRCLE (for high resolution graphics). A circle can be drawn anywhere on the screen with a designated center (X,Y) of radius R, with a given color C. Choose a height to width ratio in the range of zero to four to form an ellipse. Draw an arc by specifying a starting and ending point using numbers between zero and one. For graphics, that is powerful and fast!

CLOAD M loads a machine language program from cassette at 1500 baud. You can specify the address at which the program starts to load.

COLOR allows you to specify a foreground and a background color for graphics. Lines and points are in the foreground color with an overall screen color set by the background color. Eight colors are available; only two or four can be used at one time (see PMODE).

COS is as in Level II. Radians must be used.

CSAVEM writes a machine language program to tape. This is poorly defined in the manual.

DEF FN defines a function as in Disk Basic. This is not available in Level II.

DEF USR is the same as Disk Basic. You can define up to 10 USR functions.

DEL is the same as delete in Level II. It also deletes program lines but is more forgiving and more flexible.

DLOAD M loads a machine language program at either of two baud rates—300 or 1200. It is also poorly defined in the manual.

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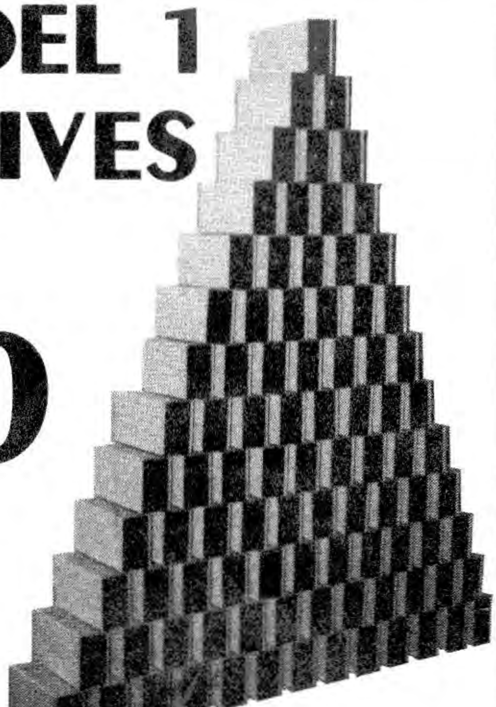
TRS-80* MODEL 1
MINI DISK DRIVES



Our Mini Disk Drives are based on the world famous TEAC Mini Disk Unit. The TEAC Unit features an estimated 8000 power-on-hours mean time between failure (that's 8 hours a day, 5 days a week, for 3.85 years!!). Our drives also feature a lead screw head positioner-not a band type positioner. This type of positioner insures accurate head positioning over the read-write media while giving a very quiet, noise-free read-write operation. If you have any doubts about our drives, our **one year** warranty should convince you that **we** know this unit is the **best** drive at the **best** price on the American market. This is one example where you can pay less and get more!!

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"Thirty or more nested rectangles can be drawn in about one second!"

DRAW is a powerful instruction. Begin a graphics figure anywhere on the screen and draw any of two or four colors in any of eight directions sequentially. You can draw blank lines or draw to scale (1-62) in units of ¼. The color, angle and scale can be specified. For example, the instruction

```
DRAW "BM60,116E20BE20E20F20BF20F20L40BL
40240BU40R40BR40R40G20B620H20BH20H20
BM128,96NU40ND40NE20NF20N620NH20NL40R40:
```

draws a complex star (see Fig. 1.). The instruction set is

- U = up
- R = right
- D = down
- L = left
- E = up 45 degrees to the right
- F = down 45 degrees to the right
- G = down 45 degrees to the left
- H = up 45 degrees to the left
- B = X-axis starting point (Begin)
- M = move
- C = Color (followed by an integer from zero to eight)
- N = No. update. Start again at the beginning.
- S = scale

Appreciating the versatility of this instruction requires experimentation. Invisible lines can be drawn and a series of Draw instructions concatenated into a single instruction (similar to string concatenation). To draw nested rectangles use a loop and change the scale factor. Thirty or more nested rectangles can be drawn in about one second!

EDIT is the same as Level II but you cannot use "EDIT" to access the last line number. When you edit a line, the whole line is displayed and Basic goes into the Edit mode.

EXP is the same as Level II.

Exponentiation (↑) is the same as Level II.

FIX is the same as Level II.

GET is not a disk instruction. Get puts a section of a high resolution screen into an array for later recovery. It is limited by memory. With 16K, the limit is about 36 x 36 for a square or the equivalent in a rectangle. This is good for animation. Five options are available with Get and Put (PSET,PRESET, AND,OR,NOT). (See Put.)

HEX$ is a bonus for machine language users. HEX$ converts decimal to hex, not available in either Level II or Disk Basic.

INSTR returns the starting point of a substring within another string. It is the same as the Disk Basic instruction.

LET is nothing new but can sometimes be used instead of Then.

LINE draws a line between any two points on the screen using the foreground color. It is extremely fast. The format is: Line (X1,Y1)-(X2,Y2). If the beginning point is not specified, the last point set on the screen is the default, -(X1Y1) draws a line from the last point drawn or set to X1,Y1. If the instruction is followed by a ' , B' and the diagonal corners of the rectangle are specified, a rectangle is drawn. If ' , BF' is specified, the rectangle is filled with the foreground color. (The color may be specified with 'COLOR X,Y'.)

LINE INPUT is the same as Disk Basic. There is no "?" displayed and any input from the keyboard is accepted.

LOG is the same as Level II.

MID$ is the same as Disk Basic. It replaces a section of a string with the designated substring. Mid$(A$,10,2) = "MS" replaces the characters at positions 10 and 11 with MS.

PAINT fills any area of the screen with one of four colors designated up to any other one of four color boundaries. The

Instruction	Byte I	Byte II	Byte III				
ABS	255	130	—	MEM	255	147	—
ASC	255	38	—	MID$	255	144	—
ATN	255	148	—	MID$ =	255	144	179
AUDIO	161	—	—	MOTOR	159	—	—
CHR$	255	139	—	NEW	150	—	—
CIRCLE	194	—	—	ON...GOSUB	136 + ASC II	—	—
CLEAR	149	—	—	ON...GOTO	136 + ASC II	—	—
CLOAD	151	—	—	OPEN	153	—	—
CLOADM	151	77	—	PAINT	195	—	—
CLOSE	154	—	—	PCLEAR	192	—	—
CLS	158	—	—	PCLS	188	—	—
COLOR	193	—	—	PCOPY	199	—	—
CONT	147	—	—	PEEK	255	136	—
COS	255	149	—	PLAY	201	—	—
CSAVE	152	—	—	PMODE	200	—	—
CSAVEM	152	77	—	POINT	255	145	—
DATA	134	—	—	POKE	146	—	—
DEF FN	185	204	—	POS	255	152	—
DEF USR	185	255	131	PPOINT	255	160	—
DEL	181	—	—	PRESET	190	—	—
DIM	140	—	—	PRINT	135	—	—
DLOADM	202	77	—	PRINT @	135	64	—
DRAW	198	—	—	PRINT #-1	135	35	172
EDIT	182	—	—	PRINT #-2	135	35	172
END	138	—	—	PRINTTAB	135	164	—
EOF	255	140	—	PRINT USING	135	203	—
EXEC	162	—	—	PSET	189	—	—
EXP	255	151	—	PUT	197	—	—
↑	175	—	—	READ	141	—	—
FIX	255	152	—	REM (OR ')	130	—	—
FOR	128	—	—	RENUM	203	—	—
TO	165	—	—	RESET	157	—	—
STEP	169	—	—	RESTORE	143	—	—
NEXT	139	—	—	RETURN	144	—	—
GET	196	—	—	RIGHT$	255	143	—
GOSUB	129	166	—	RND	255	132	—
GOTO	129	165	—	RUN	142	—	—
HEX$	255	156	—	SCREEN	191	—	—
IF	133	—	—	SET	156	—	—
THEN	167	—	—	SGN	255	128	—
INKEY$	255	146	—	SKIPF	163	—	—
INPUT	137	—	—	SIN	255	133	133
INPUT#-1	137	35	172	SOUND	160	—	—
INSTR	255	158	—	STOP	145	—	—
INT	255	129	—	STRING$	255	161	—
JOYSTK	255	141	—	STR$	255	136	—
LEFT$	255	142	—	SQR	255	155	—
LEN	255	135	—	TAN	255	150	—
LET	186	—	—	TIMER	255	159	—
LIST	148	—	—	TROFF	184	—	—
LLIST	155	—	—	TRON	183	—	—
LINE	187	—	—	USR	131	—	—
LINE INPUT	187	137	—	VAL	255	137	—
LOG	255	153	—	VARPTR	255	157	—

Table 1

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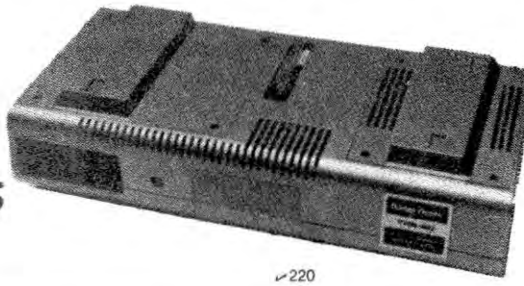

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CAMEO HARD DISK DRIVES FOR TRS-80 MODEL II

The Cameo Hard Disk offers TRS-80 Model II users 10 million bytes of on-line disk storage. Five million bytes are stored on a standard non-removable disk platter. The second five million bytes are stored on a removable "disk pack". This configuration allows, for example, the accounts receivable to be stored on one disk pack, accounts payable on still another disk pack, mailing list on another, etc., etc.

The Cameo also allows up to four computers to share the same disk drive. This means one person working at one computer can be updating accounts payable, while another person working at another computer can be retrieving records from a data base. So...when your business needs soar beyond a floppy disk limitations, call AMERICAN SMALL BUSINESS COMPUTERS and ask for THE CAMEO CONNECTION.

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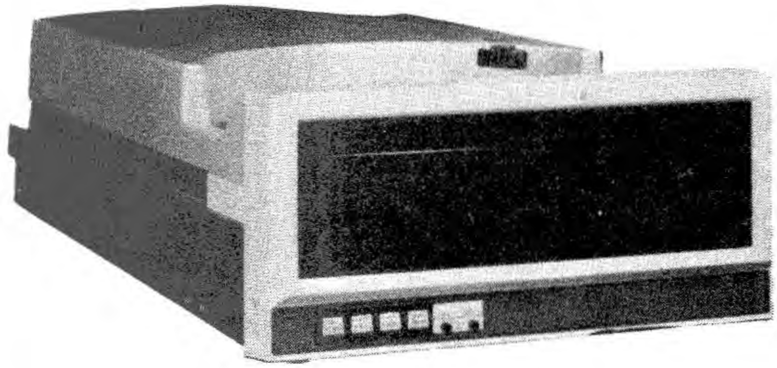

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TRS-80® Daisy Wheel Printer II

By Radio Shack

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Line Printer V	**$1635**
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". . . you can renumber a program or part of a program at any time."

starting point does not need to be accurate. Anywhere within the area to be painted will do. It is surprisingly fast. Eight colors are available depending on the PMODE.

PCLEAR. High resolution graphics require large amounts of memory. Animation alone can use several pages of memory. This makes it necessary to reserve memory at the outset. With 16K you can PCLEAR up to eight pages. The default is PCLEAR 4.

PCLS X sets the screen background color, where X is a number between zero and eight.

PCOPY. If you PCLEAR enough pages then you may PCOPY pages of graphics memory and save them for use in animation.

PEEK is the same as Level II.

PLAY is for those who use sound with their programs. You have twelve notes in five octaves, a pause (rest) and a tempo. These can be set up as strings and the strings concatenated. The music is played through the tv speaker one note at a time. The volume can be varied as can the note length. This instruction is not the same as Sound.

PMODE selects the resolution (0-4) and the memory page where graphics start. Available resolutions are 256 x 192, 128 x 192, 128 x 192, 128 x 96, 128 x 96. Very low resolution (64 x 32) can be used also but without reserving pages.

POKE is the same as Level II.

POS(X) returns the current cursor position. For Level II users this can be used with the printer as POS(-2). POS(-2) will return the printer head position.

PPOINT is the same as Point but in high resolution.

PRESET resets a point to the background color.

PRINT USING is the same as Level II.

PSET is the same as Set but is used in high resolution graphics. A color must be specified.

PUT places an array set up by GET on the screen. The area is designated by diagonal coordinates.

RENUM is a useful command. With it you can remember a program or part of a program at any time. If you need to insert a line and do not have the space just RENUM. It is instantly available.

SCREEN. There are two high resolution graphics modes with two sets of two or four colors. You can choose either and change them in the program. The contents of the screen are not lost in a change.

STRING$ is the same as Level II.

STR$ is the same as Level II.

SQR is the same as Level II.

TAB is the same as Level II.

TIMER can be useful. The timer can be set to zero at any time. Time is kept in increments of 1/60 of a second. It is turned off automatically during cassette loads and saves.

TRON-TROFF is the same as Level II.

VARPTR is the same as Level II.

Some Final Thoughts

The well-written instruction manual includes plenty of exercises and examples. There are twenty-one complete graphics and sound programs, as well as a memory map with entry points for a number of useful ROM routines.

When using the higher resolution graphics it is not possible to put characters on the screen. They must be drawn with the Draw instructions. In high resolution, the pages of screen memory are retained and can be recalled or erased by PCLS. The latest Radio Shack computer catalog announced an upgrade to 32K and one to four disk drives. Spectral Associates of Tacoma, Washington has software for entering Level II tapes into the Color Computer (with some reservations).

For its price, the Color Computer with 16K and Extended Color Basic is a bargain, especially if you use it for games, graphics or educational purposes. Software is scant but developing rapidly. Chromasette is producing a good edition of monthly tapes similar to Cload.

Extended Color Basic has many similarities to Level II and Disk Basic. The main differences are in the memory map and the way Basic tokens are used. Whereas Level II and Disk Basic use only one number to store an instruction, Extended Color Basic uses up to three. Line numbers and pointers are stored the same as Level II except the order is MSB, LSB for the 6809E. For those interested Table I lists the Tokens used in Extended Color Basic for the storage of Basic programs. With this list you can alter Basic programs almost at will.

Some Level II instructions I miss are On Error GOTO, ERL/2+1, Edit, DEFINT, DEFSNG, DEFDBL. The serial printer output is slower than parallel. On the other hand you have upper and lowercase capability (for the printer only) and can access Videotex with inexpensive software. The 32 character by 16 line screen is a disadvantage, but is easy to read. For some, the joysticks are a plus. The cassette system has not given me a poor or difficult Load in over 300 tries and is three times as fast as Level II and six times as fast as Level I. ■

Predict high frequency wave propagation.

Propagation Prediction

John D. Chipman
18 Laurel Drive
Medfield, MA 02052

During the years I became hooked on electronics and radio, computers warmed up large rooms. I never dreamed of using one to aid my new-found interests. But here I am to tell you how your TRS-80 microcomputer can perform a task previously reserved for large mainframes—*predicting* high frequency radio wave propagation. I call the program which performs this task Propagation Prediction.

Propagation Prediction occupies less than 16K of RAM in a Level II machine. The program helps the radio amateur and shortwave listener select the best radio frequencies and times for working or hearing various DX locations. Propagation Prediction provides forecasts based on current solar activity. Figure 1 illustrates some typical MUF (Maximum Usable Frequency) charts as displayed on the screen.

The program presents the predictions in an easy-to-understand graphic display on the screen. The only items you need to enter are solar flux numbers and geographical locations (latitude and longitude). The program reduces much of the prediction complexity to a form the personal computer can manage. You obtain realistic results for path lengths greater than 3000 kilometers. Accuracy decreases rapidly below 3000 km due to short range propagation phenomena factors the program does not consider.

Definitions

Before jumping into the program description, let's review some important radio propagation terms.

The Great Circle Path is the shortest route between any two points on the earth. Remember the earth is a sphere, not the flat surface we all become accustomed to viewing on maps. For example, if you lived in New England and desired to work the Philippines, where would you point your antenna? If you guessed southwest or west, you are wrong. The proper beam heading is north northwest. The shortest path length between New England and the Philippines is over northern Alaska. If you don't believe it, try this small experiment. Get a piece of string and a globe. Hold one end of the string to New England and move the other end due west to the Philippines. Measure the string length, and repeat for a path over Canada and

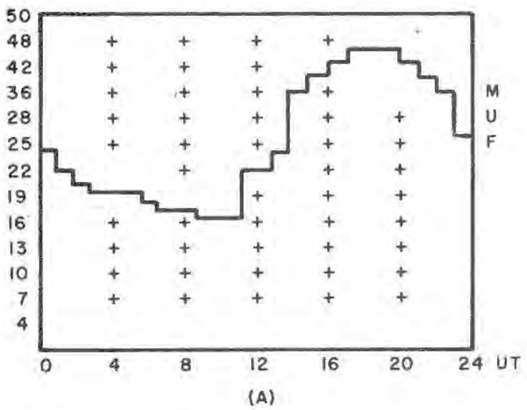


Figure 1a

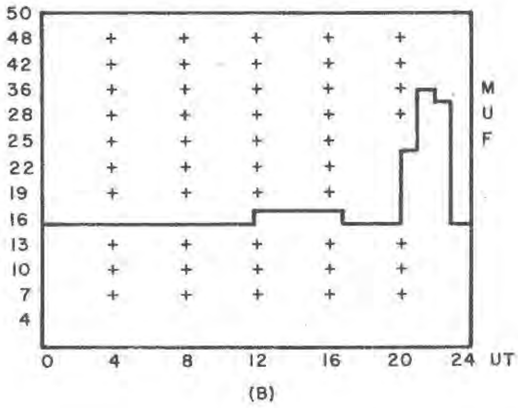


Figure 1b

northern Alaska. It's shorter, isn't it!

Most normal radio propagation follows the shortest path, otherwise known as the Great Circle Path. Some infrequent propagation anomalies do not follow this rule. Propagation Prediction provides both the optimum beam heading and path length for any Great Circle Path.

Maximum Usable Frequency (MUF)

The Maximum Usable Frequency, often referred to as the MUF, is the highest radio frequency which the ionosphere reflects on any given Great Circle Path. If you operate (or listen, in the case of a shortwave listener) on a frequency or band lower than the MUF, the reflection distance, better known as the skip distance, would decrease. Signal strengths tend to be weaker since radio wave absorption increases as the frequency selected is decreased from the MUF.

If you select a frequency higher than the MUF your transmitted radio signal is not reflected back to earth by the ionosphere, but travels out into space. For example, suppose the MUF for the East coast (your location) to the West coast path is 29 MHz (Megahertz). The strongest West coast signals would be found on the ten meter band (28–29 MHz). If you listen on the next higher band, six meters (50 MHz), no signals from the West coast would be heard. Six meters far exceeds the 29 MHz MUF. If you then tune down to 15 meters you would notice that the strongest signals originate from stations closer than the West Coast. West Coast stations, if any, would be weaker than those you hear on 10 meters. If you then tune down even further in frequency, say to 40 or 80 meters, you hear few if any distant stations due to excessive radio wave absorption.

"Most normal radio propagation follows the shortest path, otherwise known as the Great Circle Path."

For any given path, the strongest signal will be at or just below the MUF for that path. Different paths have different MUFs. The MUF for each path varies with respect to diurnal variations (the time of day), seasonal variations, and solar cycle variations. Propagation Prediction takes all three variations into account when displaying an MUF chart for any path selection.

The MUF is a predicted value, not measured or observed. In scientific terms, the MUF is a probabilistic function having a 50 percent probability of occurrence. In other words, there is a 50 percent chance of the actual observed MUF being *at least* as high as the predicted value. It can be and often is one to five MHz higher. But there is also a 50 percent chance that the actual MUF is lower than predicted again by one to five MHz. This 50 percent factor is due to the complex nature of radio wave propagation. No one really understands how the complex solar activity variations affect propagation on a daily basis. Nor can anyone predict what the solar activity is really going to do before it happens, so we must rely on trends of activity. This is why predictions are based on smoothed solar activity and why you must enter into the program the solar flux for the seven days preceding a prediction.

Solar Flux/Sunspot Numbers

There are two world standards for monitoring and recording solar activity: Zurich Sunspot Numbers and Solar Flux Numbers. Linear relationships exist between smoothed Sunspot Numbers, Solar Flux Numbers, and Ultraviolet Radiation (UV) emanating from the sun. UV radiation ionizes (charges) the ionosphere, which is responsible for reflecting radio waves. Intense UV radiation ionizes the ionosphere more than weak UV radiation. The level of ionization in turn determines the MUF; high ionization levels mean high MUFs. With these series of interactions, you can predict the MUF by observing the solar activity. Of the two solar activity standards the average hobbyist can obtain only one on a daily basis—the Solar Flux. Therefore, the program uses Solar Flux for calculating and plotting MUFs.

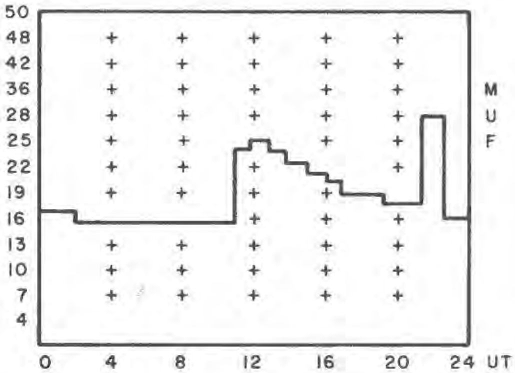
A-Index/K-Index

The A-Index is a standard scale used in measuring and recording the earth's geomagnetic field on a daily basis. Events on the sun influence the field, which in turn affects propagation of radio waves. A high A-Index (greater than 15), usually referred to as active or storm conditions, will generally suppress any east-west and northerly path MUFs below what the program predicts. However, MUFs will rarely be suppressed on any north to south paths. During the onset of or immediately after an active to storm level period, north-south MUFs are often enhanced. East to west or northerly MUFs will be highest during periods of low A-Indices (referred to as quiet conditions).

The K-Index is similar to the A-Index, except measurements of the field are taken every six hours. This provides intra-day geomagnetic field trends. High K-Indices for the day will result in a high A-Index for the same day. A sharp increase in the K-Index (from two to six) indicates the beginning of active to storm level conditions.

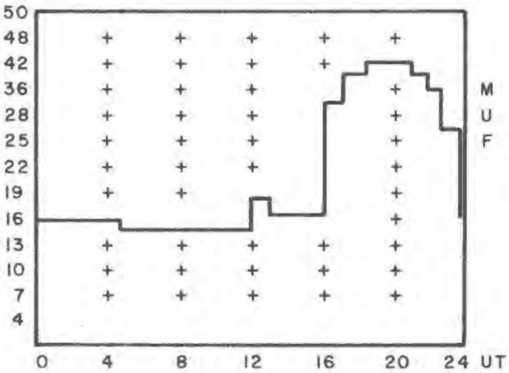
WWV Broadcasts

The Solar Flux numbers required to run the program are broadcast daily by WWV from Boulder, CO, on 5, 10, 15 and 20



(C)

Figure 1c



(D)

Figure 1d

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MHz at 18 minutes after every hour. WWV's signals are usually readable in all of North America even with an inexpensive shortwave receiver. Depending on the time of day, season, and solar activity, one of the four broadcast frequencies will be much stronger than the others. If reception is poor on one frequency, try another or try listening at a different time of day. Better yet, use the program to determine which is best.

The Solar Flux number, A-Index and solar forecast are updated once a day at 0018 UT (Universal Time). The K-Index is updated every six hours starting at 0018 UT. Plotting the Solar Flux and A-Index WWV broadcasts will provide insight into solar activity trends, both short and long term.

Universal Time

Universal Time (UT), the world's standard time, is based on a 24-hour system where 0000 UT is midnight in England. Other names for the same include: UTC; GMT; and ZULU. If a 24-hour digital clock is not available I suggest buying one; otherwise, you must convert from UT to local time. A good 24-hour digital clock will only cost about $10–24. WWV broadcasts the Universal Time every minute; use it to set your 24-hour clock.

Prediction Complexity

The explanations I have presented are simplifications of a very complex phenomenon known as radio wave propagation. There is much to be said for observing solar activity and its relationship with MUFs. A little experience will allow good understanding of the MUF charts the program displays. Although not necessary to use the program, further reading will provide you with better insights into the program. The ARRL Radio Amateur's Handbook available from most electronic hobbyist stores would be a very good starting place. The better you understand the complex nature of propagation, the more accurate you can read the MUF charts the program plots.

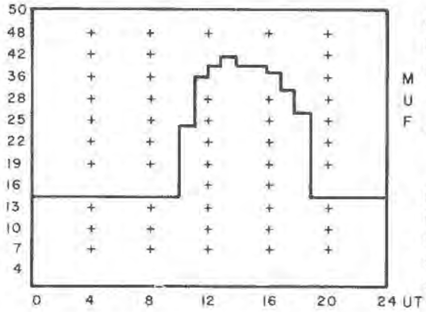
The Program

Lines 10–460 prompt for inputs, set titles and set variables. The program prompts you for: month; day; solar flux; location input option; QTH; QTH latitude and longitude; DX locations; DX latitude and longitude; and another path.

Lines 470–680 are a preprogrammed location subroutine.

Place recorder in play position, CLOAD tape and then RUN.
Enter the month number. 11.
Enter the day number. 15.
Enter the following flux numbers (seven days) upon program prompts: 186, 195, 205, 214, 202, 200, 198.
Select location input option. 1.
Enter location by number. 16 (London).
The program will now display ***COMPUTING***. After about two minutes it will display the propagation chart.

Figure 2



MUF CHART
DATE 15 NOV
FROM BOSTON
N. LAT. 42 DEG
W. LONG. 71 DEG
TO LONDON
N. LAT. 52 DEG
W. LONG. 0 DEG
BEAM HEADING 52 DEG
PATH LENGTH 5274 KM
NO. OF SKIPS 2
SOLAR FLUX 200
SUNSPOT NO. 206

Figure 3

Locations contained within Data statements are displayed on the screen with corresponding numbers. The program searches Data statements for the location, reading in the corresponding latitude and longitude. Data line 570 is reserved for your location data (name, latitude and longitude); be sure to enter that. CSAVE your personal version for later use. Presently, Data statement 570 has my location for demonstrating the program. You can alter any or all of the programmed data lines.

Lines 690–900 set variables used in calculating the propagation chart. They change the average solar flux to a sunspot number. They calculate the distance in radians, kilometers and nauti-

Program Listing

```
10 '* * * * PROPAGATION PREDICTION PROGRAM * * * *
20 'REV 2.0 , LII , 16K , J.D.CHIPMAN , WA1KYH , 9/25/81
30 '* * * * MAIN PROGRAM * * * *
40 CLEAR 200:DIMMF(25):CLS
50 X=0:SF=0:RC=57.296
60 AA$="NORTH LATITUDE":AB$="-90 TO 90"
70 AC$="WEST LONGITUDE":AD$="-180 TO 180"
80 MN$="JANFEBMARAPRMAYJUNJULAUGSEPOCTNOVDEC"
90 CLS:PRINT@20,"PROPAGATION PREDICTION":X=X+1
100 PRINTSTRING$(63,"*"):PRINT
110 ONXGOTO120,160,180,260,320,380
120 INPUT"ENTER THE MONTH NUMBER (1 TO 12)";MN
130 IFMN<1ORMN>12THEN1810
140 MM=(MN-1)*3+1
150 GOTO90
160 INPUT"ENTER THE DAY NUMBER (1 TO 31)";DN
170 IFDN<1ORDN>31THEN1840ELSE90
180 PRINT@192,"ENTER THE SOLAR FLUX FOR THE PAST 7 DAYS"
190 FORZ=1TO7:PRINT@(192+64*Z),"TYPE IN THE FLUX NUMBER FOR DAY"
;Z
200 INPUTFX:IFFX<60THEN1860
210 IFFX>400THEN1880
220 PRINT@(234+64*Z),FX:SF=SF+FX:NEXTZ
230 SF=INT(SF/7+.5)
240 INPUT"ARE THE FLUX NUMBERS CORRECT, (YES/NO)";Q$
250 IFQ$="YES"ORQ$="Y"THEN90ELSE180
260 PRINT"SELECT LOCATION INPUT OPTION"
270 PRINT"1 - PREPROGRAMED LOCATIONS"
280 PRINT"2 - MANUAL LOCATION ENTRY"
290 INPUTQ:IFQ<1ORQ>2THEN1900
300 IFQ=1GOSUB470:X=X+2:GOTO430
310 GOTO90
320 PRINT"ENTER YOUR QTH":INPUTHN$
330 PRINT"ENTER IN DEGREES, YOUR :":PRINTAA$;AB$
340 INPUTLT:IFABS(LT)>90THEN1910
350 PRINTAC$;AD$:INPUTWT
360 IFABS(WT)>180THEN1940
370 GOTO90
380 PRINT"ENTER THE DX'S QTH":INPUTDX$
390 PRINT"ENTER IN DEGREES, THE DX'S :":PRINTAA$;AB$
400 INPUTLR:IFABS(LR)>90THEN1910
410 PRINTAC$;AD$:INPUTWR
420 IFABS(WR)>180THEN1940
430 GOSUB690
440 PRINT@970,"ANOTHER PATH .......................YES/NO";
450 INPUTQ$:IFQ$="Y"ORQ$="YES"THENX=3:GOTO90
460 END
470 REM * * * * PREPROGRAMED LOCATIONS * * * *
480 CLS:PRINT"ENTER THE DX LOCATION BY NUMBER"
490 READHN$,LT,WT:PRINT"FROM ";HN$
500 PRINTSTRING$(63,"*")
510 FORZ=0TO29STEP3:FORY=0TO1:READDX$,DD,DU
520 PRINTTAB(Y*21)Z+Y+1;" - ";DX$;:NEXTY:READDX$,DD,DU
530 PRINTTAB(42)Z+Y+1;" - ";DX$:NEXTZ:RESTORE
540 PRINTSTRING$(63,"*"):INPUTQ
550 FORZ=1TOQ+1:READDX$,LR,WR:NEXTZ
560 RESTORE
570 DATA"BOSTON",42,71
580 DATA"MIAMI",26,81,"SAN ANTONIO",29,98,"SEATTLE",47,123
590 DATA"QUITO",-1,78,"LIMA",-12,77,"SAO PAULO",-24,45
600 DATA"SAN FRANCISCO",37,122,"ANCHORAGE",62,150,"CARACAS",66,1
1
610 DATA"BUENOS AIRES",-35,58,"TOKYO",36,-140,"SYDNEY",-35,-150
620 DATA"TAHITI",-18,150,"HONOLULU",22,157,"MANILA",15,-120
630 DATA"LONDON",52,0,"ROME",42,-12,"MADRID",41,4
640 DATA"MADAGASCAR",-18,-50,"LIBERIA",8,10,"FT LAMY, CHAD",12,-
16
650 DATA"CANARY IS.",25,16,"CAIRO",30,-33,"CAPETOWN",-35,-20
660 DATA"MOSCOW",56,-37,"STOCKHOLM",58,-18,"ATHENS",37,-24
670 DATA"HONG KONG",23,-114,"SINGAPORE",2,-104,"RIYADH",24,-48
680 RETURN
690 REM * * * * * MUF ROUTINE * * * * * *
700 RT=10:EX=9:NT=1.5:SR=250:F0=6:F1=58:PI=3.1415:LG=0
710 CLS:PRINTCHR$(23):PRINT"*** COMPUTING MUF ***"
720 LR(1)=LR:LT(1)=LT:WR(1)=WR:WT(1)=WT
730 LR=LR*PI/180:LT=LT*PI/180
740 WR=WR*PI/180:WT=WT*PI/180
750 WO=WT-PI
760 SN=(SF-70)/.63
770 SN=INT(SN+.5)
780 AL=COS(LT)*COS(LR)*COS(ABS(WT-WR))+COS(ABS(LT-LR))-COS(LT)*C
OS(LR)
790 AL=ATN(SQR(1-AL*AL)/AL)
800 IFSGN(AL)=-1THENAL=PI+AL
810 DM=INT(AL*3956.834+.5)
820 DK=INT(DM*1.6093+.5)
830 HD=(SIN(LR)-SIN(LT)*COS(AL))/(SIN(AL)*COS(LT))
840 HD=ATN(SQR(1-HD*HD)/HD)
850 IFSGN(HD)=>0ANDSGN(SIN(WT-WR))=>0THEN890
860 IFSGN(HD)<0ANDSGN(SIN(WT-WR))=>0THENHD=PI+HD:GOTO890
```

Program continues

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Program continued

```
870 IFSGN(HD)<0ANDSGN(SIN(WT-WR))<0THENHD=PI-HD:GOTO890
880 HD=2*PI-HD
890 HD(1)=INT(HD*RC+.5)
900 NH=INT((AL*5/PI)+1)
910 N=1
920 IFNH>1THENN=2
930 PRINT:PRINTTAB(1)"UT";TAB(10);"MUF";
940 REM DO FOR 0 TO 23 HOURS
950 FORUT=0TO23
960 MF(UT)=60
970 FORIT=1TON
980 IFIT=1THENDF=1/(NH*2):GOTO1000
990 DF=1-1/(NH*2)
1000 NL=(SIN(AL*(1-DF))*SIN(LT)+SIN(AL*DF)*SIN(LR))/SIN(AL)
1010 NL=ATN(NL/SQR(1-NL*NL))
1020 NN=NL*57.296
1030 IFIT=1THENWL=WT+SIN(WR-WT)*AL*DF:GOTO1080
1040 WL=WR+SIN(WT-WR)*AL/(NH*2)
1050 IFABS(WL)<=PITHEN1080
1060 IFSGN(WL)=-1THENWL=PI-ABS(PI+WL):GOTO1080
1070 WL=-PI+ABS(PI-WL)
1080 TA=.0172*(30.4*(MN-1)+DN+10)
1090 TB=.409*COS(TA)
1100 LN=12+.13*(SIN(TA)+1.2*SIN(2*TA))
1110 TN=WL*3.82+LN
1120 IFTN<0THENTN=TN+24
1130 IFTN>24THENTN=TN-24
1140 DT=(-.26+SIN(TB)*SIN(NL))/(COS(TB)*COS(NL))
1150 IFABS(DT)>1-1E-5THENDT=1-1E-5
1160 DT=(24/PI)*(-ATN(DT/SQR(1-DT*DT))+PI/2)
1170 LD=LN-DT/2:LS=LN+DT/2
1180 TD=TN-DT/2:TS=TN+DT/2
1190 IFTD<0THENTD=TD+24
1200 IFTD>24THENTD=TD-24
1210 IFTS<0THENTS=TS+24
1220 IFTS>24THENTS=TS-24
1230 NR=NE*NT[XN
1240 XN=ABS(COS(NL+TB))
1250 IFIT=1THENNX=XN
1260 DR=RT*XN[EX
1270 NR=NT/EXP(-(DT/20))
1280 BT=PI*DR/DT
1290 XS=(XN/(1+BT*BT))*BT*(1+EXP(-DT/NR))
1300 LO=UT-WL*3.82
1310 IFLO<0THENLO=24+LO
1320 IFLO>24THENLO=LO-24
1330 IF(LO<LD)OR(LO>LS)THEN1390
1340 AP=PI*(LO-LD)/DT
1350 XD=(XN/(1+BT*BT))*(SIN(AP)+BT*(EXP(-((LN-LD)/DR))-COS(AP)))
1360 XA=XS*EXP((DT-24)/NR)
1370 IFXD<XATHENXE=XA:GOTO1420
1380 XE=XD:GOTO1420
1390 IFLO>LSTHENXM=XS*EXP(-(LO-LS)/NR):GOTO1410
1400 XM=XS*EXP(-(LO+24-LS)/NR)
1410 XE=XM
1420 FO=(1+SN/SR)*SQR(F0+F1*SQR(XE))
1430 FH=.75*COS(NX+.5)+.5
1440 FS=1-.1*(1+SGN(ABS(SIN(NL-PI/12))-COS(NL-PI/12)))
1450 FT=1+(1-SGN(LT)*SGN(LR))*.1
1460 IFAL>PI/5THENLG=PI/5
1470 M=(1+2.5*(SIN(LG*2.5))[1.5)*FH*FS*FT
1480 MF=FO*M
1490 IFMF<MF(UT)THENMF(UT)=MF
1500 NEXTIT
1510 PRINT@256,UT;:PRINT@274,MF(UT);
1520 NEXTUT
1530 MF(24)=MF(0)
1540 REM * * * * SCREEN DISPLAY * * * *
1550 CLS:PRINT@4,"50";:PRINT@68,"48";
1560 PRINT@132,"42";:PRINT@196,"36";
1570 FOR Z=1 TO 9:X=31-3*Z:PRINT@(195+64*Z),X;:NEXTZ
1580 FOR Z=1 TO 11:FOR X=11 TO 27 STEP4:PRINT@(64*Z+X),"+";:NEXT
X:NEXTZ
1590 FOR Z=0 TO 38:SET(13,Z):SET(63,Z):NEXTZ
1600 FOR Z=13 TO 63:SET(Z,0):SET(Z,38):NEXTZ
1610 PRINT@839,"0";:PRINT@843,"4";:PRINT@847,"8";:PRINT@851,"12"
;
1620 PRINT@855,"16";:PRINT@859,"20";:PRINT@863,"24 UT";
1630 PRINT@226,"M";:PRINT@290,"U";:PRINT@354,"F";
1640 PRINT@40,"MUF CHART";:PRINT@104,"DATE ";DN;" ";MID$(MN$,MM,
3);
1650 PRINT@168,"FROM ";HN$;:PRINT@234,"N. LAT. ";LT(1);"DEG";
1660 PRINT@298,"W. LONG. ";WT(1);"DEG";:PRINT@360,"TO ";DX$;
1670 PRINT@426,"N. LAT. ";LR(1);"DEG";:PRINT@490,"W. LONG. ";WR(
1);"DEG";
1680 PRINT@552,"BEAM HEADING ";HD(1);"DEG";:PRINT@616,"PATH LENG
TH ";DK;"KM";
1690 PRINT@680,"NO. OF SKIPS ";NH;:PRINT@744,"SOLAR FLUX ";SF;
1700 PRINT@808,"SUNSPOT NO. ";SN;
1710 Z=15:Y=3
1720 FOR UT=0 TO 24:F=INT(MF(UT)+.5)
1730 IF F>30 THEN F=30+INT((F-30)/2):IF F>41 THEN F=41
1740 IF UT=0 THEN 1780
1750 IF F<Y THEN 1770
1760 FOR Q=(41-F)TO(41-Y):SET(Z-1,Q):NEXTQ:GOTO1780
1770 FOR Q=(41-Y)TO(41-F):SET(Z-1,Q):NEXT Q
1780 SET(Z,41-F)
1790 SET(Z-1,41-F):Y=F:Z=Z+2:NEXTUT
1800 RETURN
1810 REM * * * * ERROR MESSAGES * * * *
1820 PRINT"MONTH NUMBER MUST BE A WHOLE NUMBER FROM 1 TO 12"
1830 PRINT"WHERE JANUARY IS 1 AND DECEMBER IS 12":GOTO120
1840 PRINT"THE DAY NUMBER MUST BE A WHOLE NUMBER FROM 1 TO 31"
1850 GOTO160
1860 PRINT"THE SOLAR FLUX NUMBER MUST BE GREATER THAN 60"
1870 GOTO200
1880 PRINT"A SOLAR FLUX NUMBER GREATER THAN 400 IS"
1890 PRINT"UNREALISTICALLY HIGH":GOTO200
1900 PRINT"ENTER EITHER A 1 OR A 2 PLEASE":GOTO290
1910 PRINT"THE LATITUDE MUST BE FROM -90 TO 90 WHERE;"
1920 PRINT"-90 IS THE SOUTH POLE AND 90 IS THE NORTH POLE"
1930 IFX=5THEN330ELSE390
1940 PRINT"THE LONGITUDE MUST BE FROM -180 TO 180 WHERE;"
1950 PRINT"- DEGREES ARE IN THE EASTERN HEMISHERE AND +"
1960 PRINT"DEGREES ARE IN THE WESTERN HEMISPHERE"
1970 IFX=5THEN350ELSE410
```

cal miles to the DX location, beam heading in degrees to the DX location, and number of radio skips to the DX location.

Lines 910–1530 calculate the MUF for 0–23 hours via loop UT. If the number of skips is greater than one, the MUF is calculated for each end of the Great Circle Path via loop IT (for iteration). In this case, line 1490 selects the lesser of the two calculated MUFs. Each hour's MUF is stored in the array MF (UT).

Lines 1540–1800 contain a subroutine to display the results. Lines 1710–1790 draw the plot. Lines 1540–1700 display associated information (titles, distance, headings, and so on).

Lines 1810–1970 contain error trapping subroutines for each prompted input.

A Sample Program

Once you have entered Propagation Prediction, try this sample run to verify proper operation. Enter the data shown in Fig. 2, and examine the MUF chart for the two-hop path to London. Figure 3 shows the screen printout of this path. Notice that the graph's vertical scale on the left side is frequency in MHz and the horizontal scale is Universal Time in hours. The chart provides one plotted point per hour.

In this example the highest plotted MUF of the day is about 1300 UT, reaching 42 MHz. England's BBC-1 tv audio may be heard on 41.25 MHz between 1230 to 1430 UT. The lowest MUF of the day is from 2100 to 0900 UT. This is the best time to listen on the lower bands for western Europe. Ten meters (28-29.5 MHz) is best for the western Europe path from about 1130 to 1730 UT.

To determine the best times and frequencies, simply follow along the curve observing the MUF versus time. Remember, the best operating times are when the desired operating frequency is at or just below the MUF curve.

Notice that the highest MUF of the day is during noon, at the midpoint of the path. The lowest MUF of the day is just before sunrise at the most easterly end of the path (around 1330 UT), in this case Europe since sunrise is 5–6 hours earlier than on the US east coast. Rapid increases in the MUF occur after sunrise at the most westerly end of the path (in this case, about 6:30–7:00 am local time (1100 UT)). Rapid decline of the MUF occurs after sunset at the most easterly end of the path, about 1800 UT in Europe. The rate of the MUF curve's decline is slower than its incline. This is due to the physics of the ionosphere.

Conclusions

I have described a program for the prediction of radio propagation which the average ham, shortwave listener (SWLs) or even CB DXer can use. The obvious advantage of this program is the user's ability to select the best times and frequencies for scheduled contacts, DX chasing, and contesting. Imagine the advantage you could have at the start of the next DX contest knowing when to operate and where to aim your antenna.

The program also carries an educational value with it. By entering different levels of solar flux, changing the time of year, or selecting different paths, you can gain a great deal of insight into the phenomenon known as HF radio wave propagation. With enough use you could even become a propagation wizard within your locale, explaining to others how the seasonal, diurnal, and solar cycles affect the band conditions.

The program shown in the listing (Version 2.0) is an abbreviated version of a longer version (2.1). Version 2.1 includes instructions and definitions for reference, both screen print and LPRINT options, an auto-scaling MUF chart option, and a numeric MUF table display option. This version also includes numerous Remark statements throughout the listing to aid in program customization. Version 2.1 is available from the author postpaid on a high quality tape for $19.95. ■

Mr. Chipman, an engineer at GTE, is a ham radio operator and computer hobbyist.

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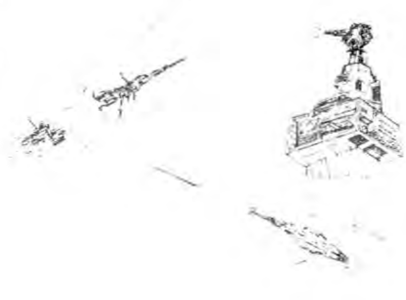

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Microstat vs. Statistical Analysis.

Statistical Analyses Analyzed

Statistical Analysis
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Cat. 26-4540
Model II
$99

Microstat
Ecosoft
P.O. Box 68602
Indianapolis, IN 46268
Model II
$250

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1730 Beaumont Road
Greenville, NC 27834

Statistical analysis on microcomputers is rapidly becoming competitive with the same type of analysis on mainframes. This is especially true where relatively small data sets are the norm. Moreover, statistical analysis of business data by firms employing microcomputers is becoming more and more common. Consequently, a number of general statistical analysis programs are now being marketed. The primary concern in the purchase of a statistical package is the content of that package and whether the computations and concepts are correct. You should consider options in data handling, price, the technical information available, format of the output, and customer service as important aspects when choosing a package.

These two packages contain common statistical procedures. Statistical Analysis runs under TRSDOS 2.0A, while Microstat runs under Pickles and Trout CP/M and MBasic. Both manuals were more than satisfactory, although the Shack manual is slicker and more tutorial. Both contained sample printouts and were easy to follow. The Microstat package, however, contains sample data which can be run to confirm the accuracy not only of the programs, but of how the user is responding to the prompts. This is an excellent feature which should be included in all packages.

Data files in both packages are random access. Each contains a data handling utility allowing the creation of new files and the editing of old files. Microstat allows the user to specify the precision of the files, a desirable feature. I like Radio Shack's data entry better because you can review an observation and reenter it if there is an error. With Microstat's package, you must enter the entire data file and then edit it by observation number; this is not as convenient as reentering observations before they are recorded. Microstat also claims to save every observation as it is input, although my disk drive did not run after entering every observation. Radio Shack did not provide a way to recover data if you accidentally depress Break. I looked in vain for a way to recover data in the Radio Shack manual, but was unable to find it. When one of my students accidentally hit Break during data entry, not even the CONT statement worked.

In terms of entering data, the Radio Shack package is a little more convenient. However, this is more than offset by the ability to transform data available with Microstat. Anyone who deals with statistics, especially regression, knows that all relationships are not linear, even though least squares regression works only with linear functions. Statisticians handle this situation by transforming the data, say to logarithms or reciprocals, thereby enabling the analysis of nonlinear relationships. Also, it is sometimes easier to enter raw numbers and compute a variable from those raw numbers than to do the computations by hand. If, for example, you wish to use income per person as a variable, it is much easier to enter income and the population of a locality into the data file and then form the income/population variable through a transformation than to make all of the divisions by hand or write a program to do them. The lack of the ability to transform variables in Statistical Analysis is a serious deficiency.

A serious deficiency in Radio Shack's data handling utility is the lack of a satisfactory method for subsetting observations in the data set. Radio Shack allows specifying up to ten values of a particular variable that the program uses to select observations for analysis. While this is better than nothing, it makes it difficult if you are dealing with a large data set and impossible if you wish to subset on more than one variable. Microstat solves this problem by providing file moving and merging utilities as well as a sorting utility. While it is not as convenient as the mainframe packages, you can sort on multiple keys and then subset by either copying part of a file to another file or specifying that only certain observations in the sorted file be used.

Both packages contain programs for descriptive statistics (mean, standard deviation, range, and so on) and histograms. The Radio Shack package has separate programs, while Microstat combines them. The Radio Shack package offers an option to let the computer determine the intervals based on the data, while Microstat requires the user to enter the lower limits of each class. I prefer having the option of allowing the computer to compute the frequency and histogram intervals. It is simply more convenient not to have to run the descriptive statistics program to see the distribution of the data. More sophisticated researchers would probably like Microstat's program better, since it provides the sum of squares, the deviation sum of squares, and the first four moments about the mean.

In addition to descriptive statistics and histograms, each package offers analysis of variance, correlation analysis, regression analysis, and time-series analysis. In general, the programs do what they are supposed to. Radio Shack's ANOVA offers one-way, randomized block and two-way, factorial design while Microstat offers simple one-way as well as the other two. Microstat's correlation program is more sophisticated in that it provides the sum-of-squares-and-crossproducts matrix as well as the variance-covariance matrix and the correlation matrix. Again, Microstat has added that extra touch which could be valuable to those doing more sophisticated research projects.

The difference in sophistication between the two programs shows up especially well when comparing the regression packages. The Shack offers multiple regression in one subprogram and simple regression within the correlation program, a satisfactory arrangement. The regression is full model with complete analysis of the variance table. Unfortunately, it does not display (or apparently compute) the t ratios which indicate whether a particular coefficient is significantly different from zero. The user is left to do this from the output of the regression slopes and their standard deviations. There is no Durbin-Watson statistic and no residual analysis. Microstat, on the other hand, offers both stepwise and full-model regression and provides an option to compute and plot the residuals as well as the Durbin-Watson statistic. In my estimation, these are necessities for serious research.

Time-series analysis is provided in both packages and both contain serious flaws. The Radio Shack package offers moving averages, analysis of seasonality based on the ratio of actual to moving averages, and a time-series regression program which is called Forecasting. However, there is no way to combine the time-series regression and the seasonal indices to obtain a true forecast of a seasonal series. These individual programs are three of the component parts of a forecasting technique known as Classical Decomposition. It amazes me that someone would go to the trouble of computing the time-series regression and the seasonal indices and not provide a way that the two could be combined to forecast a seasonal series. This is a serious flaw and renders the time-series package useless.

Microstat provides moving averages, centered moving averages, deseasonalization (or the computation of the seasonal indices), and simple exponential smoothing. However, they succeed in frustrating the time-series forecaster again, since there is no way to compute the time-series trend, much less a way to combine the trend and the seasonal indices to compute a forecast. Worst of all, the program displays the preliminary seasonal indices instead of final seasonal indices which are normalized so that their mean value is one. Simple exponential smoothing provides a way of predicting data without a trend and works as it is supposed to. Unfortunately, there is no computation of mean square errors or any other indication of fit, effectively eliminating the use of the program in searching for the optimal smoothing constant. This again makes this part of the program effectively useless.

The programs generally do their job, but the output from Microstat is more sophisticated. The one exception to this is the time-series package which I regard, in both instances, as completely inadequate.

Programs contained in the Radio Shack package not included in Microstat are analysis of covariance, a test-scoring package and a random-sample generator. For those who use ANCOVAR, and those who do questionnaire research, these programs are quite valuable. Unfortunately Radio Shack has made it impossible to use what would otherwise be quite a useful program to draw random samples from the data observations. I can think of two uses: The first is to draw a small sample from a large data set to analyze. This necessitates the storage of the selected sample on disk for later analysis. Unfortunately, no mechanism is provided for such storage. Consequently, the samples are lost or the user must reenter the data for the selected observations. The other use, that of showing the students the effects of sampling error on various statistics, is equally frustrated by the fact that no statistics are computed for the samples.

Programs which Microstat offers not available in the Radio Shack package include nonparametric statistics, factorials, permutations, combinations, several probability distributions, and test for differing proportions and means. The importance of these programs again is determined by what your applications are.

In the final analysis, a package is only as good as its reliability and customer service. In using Microstat, there were three problems which I encountered—an illegal function call, a hang-up when I tried to go to the printer in the probability distribution program, and the failure to read a double-precision file in the descriptive statistics program. I notified Ecosoft of the first two problems (the third occurred the day before this writing). They asked me to return my disk for an updated version. While it took them about three weeks to return the new version, I am happy to report that the package is now working fine.

In summary, the Radio Shack package, although not as sophisticated as Microstat, performed as it was supposed to with no errors. Microstat, on the other hand, had errors which were satisfactorily remedied. The Radio Shack package is certainly a bargain for the price if one can live with its limitations. But for those users who require more sophisticated types of analysis and data handling capability, especially if one already owns CP/M and MBasic, the Microstat package is worth the extra money. ■

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100+ Reasons

DOS FEATURES

- A 252+ page technical manual with index and detailed table of contents.
- Commands **SYSTEM** and **PDRIVE** allow the user to configure/customize his/her own DOS.
- Depending on installed hardware, **NEWDOS/80,** via the **PDRIVE** command, supports within one system, mixtures of single/double density, single/double head, 5 or 8 inch drives with single/double volume diskettes of up to 7680 standard 256 byte sectors. 80 track drives can read 35/40 track diskettes. Parameters for 10 drives may be pre-specified though only a maximum of 4 are in use at anytime. ADR not provided.
- LNW 5/8 and Omikron mapper boards supported.
- APPARAT, AEROCOMP, AM, LNW, and PERCOM, disk doublers supported.
- Most CPU speed up mods may be used though not specifically supported.
- Model I/III data diskette interchangeability when both computers are operating under **NEWDOS/80** version 2.0.
- Model I 2.3 TRSDOS compatible.
- **COPY** to/from Model I 2.3B and Model III TRSDOS diskettes (no other useage allowed).
- Single drive **COPY** and Copy By File features.
- Depending on installed hardware, the system volume may be single/double density, single/double sided, 5 or 8 inch and up to 7680 sectors.
- **RUN-ONLY** program mode restricts the operator to program defined input only.
- **MINI-DOS** allows the executing program to be interrupted by the operator to perform one or more of the 51 DOS commands executable under MINI-DOS, and then continue the interrupted program's execution.
- **CHAIN** or **DO** commands activate chaining whereby keyboard input comes from the specified disk file, allowing a pre-determined set of commands and/or parameters to be automatically inputted.
- Dump display to printer function.
- Enhanced **DEBUG** facility (14 commands) allows interrupting current program execution, inspecting/altering memory or disk, and resuming execution, continuous or single step, with/without stops.
- DOS vectors defined for Assembly Language programmers.
- DOS-CALL allows user programs and BASIC to execute DOS commands.
- The programmer may create his own resident DOS commands.
- Programs may enable/disable user routines driven off the timer interrupt.
- The programmer may create his/her own resident DOS commands.
- Model I built-in lower case driver, blinking cursor, auto key repeat.
- **ROUTE**ing of keyboard, display, printer and (Model III only) RS232C. May be routed to a user routine in memory, but not to/from disk unless via a user routine.
- Except for the spooler, there are no high memory routines for DOS or BASIC; this includes **ROUTE** and **CHAIN** functions.
- Lower case DOS commands honored.
- Full error messages displayed instead of error codes.
- 31 enhanced **COPY** parameters.
- Copy By File allows 6 criteria for file selection.
- 15 enhanced **FORMAT** parameters.
- Partial diskette re**FORMAT** permitted.
- File **PURGE** by wildcard extents and/or user files.
- **DI**Rectory command allows wildcard extents, user files, short or extended format, dump to printer.
- User may specify diskette's directory location.
- Expanded directory provides for up to 222 file entries.
- Some DOS commands may be aborted without reset.
- **R** command repeats last performed DOS command.
- **CREATE** command to pre-allocate a disk file.
- **ERROR** command displays error message associated with error code.
- **HIMEM** command sets/displays DOS/BASIC high memory address.
- **DATE** command sets/displays computer's date.
- **TIME** command sets/displays computer's time.
- Model III **FORMS** command for printer control.
- Model III **SETCOM** command for RS232 control.
- Enhanced **LIST/PRINT** commands for ASCII files with pause, abort and partial file listing.
- Alter chaining state via the **CHNON** command or commands within the chain file.
- A program or a chaining sequence may display a message with/without pause.
- **CLEAR** command to zero memory and to purge routes, user DOS commands and user timer routines.
- Commands to enable/disable BREAK key, blinking cursor, lower case driver.
- **PROT** command to change diskette **NAME/DATE/PASSWORD**
- **ATTRIB** command to change a file's attributes.
- **CLS** command to clear screen.
- **AUTO** specifies the command to execute automatically at reset/power-on.
- **SYSTEM** specifies the default system configuration values (usually enable or disable) which become effective on RESET/POWER UP.

  Diskette/file password checking
  RUN-ONLY mode
  Keyboard debounce (Model I)
  Screen dump to printer (JKL)
  DEBUG 123 entry
  MINI-DOS
  Break key as keyboard key
  Hardware lower case (Model I)
  Assign default drive number for **DIR**
  Assign default drive number for file creation
  Memory protect value
  Clear key as keyboard key
  Disk master password required for full diskette or **CBF COPY**
  Auto Repeat key function
  TIME/DATE question on power-up
  TIME/DATE question on reset
  Display disabled until operator/program reenables
  Manual operator chaining pause/abort
  Manual operator **AUTO** command override
  R = repeat last DOS command performed
  Built-in lower case driver (Model I)
  Lower to upper case toggle
  Blinking cursor
  Number of physical drives on computer
  Number of disk I/O retries
  Time delay for 1st repeat of auto repeat key
  Specify the cursor character
  Specify the write of the directory sector's address mark for Model I single density diskette in Model III format for easy Model I, Model III diskette exchangeability

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Why NEWDOS/80™ VER. 2.0 Is the Best DOS for your TRS-80 Model I or III Computer

DISK BASIC FEATURES

- In one statement from DOS READY, BASIC can be brought up, the number of files set, the memory size set and a program LOADed or RUN.
- **RUN-ONLY** prevents the operator from getting to READY or DOS READY, thus giving the program almost total control.
- Via the CMD function, all DOS commands are executable from BASIC, either directly or dynamically.
- **MINI-DOS** is available from BASIC.
- **DEBUG** is available from BASIC.
- **CHAIN**ing is available from BASIC.
- Variable passing between programs via the **V** parameter of RUN.
- Abbreviated commands:
  (A)uto; **(D)**elete; **(E)**dit or comma; **(L)**ist or period
- Accidental text line deletion more difficult
- Text line scrolling foreward or backward.
- Text page scrolling foreward or backward.
- **DI** moves text line to new position
- **DU** duplicates text line to new position
- Built-in **RENUM**ber with line number and limited syntax error check. A portion of text may be moved to another part of the program with all references to that code resolved.
- Built-in **REF**erence function will display/print references to all line numbers, integers and variables. It will display references to a single line number, integer, string, function code (reserved word) or a group of packed or unpacked characters, and then allows displaying of each referencing text line in turn with editing as necessary.
- A program may be loaded into reserved high memory via CMD or MINI-DOS and its execution address extracted from the two bytes at 17411 (4403H).
- **MERGE** functions with packed or ASCII text files.
- Built-in text space eliminator and/or remark deleter.
- Built-in calendar date conversion.
- Dynamic **ERASE** of selected variables, keeping all others.
- Dynamic **KEEP** selected variables, **CLEAR**ing all others.
- After clearing an array via **ERASE** or **KEEP**, the array may be redimensioned via **DIM**.
- Dynamic text line deletion.
- Dynamic text line insertion via **MERGE**, which with dynamic **DELETE**, allows use of overlays.
- **SWAP** contents of 2 variables of the same type.
- Single Stepping starting at specified text line number.
- In-memory sort of up to 9 arrays in either ascending or descending order
- **RENEW** function to reinstate **NEW**ed program.
- Full BASIC error messages, including associate DOS error message, if applicable
- With default start up parameters and no reserved high memory, 48K RAM has 38261 bytes available.
- SUPERZAP, DIRCHECK and other programs using only memory from 5200H to 6FFFH can be executed directly from BASIC without disturbing the program text or variables (if 8K BASIC free memory available, exclusive of string area).

FEATURES of NEWDOS/80 enchanced BASIC disk file I/O.

- In addition to TRSDOS sequential and random file types, **NEWDOS/80** has two new file types (Marked Item and Fixed Item) divided into five subtypes **(MF, MU, MI, FF** and **FI)**
- These five subtypes do not require **LSET, RSET, MKI$, MKS$, MKD$, CVI, CVS** or **CVD**; instead, **GET**s and **PUT**s are done directly to/from the variables named in a list.
- The string separating character sequence ; " , " ; used with PRINT is not used with the new file types; instead only a comma is used as the separator.
- **MU** files are used as an option to the older PRINT/INPUT files.
- **FF** files are used as an option to the older RANDOM files.
- Record lengths up to 4095 bytes supported.
- Records may be all of the same length (**MF** and **FF**), of varying lengths (**MU**) or unknown length (**MI** and **FI**).
- Sequential files may be accessed randomly.
- Files may be accessed by **R**elative **B**yte **A**ddress to allow accessing of variable length or unkown length records.
- Existing files may be extended.

UTILITY PROGRAMS INCLUDED WITH NEWDOS/80

- **SUPERZAP** is a disk/memory display and modification program, also used as the vehicle for installing patches to **NEWDOS/80.**
- **DISASSEM** is a Z80 load module (CMD) disassembler that builds cross reference tables for all location references including those by JR instructions, includes in the disassembly printable characters for all hex bytes to help locate character strings and sends the disassembly to the display, printer or a disk file. The disk file can then be edited and/or assembled using EDTASM, if it is not too large.
- **DIRCHECK** is a program that displays directory contents and checks directory integrity (its primary function), displaying specific error codes to assist user attempts at directory trouble shooting and/or repair. Optionally will zero out unused (dead) file names.
- **EDTASM** is Apparat's enchancement of Radio Shack's 1978 tape editor/assembler program to operate from disk and with disk files. Requires purchase of that Radio Shack program (not a newer one) as a pre-condition of use of Apparat's EDTASM.
- **LMOFFSET** allows load module (CMD) transfer between disk and tape. Displays program start, end and entry addresses. Optionally allows load address relocation (not execution relocation) and subsequent execution as from non-disk BASIC via SYSTEM.
- **CHAINBLD** is a mini-text editor for creating/maintaining chaining files.
- **NEWDOS/80** manual chapter titles and page counts

  1. Introduction (5)
  2. DOS Library Commands (52)
  3. DOS Routines (12)
  4. DOS Features (14)
  5. DOS Modules, Data Structures, and Miscellaneous Information (12)
  6. Additional Programs Supplied on **NEWDOS/80** Diskette (22)
  7. Disk BASIC, non-I/O Enhancements (17)
  8. Disk BASIC I/O Enhancements and Differences (21)
  9. Error Codes and Messages (2)
  10. Glossary (9)
  11. Error Reporting, Incompatibility Handling, and Patching (8)
  12. Conversion Information and Miscellaneous Comments (9)
  13. ZAPs (increasing with time)
  14. Appendix A: Marked and Fixed Item File discussion (47)
  15. Appendix B: Marked and Fixed Item File examples (18)
  16. Index (4)

- Full time support staff
- Information, minor enhancements and corrections to **NEWDOS/80** are issued, at no charge, to registered owners only.

NEWDOS/80 Version 2.0 for the model I is a separate and distinct product from the model III. Each is sold separately.

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What you'll need to telecommunicate.

BBS Primer

Steve Wright
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After three years, my TRS-80 still fascinates me and now I have discovered a New World, where computers *converse*.

The Forum-80, Computer Bulletin Board System (CBBS), Apple Bulletin Board System (ABBS), North Star Bulletin Board System (NBBS), and Pet Bulletin Board System (PBBS) are *non*-commercial telecommunications systems. The Source, Micronet, and Tymnet are commercial systems.

The difference is money. You pay a fee for connect time, certain services such as stock quotations (from the *Wall Street Journal* and others) and the initial subscription, much like pay TV.

These systems give the computer novice and the expert, with TRS-80 or the other brands, a common connection for communication since all types of computers can speak to each other. Location or equipment is unimportant as long as you can generate ASCII code and send it through a phone line.

The Modem

A computer is not essential for generating ASCII. A terminal such as a Teletype model ASR 33 *is*. I use a TRS-80 with an LNW expansion board. Such a modem is the only way to get the code into the phone line. One way to skin the modem cat is with a Radio Shack Modem One. It is a direct connect, and operates in full duplex in answer or originate.

You can generate ASCII code with a software program. (Did all the software peddlers' eyeballs click?) I use Lance Micklaus' ST80II great program. The simplest software converts your computer to a dumb terminal (just send and receive); the more advanced program adds wings to it with such features as disk storage, automatic functions, more control features, and printer output. Many programs are available commercially and from computer magazines.

Nuts and Bolts

First you must generate ASCII code (computer and software), serialize it into a single file line, send it to the modem (RS-232 device) and get it into the phone lines (modem).

The RS-232 device serializes the information from the computer and sends it in the proper configuration at the proper speed to the modem.

Gaining Access

Accurate ASCII configuration and speed are imperative. Here is the formula: All systems I have used activate with the ASCII word set to even parity, a seven bit word, and one stop bit. You set that configuration with hardware or software according to your RS-232 device. The speed of communication is set at the RS-232 and all the systems I have used *will* operate at 300 baud. Some will operate faster or slower.

The modem itself converts voltages to sound, puts it on the telephone line and vice versa. The modem can answer or originate at full or half duplex. Since computers can send and receive at the same time they use two different tone sets. All of the systems want you to call on the originate tones and they will answer on the answer tones. Full duplex is fastest since machines both *talk* and *listen* at the same time.

Buy some telephone company stock and visit some of the systems (see Table 1). For *no fee* you can leave or receive personal messages, get general interest messages and ads, and receive free public domain programs. You can get a full list of currently

Wichita Falls, TX (817-855-3916) A Forum-80 system operated by the Texhoma Micro Enthusiasts.	Memphis, TN. (901-761-4743) Forum-80
Kansas City, MO (816-861-7040) Headquarters for Forum-80 systems.	Falls Church, VA (703-734-1387) Amateur Radio Research and Development. A CBBS system
Shreveport, LA (318-631-7107) N.W. Louisiana TRS-80 User's Group. Another Forum-80.	Decatur, GA (404-939-1520) The Microstuff Company A Remote Northstar system

Table 1

S = summarize messages
R = retrieve messages
E = enter messages
K = kill messages
F = flagged msg retrieval
M = messages in system
O = other system numbers
I = system info
H = help with sys operation
U = user log
C = configuration changes
L = local features list
T = terminate connection

Figure 1

active systems from the systems themselves using the proper command from their menus.

The Menu

A typical menu from a Forum-80 system is shown in Fig. 1.

Most of the command selections take you to a submenu for that function, and you always have Help command for further system explanation.

Telecommunication for a price: CompuServe

CompuServe is a commercial system. For a fee, you have access to a monster network of DEC mainframes that offer hundreds of features. Imagine receiving newswires and regional newspapers, sports and political information, stock market quotes and business news; or purchasing publications and software in the comfort of your library on your personal keyboard. The network also allocates you memory workspace and disk storage area, so useful if you have limited memory or disk capacity. (And, what a hedge against the rising costs of newspapers and magazines, a cost effective alternative to a kilobuck capital outlay.) Further, many systems give the users an opportunity to practice alternate languages such as Fortran, Pascal and others.

"...I have discovered a New World, where computers converse."

The systems are high self-prompting and self-promoting. They offer computer users the 21st Century equivalent to the Boston Common. Leave me a message on CompuServe ID. #70265,217. Telecommunications like this mean "Let's get together." ■

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Finally, a disk directory for the Model III.

Lost and Found

Robert Athanasiou
and William Athanasiou
13 Lawnridge Avenue
Albany, NY 12208

This disk index program is different: It runs on the Model III with either one or two drives, under TRSDOS 1.3 without modification and nothing else to buy or add!

Its most important feature is vertical rastering of the printer output. It also has an error trap, and an abort sequence returns you to the menu if you wish to cancel an option. The program uses Model III graphics capabilities.

We wrote this program to keep track of all our disks. We could not locate a program without putting a pile of disks in the drive and typing DIR.

Commercial versions of disk directories are available for $13–$25 but they are not designed for the Model III and do not have output in the form we want. This program does not require you to load a special sort routine; just boot the disk and hit a few keys.

Arranging printer output so that you can scan it vertically makes an enormous difference in its readability. Compare the horizontal raster output (raster is from a Greek word meaning screen) shown in the video dump in Fig. 1 with the vertical raster output in Fig. 2. You can locate any program, for example DIR73 (a directory of articles from *73 Magazine)*, much more easily in the alphabetized vertical raster of Fig. 2 than in Fig. 1. The same is true of searching for a specific disk.

I adapted the vertical raster subroutine from an article by Robert R. Lewis for Pet Basic published in the October 1981 issue of *Interface Age*.

The Programs

Assume that A$(i) has 25 elements; we wish to print in four columns. Since line printers can only print in rows we have to print the string in the following order:

A$(1), A$(8), A$(14), A$(20) (skip to next line) A$(2), A$(9), A$(15), A$(21),.... The last item is A$(7).

The formula to generate the sequence of index numbers 1,8,14,20,2,9... uses modular arithmetic. In modular arithmetic, a complicated concept of higher mathematics, a number is usually expressed as one of a set of congruent numbers less than the modulous number. For example, 18 and 30 are congruent 6 (mod12). That is, 18 and 30 are numbers which, when divided by 12, have a remainder of 6.

In the example using A$(i) where i_{max} equals N equals 25 and the number of columns is equal to four, there were six items in each column and an extra item in the first column. If N were 27 there would be six items in each column and extras in the first three columns. Lewis suggested an algorithm for calculating the index J such that J(I) represents the ordered set of numbers (1,8,14,20,2,9...) as I steps from one to N across C columns. The algorithm is: J(I) equals mod ((I – 1),C) times the integer of (N/C) plus the lesser of

Disk	Program	Disk	Program	Disk	Program	Disk	Program
000	ANTENNA/BA	000	ASCII/BAS	000	AZIMUTH/BA	000	DIR73/BAS
000	DXCCLOG/BA	000	DXCCNEED/B	000	DXCONST/B	000	FIELDDAY/B
000	MORSE/BAS	000	QSLFILE/BA	000	QSTDIR/BAS	000	RPTRDIR/BA
000	RTTYXCVR/B	000	W2HKMLOG/B	000	XCVRTEST/B	001	BLOCKS
001	BOBLOGO/ME	001	BOBLOGO/PS	001	GETDISK/BA	001	HEADER
001	HIPPO	001	SCRIPSIT/C	001	TYPICAL/TX	001	VITA1
001	VITA2	001	VITA3	100	ACEP	100	ATLS2
100	ATLS3	100	ATLS4/HLP	100	ATLSANN	100	BKRVWLLS/S
100	BKRVWLTR/S	100	EYE2/TXT	100	LLSBKRVW/S	100	UCFEVAL/SC
100	UCFLETR/SC	100	VITA1	100	VITA2	100	VITA3

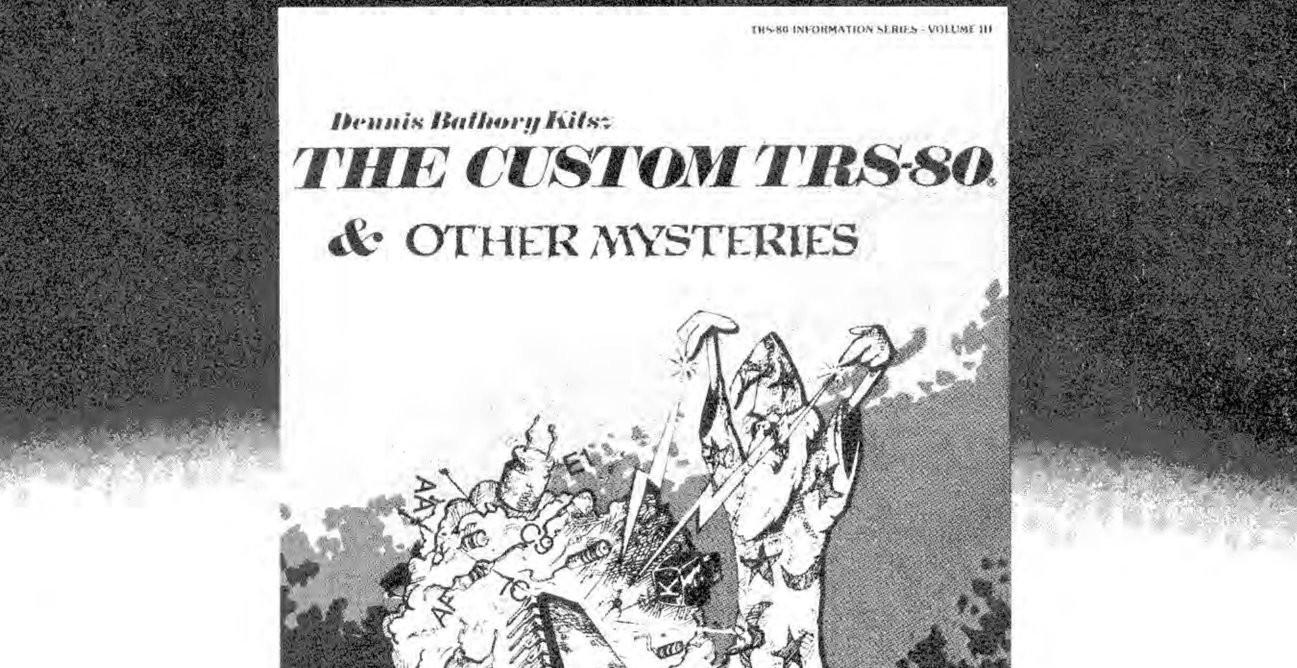
Program	Disk	Program	Disk	Program	Disk	Program	Disk
ACEP	100	ANTENNA/BA	000	ASCII/BAS	000	ATLS2	100
ATLS3	100	ATLS4/HLP	100	ATLSANN	100	AZIMUTH/BA	000
BKRVWLLS/S	100	BKRVWLTR/S	100	BLOCKS	001	BOBLOGO/ME	001
BOBLOGO/PS	001	DIR73/BAS	000	DXCCLOG/BA	000	DXCCNEED/B	000
DCONTST/B	000	EYE2/TXT	100	FIELDDAY/B	000	GETDISK/BA	001
HEADER	001	HIPPO	001	LLSBKRVW/S	100	MORSE/BAS	000
QSLFILE/BA	000	QSTDIR/BAS	000	RPTRDIR/BA	000	RTTYXCVR/B	000
SCRIPSIT/C	001	TYPICAL/TX	001	UCFEVAL/SC	100	UCFLETR/SC	100
VITA1	001	VITA1	100	VITA2	001	VITA2	100
VITA3	001	VITA3	100	W2HKMLOG/B	000	XCVRTEST/B	000

Fig. 1. Horizontal raster output by disk and by program

The Key Box

Basic Level II
Model III
32K RAM
TRSDOS 1.3

TUNE-UP YOUR TRS-80®



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If the thought of using a screwdriver gives you the shivers then you can turn to the software section. In this you learn how to make BASIC programs auto-execute, reset the memory size, patch into the interpreter, test memory with machine-language, pack program lines with machine code, and generate sound effects.

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Program	Disk	Program	Disk	Program	Disk	Program	Disk
ACEP	100	BLOCKS	001	HEADER	001	UCFEVAL/SCR	100
ANTENNA/BAS	000	BOBLOGO/MED	001	HIPPO	001	UCFLETR/SCR	100
ASCII/BAS	000	BOBLOGO/PSY	001	LLSBKRVW/SCR	100	VITA1	001
ATLS2	100	DIR73BAS	000	MORSE/BAS	000	VITA1	100
ATLS3	100	DXCCLOG/BAS	000	QSLFILE/BAS	000	VITA2	001
ATLS4/HLP	100	DXCCNEED/BAS	000	QSTDIR/BAS	000	VITA2	100
ATLSANN	100	DXCONTST/BAS	000	RPTRDIR/BAS	000	VITA3	001
AZIMUTH/BAS	000	EYE2/TXT	100	RTTYXCVR/BAS	000	VITA3	100
BKRVWLLS/SCR	100	FIELDDAY/BAS	000	SCRIPSIT/CMD	001	W2HKMLOG/BAS	000
BKRVWLTR/SCR	100	GETDISK/BAS	001	TYPICAL/TXT	001	XCVRTEST/BAS	000

Disk	Program	Disk	Program	Disk	Program	Disk	Program
000	ANTENNA/BAS	000	QSTDIR/BAS	001	HIPPO	100	ATLSANN
000	ASCII/BAS	000	RPTRDIR/BAS	001	SCRIPSIT/CMD	100	BKRVWLLS/SCR
000	AZIMUTH/BAS	000	RTTYXCVR/BAS	001	TYPICAL/TXT	100	BKRVWLTR/SCR
000	DIR73/BAS	000	W2HKMLOG/BAS	001	VITA1	100	EYE2/TXT
000	DXCCLOG/BAS	000	XCVRTEST/BAS	001	VITA2	100	LLSBKRVW/SCR
000	DXCCNEED/BAS	001	BLOCKS	001	VITA3	100	UCFEVAL/SCR
000	DXCONTST/BAS	001	BOBLOGO/MED	100	ACEP	100	UCFLETR/SCR
000	FIELDDAY/BAS	001	BOBLOGO/PSY	100	ATLS2	100	VITA1
000	MORSE/BAS	001	GETDISK/BAS	100	ATLS3	100	VITA2
000	QSLFILE/BAS	001	HEADER	100	ATLS4/HLP	100	VITA3

Fig. 2. Vertical raster output by program and by disk

mod(I − 1,C) or mod(N,C) plus the integer of ((I − 1)/C) plus 1 where mod(N,C) is the remainder function N minus C times int (N/C).

The general vertical raster subroutine is shown in Program Listing 1. It differs somewhat from the subroutine used in DIRECTORY/BAS (see Program Listing 2) because the line length in the program was calculated to fill 80 columns of print and did not require the extra Print statement or the calculation of IEC (Index End Column) found in line 230 of the subroutine listing.

You must substitute LPRINT for Print statements when using your printer. Use DEF FN to make the algorithm easier to handle and apply it in different ways in your programs.

Vertical rastering is more useful on a line printer than it is on the video screen if your lists are long. On the video screen, each column may contain only about 15 elements before one is lost at the bottom or the list scrolls out of sight. For short lists using four or more columns, vertical raster is really nice.

Lines 50–90 speed up program execution. The DIM statement assigns a memory location to each variable, with the most used variable at the head of the list. I produced the DIM statement with Prosoft's Faster utility program (which can speed a program by more than 50 percent).

Line 50 is set to run on machines with at least 32K RAM. If you have 48K, set it to Clear 19000. Increasing the amount of string space available during a string manipulation program provides more "scratch paper" for the machine and improves program speed by about 30 percent.

Deleting the REM lines and compacting the program with the TRSDOS CMD"C" function will speed operation somewhat and require less space on your disk.

The video display routines are quite simple. The top two lines are scroll protected and then 12 lines (48 names) of program listings are printed, followed by a prompt to continue scrolling when you are ready.

The update option is a combination of menu options 4 and 2 (see Fig. 3). The program first displays the file's contents and then erases it (if you wish) and writes the new disk directory into the file. When adding a new disk, the program checks to make sure you have not used the three character identification number before. When choosing an ID remember that blanks are sorted before everything else and that numbers are sorted before letters. Thus, disk 100 will be put before disk 10A.

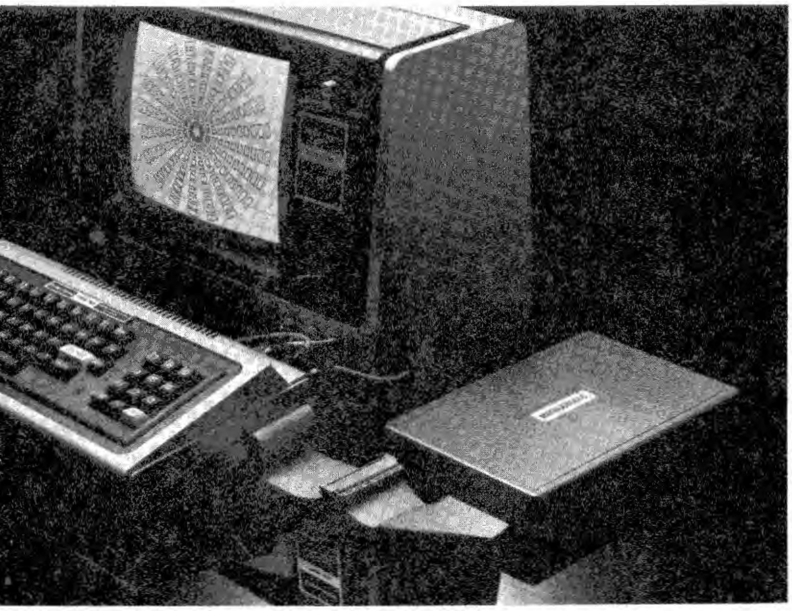
Option 8, patterned after some Kitchen Table Software ideas, tries to keep you from exiting the program without saving your updated file. Lines 290, 1000, 4180, and 6270 are part of the plot.

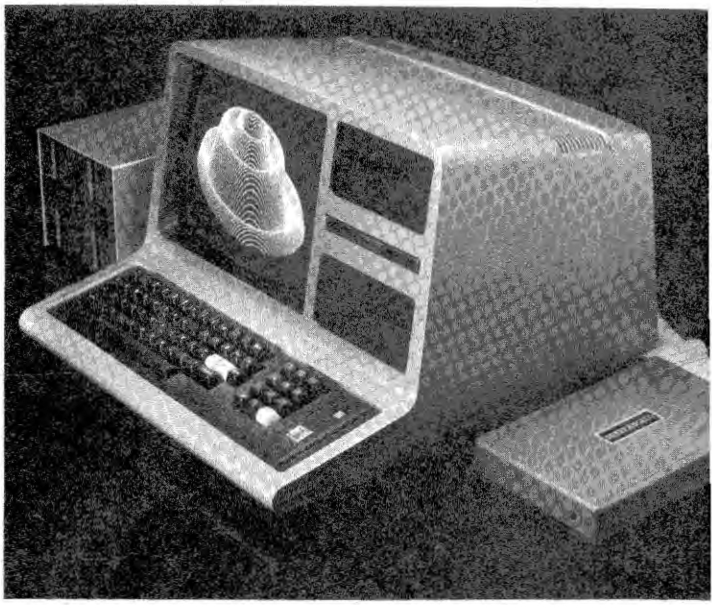
Line 130, a toggle switch, turns on the special graphics characters for the Model III. If you run the program twice without rebooting, the toggle will be off on the second run and

1—Build a new file
2—Add a new disk to an existing file
3—Update a disk already on file
4—Delete a disk from file
5—Sort and list by program name or disk number
6—Search for a specific program or list a disk
7—Save file 'DSKINDEX'
8—Quit and return to Basic

Fig. 3. DIRECTORY/BAS Menu

TURN YOUR COMPUTER INTO A GRAPHICS MACHINE





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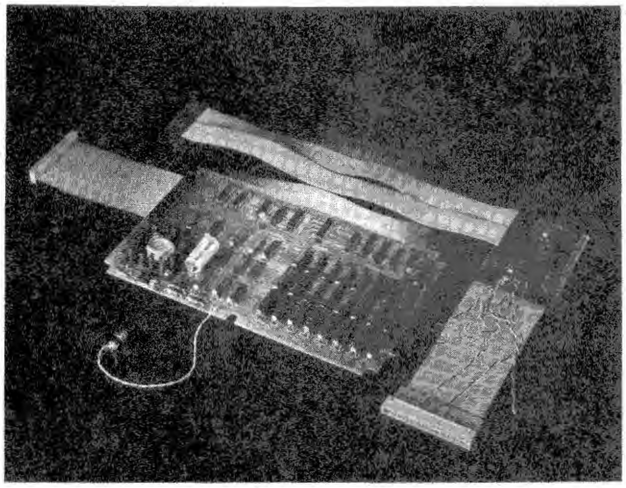

HARDWARE

- TOTAL SCREEN INVERSE VIDEO
- TWO MODES OF DENSITY:
  384 × 192 or 191 × 192 for Model I
  512 × 192 or 256 × 192 for Model III
- EVERY DOT CAN BE SET, RESET or TESTED
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- FUNCTIONS SELECTED BY OUTPUT PORT #254.
- MEMORY MAPPED FOR SPEED
- OCCUPIES LAST 16K BLOCK OF MEMORY
- CAN BE USED AS NORMAL MEMORY
  (if you have 32K or more of memory)
- COLOR COORDINATED ENCLOSURE
- DOES NOT CONFLICT WITH DISK OR CASSETTE I/O
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  (Powers up with Computer)
- COMES WITH IT'S OWN WALL TRANSFORMER
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you will get no special characters. Hit Break and then type run to get them back. POKE 16420,1 locks the toggle switch "on."

I have tried to make the program as goof-proof as possible by using Enter when you have to think about a choice and INKEY$ when you do not. Almost every input from the keyboard is checked to see if it is the right length or in the right range of values. Pressing or entering M at almost any input point will cancel an option and send you back to the menu. ■

Robert Athanasiou PhD, MD, practices Emergency Medicine at Samaritan Hospital in Troy, NY. William is a junior at Albany High School.

```
10 REM J = STRING INDEX FOR THE I-TH ELEMENT OF A$
20 REM C = NUMBER OF COLUMNS DESIRED
30 REM N = NUMBER OF ELEMENTS IN A$
40 REM IEC = COLUMN NUMBER IN WHICH J-TH ELEMENT IS PRINTED
50 REM I = INDEX FOR LOOP STEPPING FROM 1 TO N
100 INPUT"ENTER THE NUMBER OF COLUMNS DESIRED ";C
110 REM BE SURE THAT NUMBER OF COLUMNS TIMES NUMBER OF SPACES
      PER COLUMN DOES NOT EXCEED PRINTER WIDTH
200 FOR I = 1 TO N
210 GOSUB 1000
220 PRINT A$(J);
230 IF IEC = C THEN PRINT      '*** MOVES TO NEXT LINE WHEN END
                                    COLUMN IS REACHED
240 NEXT I
1000 REM ALGORITHM TO CALCULATE J AND IEC
1010 IIC = INT ((I-1)/C)
1020 MIC = I - C * IIC - 1      '*** MOD(I-1,C)
1030 INC = INT (N/C)
1040 MNC = N - C * INC      '*** MOD(N,C)
1050 IF MIC < MNC THEN LESS = MIC ELSE LESS = MNC
1060 J = LESS + MIC * INC + IIC + 1
1070 IEC = MIC + 1      '*** COLUMN NUMBER IN WHICH ITEM WILL BE
                             PRINTED
1080 RETURN
```

Program Listing 1

Program Listing 2

```
10 REM *** A DISK DIRECTORY PROGRAM ***
20 REM *** "DIRECTRY/BAS"
30 REM *** WILL HOLD A MAX OF DISKS*PROGRAMS = 900
40 REM *** RUNS 'AS IS' ON TRSDOS 1.3
50 CLEAR 10000          '*** CLEAR AS MUCH STRING SPACE AS
                          POSSIBLE. PROGRAM RUNS FASTER
60 DEFINT X,V,C,J,I,K,L,N,M,A,Q
70 DEFSTR P,D,R,E,H,B
80 DIM X,P1$,VL,DN$,XX,C1,JJ,I,R$,E$,K,H$,A,CX,L,N,J,B$
90 DIM DP$(900),DN$(900),PN$(900),P1$(50)
100 REM *** THE TWO PREVIOUS LINES HELP THE PROGRAM RUN FASTER
          BY ASSIGNING MEMEORY LOCATIONS TO FREQUENTLY
          USED VARIABLES    ***
110 ON ERROR GOTO 11000
120 R$="DRIVE :"
130 POKE 16420,1          '*** LOCKS ON SPECIAL CHARACTERS
140 H$= CHR$(244)+CHR$(245)+CHR$(246)+CHR$(32)  '*** GIVES YOU
                                                   A HAND !
150 CLS:INPUT"IF YOU HAVE ONLY 1 DISK DRIVE ENTER (1)
IF YOU HAVE 2 OR MORE DRIVES ENTER (2) ";Q
160 IF Q<1 OR Q>2 GOTO150
170 CLS:PRINTH$;" A PROGRAM TO INDEX DISK FILES ":PRINT"BY ROBER
T AND WILLIAM ATHANASIOU":PRINT"ALBANY, NEW YORK":PRINT"JANUARY
1982":PRINT
179 REM **********  MENU  *************
180 PRINT,"1--BUILD A NEW FILE"
190 PRINT,"2--ADD A NEW DISK TO AN EXISTING FILE"
200 PRINT,"3--UPDATE A DISK ALREADY ON FILE"
210 PRINT,"4--DELETE A DISK FROM FILE"
220 PRINT,"5--SORT AND LIST BY PROGRAM NAME OR DISK NUMBER"
230 PRINT,"6--SEARCH FOR A SPECIFIC PROGRAM OR LIST A DISK"
240 PRINT,"7--SAVE FILE
'DSKINDEX' "
250 PRINT,"8--QUIT AND RETURN TO BASIC"
260 PRINT"PRESS OR ENTER (M) TO RETURN TO MENU AND CANCEL OPTION

270 PRINT:PRINTH$;:INPUT"ENTER OPTION NUMBER...";K
280 IF K<1 OR K>8 THEN 170
290 IF K<5 AND K>0 THEN A=1 ELSE A=0
300 ON K GOTO 6010 ,2000 ,8000 ,8000 ,3000 ,5000 ,7000 ,1000

999 REM ********* OPTION 8 **************
1000 CLS:IF A=1 PRINT"YOU MADE CHANGES TO THE 'DSKINDEX' FILE."
ELSE 1040
1010 E$="":PRINT"YOU MAY WISH TO SAVE THESE CHANGES ":
INPUT"ENTER <S> TO SAVE THE FILE
ENTER <M> TO RETURN TO MENU
ENTER <Q> TO QUIT WITHOUT SAVING THE FILE ";E$
1020 IF E$="Q" GOTO 1040
1030 IF E$="S" GOTO 7030 ELSE 170
```

Program Listing 2 Continues

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Program Listing 2 Continued

```
1040 CLS:INPUT"IF YOU'RE SURE YOU WANT TO QUIT THEN ENTER (QUIT)

ANY OTHER WORD WILL RETURN YOU TO THE MENU";R1$
1050 IF R1$="QUIT" THEN END  ELSE 170

1999 REM ********* OPTION 2 **************
2000 IF L=0 THEN GOSUB 7140   '*** INPUT FILE, CHECK FOR DUPLICA
TE ID *OPTION 2*
2010 GOSUB10010       '*** DISK ID ENTRY SUBROUTINE
2020  FOR X=1 TO XX: IF DN$=DN$(X) THEN GOTO 2040
2030 NEXT : GOTO 6020    '*** GOES TO VIDEO READ ROUTINE
2040 PRINTH$;" THE ID ";DN$;" HAS ALREADY BEEN USED FOR A DISK T
HAT IS ON FILE. USE ANOTHER ID OR OPTION 3."
2050 E$="":PRINTH$;:INPUT"ENTER (M) FOR MENU OR (A) TO ENTER ANO
THER ID";E$
2060 IF E$="A" THEN 2010 ELSE 170

2999 REM ********* OPTION 5 **************
3000 IF L=0 THEN GOSUB 7140 '** INPUT FILE, SORT AND THEN PRINT
DATA
3010 PRINT"LISTING MAY BE BY DISK (D) OR BY PROGRAM (P)"
3020 E$="":INPUT"ENTER YOUR CHOICE...(D/P) ";E$
3030 IF E$="M" GOTO 170
3040 PRINT:INPUT"ENTER (P) FOR PRINTOUT OR (V) FOR VIDEO ONLY...
";B$:CLS
3050 IF B$="M" GOTO 170
3060 IF E$="D" GOTO 3080
3070 IF E$="P" GOTO 3290 ELSE 170
3080 FOR X=1 TO XX:DP$(X)=DN$(X)+PN$(X):NEXT  '** PUT DISK# FIRS
T
3090 N%=XX:CMD"O", N%, DP$(1):POKE 16916,2  '** SORT:SCROLL PROT
ECT TOP 2 LINES
3100 FORI=1 TO 4:PRINT"DSK  PROGRAM    ";:NEXT
3110 PRINTSTRING$(64,"-"):C1=0
3120 FOR X=1 TO XX
3130 PRINT LEFT$(DP$(X),3);" ";MID$(DP$(X),4,10),
3140 C1=C1+1: IF C1<>48 THEN 3180 '**FILL SCREEN THEN WAIT FOR P
ROMPT
3150 PRINTH$;"PRESS ANY KEY TO CONTINUE DISPLAY"
3160 IF INKEY$="" THEN 3160
3170 C1=0
3180 NEXT :PRINTH$;"PRESS ANY KEY TO CONTINUE":POKE 16916,0

     '*** RESET SCROLL PROTECT TO ZERO LINES
3190 IF INKEY$="" THEN 3190
3200 IF INKEY$="M" THEN 170
3210 IF B$<>"P" GOTO 170  '*** RETURN TO MENU IF NO PRINTOUT REQ
UESTED
3220 FOR I=1 TO 4
3230 LPRINT"DISK  PROGRAM        ";:NEXT:LPRINTSTRING$(80,45)
3240 C=4: N=XX        '*** C= NUMBER OF COLUMNS
                           N= NUMBER OF ELEMENTS IN STRING
3250 FOR I=1 TO N
3260 GOSUB 9010       '*** VERTICAL RASTER SUBROUTINE
3270 LPRINT" ";LEFT$(DP$(J),3);" ";RIGHT$(DP$(J),12);"   ";
3280 NEXT :LPRINTCHR$(10):LPRINTCHR$(10):GOTO170
'*** CHR$(10) = LINE FEED FOR MY PRINTER
3290 FOR X=1 TO XX  '*** PUT PROGRAM NAME FIRST IN STRING
3300 DP$(X)=PN$(X)+DN$(X):NEXT
3310 N%=XX:CMD"O", N%, DP$(1)
3320 CLS:POKE 16916,2   '*** SCROLL PROTECT 2 LINES
3330 FOR I=1 TO 4:PRINT" PROGRAM   DSK  ";:NEXT:PRINTSTRING$(64,
45):C1=0
3340 FOR X=1 TO XX
3350 PRINT LEFT$(DP$(X),10);" ";RIGHT$(DP$(X),3),
3360 C1=C1+1: IF C1<>48 THEN 3400
3370 PRINTH$;"PRESS ANY KEY TO CONTINUE THE DISPLAY"
3380 IF INKEY$="" THEN 3380
3390 C1=0
3400 NEXT :PRINTH$;" PRESS ANY KEY TO CONTINUE":POKE 16916,0
3410 IF INKEY$="" THEN 3410
3420 IF B$<>"P" GOTO 170
3430 FOR I=1 TO 4:LPRINT"PROGRAM      DISK   ";:NEXT:LPRINTSTRIN
G$(80,45)
3440 C=4: N=XX        '*** C= NUMBER OF COLUMNS
                           N= NUMBER OF ELEMENTS IN STRING
3450 FOR I=1 TO XX
3460 GOSUB 9010       '*** VERTICAL RASTER SUBROUTINE
3470 LPRINT LEFT$(DP$(J),12);" ";RIGHT$(DP$(J),3);"    ";
3480 NEXT :LPRINTCHR$(10);CHR$(10):GOTO 170

3999 REM ********* OPTION 4 (PART 2)  **************
4000 CX=0    '*** BEGINS ROUT. TO BLANK OUT PROGRAMS
4010 FOR X = 1 TO XX
4020 IFDN$(X)<>DN$ GOTO 4040
4030 DN$(X)="ZZZ":PN$(X)="ZZZ":CX=CX+1   '*** BLANK OUT DATA TO
BE DELETED WITH -Z- SO SORTING WILL PLACE THEM AT END OF STRING
4040 NEXT X
4050 IF CX=0 THEN PRINT"DISK ";DN$;" WAS NOT FOUND."ELSE GOTO 40
80
4060 E$="":PRINTH$;:INPUT"ENTER  (M) TO RETURN TO MENU OR (D) TO
 DELETE ANOTHER DISK";E$
4070 IF E$="D" THEN 8010   ELSE 170
4080 FOR X=1TOXX:DP$(X)=DN$(X)+PN$(X):NEXT
4090 N%=XX: CMD"O", N%, DP$(1) '*** SORT SO DATA TO BE DELETED
                                    IS AT THE END OF STRING
4100 XX=XX-CX       '*** SHORTEN THE FILE LENGTH INDEX NUMBER
4110 FOR X=1 TO XX:DN$(X)=LEFT$(DP$(X),3):PN$(X)=RIGHT$(DP$(X),1
2):NEXT
4120 PRINT" DATA PERTAINING TO DISK ";DN$;" HAVE BEEN DELETED."
4130 PRINTCX;" PROGRAM NAMES HAVE BEEN ERASED AND THE FILE"
4140 PRINT"   NOW CONTAINS ";XX;" PROGRAM NAMES."
4150 IF K=3 THEN PRINTH$;" NOW GOING TO UPDATE FILE":FOR I=1TO20
00:NEXT:I=0: GOTO 6020     '***TRANSFER FOR UPDATE OPTION***
4160 E$="":PRINTH$;:INPUT"ENTER (D) TO DELETE ANOTHER DISK
    ENTER (S) TO SAVE FILE ";E$
4170 IF E$="D" GOTO 8010
4180 IF E$="M" GOTO 170  ELSE 7030  '*** ANYTHING BUT D OR M SAV
ES FILE

4999 REM ********* OPTION 6 **************
5000 IF L=0 THEN GOSUB7140        '*** OPTION 6 SEARCH FOR DISK O
R PROGRAM
```

Program Listing 2 Continues

Program Listing 2 Continued

```
5010 E$="":PRINT:INPUT"ENTER (D) TO LIST A DISK,
ENTER (P) TO SEARCH FOR A PROGRAM";E$
5020 IF E$="D" GOTO 8010
5030 IF E$="P" CLS  ELSE 170
5040 PRINT"TO SEARCH FOR A PROGRAM,
ENTER THE FIRST 5 LETTERS OF THE PROGRAM NAME.

INCLUDE TRAILING BLANKS IF THE NAME IS SHORT."
5050 PRINT:PRINT"ALL PROGRAMS BEGINNING WITH THE SAME 5 LETTERS
WILL BE DISPLAYED."
5060 PRINT:PRINTH$;"PRESS ANY KEY TO CONTINUE":PRINT
5070 IF INKEY$="" THEN 5070
5080 IF INKEY$="M" THEN 170
5090  IF L=0 THEN GOSUB 7140
5100 P1$="":CLS:INPUT"ENTER FIRST 5 LETTERS OF THE PROGRAM NAME.
..";P1$
5110 IF P1$="M" GOTO 170
5120 IF LEN(P1$)<5 THEN PRINT:PRINTCHR$(236);CHR$(236);"  READ T
HE DIRECTIONS AGAIN DUMMY ! ";CHR$(236);CHR$(236):PRINT:GOTO 504
0
5130 P1$=LEFT$(P1$,5):J=0
5140 FOR X=1 TO XX  '*** SEARCH FOR NAME, PLACE IN JTH POSITION
5150 IF P1$=LEFT$(PN$(X),5) THEN GOTO 5160 ELSE 5170
5160 J=J+1: P1$(J)=PN$(X)+DN$(X)
5170 NEXT X
5180 IF J<>0 GOTO 5200
5190 PRINT"PROGRAM ";P1$;" WAS NOT FOUND":GOTO 5220
5200 CLS:PRINTTAB(5);"PROGRAM";:PRINTTAB(20);"DISK":PRINTSTRING$
(60,45):PRINT
5210 FORI=1TOJ:PRINTTAB(5);LEFT$(P1$(I),12);"     ";RIGHT$(P1$(I
),3):NEXT
5220 E$="":PRINT:PRINTH$;:INPUT"ENTER (A) TO SEARCH FOR ANOTHER
PROGRAM OR
    (M) TO RETURN TO THE MENU.";E$
5230 IF E$="A" THEN GOTO 5100 ELSE GOTO 170

5999 REM ********* OPTION 1 **************
6000 REM ***  ROUTINE TO READ DATA FROM VIDEO DISPLAY
6010 GOSUB10010
6020 VL=15360: XX=XX+1              '*** START OF VIDEO DISPLAY IN R
AM
6030 CLS:IF Q=1 PRINT"REMOVE DISK FROM DRIVE (0) AND INSERT DISK
 ";DN$:GOTO6050
6040 PRINT:PRINT"INSERT DISK ";DN$;" IN DRIVE 1"
6050 PRINT:PRINTH$;"PRESS ANY KEY WHEN READY TO CONTINUE."
6060 IF INKEY$="" THEN 6060
6070 IF INKEY$="M" THEN 170
6080 P1$=""
6090 IF Q=1 THEN CMD"D:0"
6100 CMD"D:1"     '*** DISK BASIC COMMAND TO DISPLAY DIRECTORY
6110 PRINT@530,"WORKING... PLEASE WAIT"
6120 FOR I=1 TO 4:FOR X=0 TO 11  '*** ACCUMULATE PROGRAM NAME
6130 P1$ =P1$+CHR$(PEEK(VL+X)):NEXT
6140 IF R$=LEFT$(P1$,7)THEN 6150 ELSE 6160  '*** SKIP (DRIVE :)
6150 XX=XX-1:GOTO6190
6160 IF P1$="               " THEN 6170 ELSE 6180 '*** ??? LAST

                                                  VIDEO LISTING
6170 XX=XX-1 :GOTO6240
6180 PN$(XX)=P1$: DN$(XX)=DN$
6190 P1$=""
6200 XX=XX+1:VL=VL+15   '*** INCREMENT TO NEXT VIDEO LISTING
6210 NEXT I
6220 VL=VL+4       '*** INCREMENT TO NEXT VIDEO ROW
6230 GOTO6120          '*** RETURN TO READ NEXT ROW
6240 L=1     '*** L FLAG SHOWS INDEX DATA IS IN RAM
6250 CLS:E$="":INPUT"ENTER (D) TO INDEX ANOTHER DISK,
 ENTER (M) TO RETURN TO MENU,
 ENTER (S) TO SAVE FILE THEN RETURN TO MENU";E$
6260 IF E$="D" GOTO 6010
6270 IF E$="M" GOTO 170  ELSE 7030

6999 REM ********* OPTION 7 **************
7000 IF L=1 GOTO 7030
7010 PRINT"SORRY, THERE IS NO FILE NOW IN RAM TO BE SAVED";

H$;"PRESS ANY KEY TO RETURN TO MENU"
7020 IF INKEY$="" THEN 7020 ELSE GOTO 170

7030 CLS:PRINT:IF Q=1 PRINT"BE SURE THAT THE PROGRAM DISK
IS IN DRIVE (0) IN ORDER TO SAVE THE 'DSKINDEX' FILE." ELSE 7060

7040 E$="":PRINT:PRINTH$;:INPUT"ENTER <C> WHEN READY TO CONTINUE
 ";E$
7050 IF E$="C" GOTO 7060 ELSE 170
7060 OPEN"O",1,"DSKINDEX"       '*** WRITE TO DISK ROUTINE
7070 PRINT#1,XX
7080 FOR X=1 TO XX
7090 PRINT#1,DN$(X);",";PN$(X):NEXT:CLOSE:L=0
7100 REM *** QUOTED COMMA ALLOWS RETRIEVAL OF DATA AS 2 STRINGS
             L FLAG MEANS DATA ARE SAVED ON DISK AND MUST BE
             REREAD BEFORE ANY MANIPULATIONS.
7110 PRINT"FILE SAVED AS 'DSKINDEX' WITH ";XX;" RECORDS."
7120 PRINTH$;"PRESS ANY KEY TO RETURN TO MENU."
7130 IF INKEY$="" THEN 7130 ELSE 170
7140 OPEN"I",1,"DSKINDEX"  '*** SUBROUTINE TO READ FROM DISK
7150 INPUT#1,XX
7160 FOR X=1 TO XX:INPUT#1,DN$(X),PN$(X):NEXT:CLOSE:L=1:RETURN

7999 REM ********* OPTION 3 **************
8000 IF L=0 GOSUB 7140
8010 GOSUB 10010
8020 JJ=0    '*** CHECKS AND LISTS PROGRAMS ALREADY IN FILE
8030 FOR X=1 TO XX
8040 IF DN$<>DN$(X) THEN GOTO 8060
8050 JJ=JJ+1: P1$(JJ)=PN$(X)
8060 NEXT
8070 IF JJ=0 THEN PRINT:PRINT"DISK ";DN$;" WAS NOT FOUND":PRINT:
GOTO8130
8080 CLS: PRINT:PRINT"THESE PROGRAMS ARE ON DISK ";DN$;":":PRINT

8090 FOR I=1 TO JJ:PRINT P1$(I),:NEXT:PRINT
8100 IF K<5 AND K>2 THEN PRINT"ENTER <C> TO CONTINUE... <M> TO R
ETURN TO MENU" ELSE 8130
8110 E$="":INPUT E$: IF E$="C" THEN GOTO 4000 ELSE 170
8120 PRINT:PRINT"DISK ";DN$;" WAS NOT FOUND."
8130 PRINTH$;:INPUT"ENTER <M> FOR MENU OR <D> TO ENTER ANOTHER D
ISK ID";E$
8140 IF E$="D" THEN 8010 ELSE 170
8150 IF INKEY$="M"THEN 170  ELSE RETURN

9000 REM *********** VERTICAL RASTER SUBROUTINE **************
             C= NUMBER OF COLUMNS DESIRED
             J= STRING INDEX FOR EACH STRING ELEMENT ACCORDING
                TO COLUMN ASSIGNMENT
             N= NUMBER OF ELEMNTS IN STRING
9010 IIC=INT((I-1)/C)
9020 MIC=I-C*IIC-1  '*** MOD(I-1,C)
9030 INC=INT(N/C)
9040 MNC=N-C*INC     '*** MOD(N,C)
9050 IF MIC<MNC THEN LESS=MIC ELSE LESS=MNC
9060 J= LESS+MIC*INC+IIC+1
9070 RETURN

10000 REM **************** DISK ID SUBROUTINE ***************
10010 DN$="":PRINT:PRINTH$;:INPUT"ENTER THE 3 CHARACTER DISK ID
";DN$
10020 IF DN$="M" GOTO 170
10030 IF LEN(DN$)<>3 PRINT:PRINT"WRONG LENGTH ID... TRY AGAIN":

GOTO10010
10040 RETURN

10999 REM ************** ERROR TRAP ************
11000 CMD"E"
11010 PRINT"PRESS ANY KEY TO RESUME"
11020 IF INKEY$="" THEN 11020ELSE 170
```


See List of Advertisers on page 386

CP/M printer-driver and Model II TRSDOS.

Hoodwinking TRSDOS

Linda Anderson
1188 Olive Branch Lane
San Jose, CA 95120

My husband and I purchased a Model II with a Diablo 1650 printer. However, this configuration prohibited listing output from TRSDOS. I PEEKed and POKEd into both TRSDOS and CP/M to see what caused the problem.

In TRSDOS, I found a lengthy routine with lots of bit checking and bit setting of error conditions (I followed SVC 63: BTX, which resulted, ultimately, in JMP F1BDH). In CP/M I found a routine that waits for a printer ready status and then sends the character to the printer (via Port B). This means there is no error recovery, but we were doing fine in CP/M. The reason TRSDOS failed to work was the pins from our Diablo were different than those expected by TRSDOS. The solution as I saw it, was to transplant the CP/M print routine to TRSDOS.

Performing the Transplant

I wrote an Assembly language program (Fig. 1) to move the CP/M print routine over the existing TRSDOS routine. I used the Debug monitor to enter the code into memory (Fig. 2). Then, back in TRSDOS, I dumped the code onto disk as an executable program which can then be executed with: >SPRNTR/CMD in TRSDOS.

Then I created a TRSDOS command file, Starter, with the Build command (Fig. 3). I made Starter an Automatic Command File. Now every time I boot, Port B is initialized and the CP/M print routine moves over the TRSDOS routine. I solved the problem by tinkering with memory, not the System disk. ■

```
7000  01 11 00            LXI  B,17     ;MOVE 17 BYTES
7003  11 C0 F1            LXI  D,0F1BDH ;DESTINATION
7006  21 0C 70            LXI  H,PROUT  ;PRINT ROUTINE
7009  ED B0               LDIR          ;BLOCK MOVE
700B  C9                  RET
                 ;--------------------------------------
700C  C5         PROUT    PUSH B
700D  D5                  PUSH D
700E  E5                  PUSH H
700F  DB F7      LOOP     IN   A,(F7)   ;CHECK PRINTER READY
7011  E6 04               ANI  04
7013  28 FA               JR   Z,LOOP   ;WAIT FOR PRINTER READY
7015  78                  MOV  A,B      ;CHAR TO PRINT
7016  D3 F5               OUT  (F5),A   ;SEND TO PORT B
7018  AF                  XOR  A        ;SET STATUS FLAG
7019  E1                  POP  H
701A  D1                  POP  D
701B  C1                  POP  B
701C  C9                  RET
```

Fig. 1. SPRNTR/CMD

```
>DEBUG ON                   turn on debug monitor
>DEBUG                      enter debug monitor
     ?M A = 7000            change memory at 7000H
     (F1)                   move cursor to 7000H
     —enter code shown in fig. 1
     (F2)                   effect change
     ?S                     return to system
>DEBUG OFF                  turn off debug monitor
>DUMP SPRNTR/CMD START = 7000, END = 7000
```

Figure 2

```
>BUILD STARTER                 create auto command file
     SETCOM B = (300, 7, E, 1)      initialize port B
     SPRNTR/CMD                     execute SPRNTR/CMD
     FORMS S                        set serial printer
     >AUTO DO STARTER          TRSDOS will automatically execute
                                    the STARTER command file
```

Figure 3

ADS GET RESULTS

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Use STRING$ to pack those strings.

The STRING$'s the Thing

Tim Knight
10 Fieldbrook Place
Moraga, CA 94556

Data statements are important in Basic programming, with applications ranging from business to games. Liberal use of the statements can make a program more efficient, especially if it contains much data for strings. Using Data statements saves time and memory. There is even a way to use the data itself more efficiently. This technique saves memory, a large amount of the programmer's time, and reduces a program's running time.

The Key Box
Basic Level II
Model I and III
16K RAM

The Read command retrieves Data statements from within a program. For example, the word computer may follow a Data statement, and may be retrieved by the command READ A$ elsewhere in the program. You may form strings using Data statements. A very popular way of forming strings is to read numbers from a Data statement, and gradually build up each string (see Program Listing 1). This is inefficient since every time you run the program, it must form the string.

String packing is far more efficient since the Read statement reads Data statement numbers that were automatically POKEd into the string (see Program Listing 2). Following this POKEing process, in which the string is formed within the program line, you can delete the Data and Read statements. The string is created much faster since the string itself is within the program and does not have to be formed every time you run the program. This saves time and memory.

Each time I read an article on string packing, I noticed all the Data statements were very long. When typing them in, I easily made mistakes. The Data statements might be similar to those in Listing 2, in which some graphic character numbers (ranging from 128 to 191) are repeated over and over. Is there a better way to do it?

Yes! You can use the STRING$ statement. This statement is in the format A$ = STRING$ (aaa,nnn) where nnn is the graphics character code, and aaa is the number of characters in the string. For example, the statement A$ = STRING$ (10, 191) sets A$ equal to a 10-character string of solid blocks, forming a thick white line. The STRING$ statement is the key to efficient data statements that save time and memory.

How can I use this information to make my Data statements more efficient? Program Listing 3 produces the same result as Listing 2 but instead of using only graphic character numbers, I put the number of characters I wanted and the type of character I desired within the Data statements. The computer reads the number of characters first, followed by the graphics character. The program POKEs the graphic character into the string the specified number of times. This process continues until the Read

```
10 ' Program #1 - Reads DATA statements and forms a string that
says "HI"
20 CLEAR 500
30 DEFINT A-Z
40 CLS
50 READ A
60 IF A=999 THEN PRINT A$: END
70 A$=A$+CHR$(A)
80 GOTO 50
90 DATA 191, 191, 176, 176, 176, 191, 191
100 DATA 128, 131, 131, 191, 191, 131, 131, 26
110 DATA 24, 24, 24, 24, 24, 24, 24, 24, 24, 24, 24, 24, 24, 24
120 DATA 191, 191, 131, 131, 131, 191, 191, 128, 176, 176
130 DATA 191, 191, 176, 176, 999
```

Program Listing 1

ASCII code	Result
24	Backspace cursor
26	Move cursor down
32	Advance cursor
128	(BLANK): Advance cursor

Figure 1

statement encounters the number 999 which directs the program to end there, or if I want, go on to the main program.

After all Data statements have been read and the string is formed, you may delete the Data statements and the lines with the Read instructions. The line with the string itself must remain. This way the same string is formed almost instantly.

What if you want to form long strings with many different characters? Often you may want long strings of the same graphic block intertwined with single characters (see Program Listing 3). Because of this problem you don't save much time or memory. This process may take more time and memory than the normal string packing method. How can you solve this problem?

The length of a STRING$ is rarely over 25 characters. I devised a way to add up to 128 characters to the string at a time, and still resolve this problem. I put an instruction within the Read statement telling the computer that if the number it reads is less than 128, then it should read the next character. If it is greater than 128, then it adds that particular graphic block number. This way I can add single characters and strings of characters to the Data statements. (DATA 10, 191, 150, 10, 191 forms a string consisting of 10 solid blocks, one CHR$ (150), and 10 solid blocks.) The process looks complicated in a listing, but it is very simple. Unfortunately, there is still one bug in my technique.

When I form graphics strings, I sometimes have two or three-line strings (strings which do not fit on one line). When I first started programming, I used space compression codes which consisted of the character strings from 192 to 255. This caused problems, so I instead used the cursor motion commands (see Fig. 1). By using these commands, I could easily form almost any string. The problem is that the character string numbers for some of these cursor motion commands are below the number 128, and will mess up my entire technique. I resolved this problem by modifying my Read line. I instructed the computer to watch for the numbers 24 (backspace cursor) and 26 (down cursor) and 32 (space) since I use these numbers all the time. If the computer encounters any of these numbers, it considers them as single characters (see Program Listing 4). ■

```
10 ' Program #2 - Reads DATA statements and forms a string that
says "HI"
20 CLEAR 500
30 DEFINT A-Z
40 CLS
50 A$="                                                    "
60 V=VARPTR(A$)
70 V=PEEK(V+1)+PEEK(V+2)*256
80 FOR I=0 TO LEN(A$)-1
90 READ A
100 IF A=999 THEN END
110 POKE V+I, A
120 NEXT:PRINTA$
130 DATA 191, 191, 176, 176, 176, 191, 191
140 DATA 128, 131, 131, 191, 191, 131, 131, 26
150 DATA 24, 24, 24, 24, 24, 24, 24, 24, 24, 24, 24, 24, 24, 24
160 DATA 191, 191, 131, 131, 131, 191, 191, 128, 176, 176
170 DATA 191, 191, 176, 176, 999
10 ' Program #3 - Getting better, but not perfect!
20 CLS
30 CLEAR 500
40 DEFINT A-Z
50 A$="                                                    "
60 V=VARPTR(A$)
70 V=PEEK(V+1)+PEEK(V+2)*256
80 READ A
90 IF A=999 THEN PRINTA$:END
100 READ B
110 FOR C=V TO V+A-1
120 POKE C, B
130 NEXT
140 V=V+A
150 GOTO 80
160 DATA 2, 191, 3, 176, 2, 191, 1, 128
170 DATA 2, 131, 2, 191, 2, 131, 1, 26
180 DATA 14, 24, 2, 191, 3, 131, 2, 191
190 DATA 1, 128, 2, 176, 2, 191, 2, 176, 999
```

Program Listing 2

```
10 ' Program #3 - Getting better, but not perfect!
20 CLS
30 CLEAR 500
40 DEFINT A-Z
50 A$="                                                    "
60 V=VARPTR(A$)
70 V=PEEK(V+1)+PEEK(V+2)*256
80 READ A
90 IF A=999 THEN PRINTA$:END
100 READ B
110 FOR C=V TO V+A-1
120 POKE C, B
130 NEXT
140 V=V+A
150 GOTO 80
160 DATA 2, 191, 3, 176, 2, 191, 1, 128
170 DATA 2, 131, 2, 191, 2, 131, 1, 26
180 DATA 14, 24, 2, 191, 3, 131, 2, 191
190 DATA 1, 128, 2, 176, 2, 191, 2, 176, 999
```

Program Listing 3

```
10 ' Program #4 - Eureka! STRING PACKS "80-MICRO" efficiently!
20 CLS
30 CLEAR500
40 DEFINTA-Z
50 A$="                           (180 SPACES)
                                                           "
60 V=VARPTR(A$)
70 V=PEEK(V+1)+PEEK(V+2)*256
80 READA
90 IFA=999THENPRINTA$:END
100 IFA<128ANDA<>32ANDA<>24ANDA<>26THENREADB:FORC=VTOV+A-1:POKEC
,B:NEXT:V=V+A:GOTO80
110 POKEV,A
120 V=V+1
130 GOTO80
140 DATA3,191,2,143,3,191,128,7,191,5,128,5,191
150 DATA26,25,24,24,8,191,128,2,191,3,128,2,191,128
160 DATA3,140,128,191,131,191,131,191,128,176,128
170 DATA4,176,128,3,176,128,4,176,26,42,24
180 DATA3,191,2,188,3,191,128,7,191,5,128
190 DATA191,3,128,191,128,191,128,191,3,179
200 DATA128,191,3,128,191,2,176,191,999
```

Program Listing 4

✓See List of Advertisers on page 386

LOAD 80

Keep track of those air miles and carriers.

Portal to Portal Report

J. M. Keneipp
2201 Lincolnwood Drive
Evanston, IL 60201

Last spring several major airlines announced incentive programs for the frequent air traveller. American Airlines, United Airlines, Braniff Airlines and Transworld Airlines have awards for 20,000, 30,000, 40,000 or 50,000 miles accumulated between spring 1981 and 12 or 18 months later.

It is hard to decide how to play the game to your best advantage. I needed some specific facts to guide my strategy. I wrote a program and, as one thing led to another, I added features to determine not only how far I have flown on each airline, but also average speed and how long I was airborne each month.

The only information I need to record during the month is the names of the cities flown between, the name of the airline and the times of liftoff and touchdown.

The program produces a table listing for each pair of cities, air traffic control airport identifiers, airlines flown, distances between cities, flying time and speed. A summary line provides total distance, total flying time and average speed for the month. A second summary breaks the mileage down between the four airlines with incentives and other airlines. (See the Program Listing).

In June, 1981 (Example 1) I flew a total of 8,632 miles. My incentive mileage included 1,046 miles on American and 2,528 on United. The remaining 5,058 miles was, unfortunately, on other airlines.

Computation Theory

To produce a table summarizing flying distances, times and speeds, it is necessary to determine distances between airports. Distances listed in a road atlas are not satisfactory. The program calculates the great circle distances between airports from latitude and longitude readings.

The algorithm used to calculate the great circle distance involves three steps: Calculation of the great circle angle in radians; conversion of the angle from radians to degrees; and conversion of the angle from degrees to statute miles.

The computer performs trigonometry in radians, whereas latitudes and longitudes are usually measured in degrees. A conversion factor, 0.0174533, is used to change degrees to radians in the first step. Another factor, 57.29578, converts the angle into degrees to be multiplied by the number of statute miles per degree.

```
AIR TRAVEL SUMMARY FOR JUNE 1981
-------------------------------------------------------------------
FROM       TO         LINE        MILES      HRS & MIN      MPH
-------------------------------------------------------------------
ORD        BWI        UA            625       1  20         469
BWI        ORD        UA            625       1  36         391
ORD        MIA        OT          1,200       2  25         497
MIA        ORD        OT          1,200       2  41         447
ORD        SPI        OT            174       0  33         316
SPI        STL        OT             84       0  36         140
STL        OKC        AA            461       1  10         395
OKC        ORD        UA            693       1  27         478
ORD        TUL        AA            585       1  21         433
TUL        ORD        UA            585       1  45         334
ORD        MIA        OT          1,200       2  33         471
MIA        ORD        OT          1,200       2  33         471
                                  -----      -----         -----
     TOTAL:                       8,632      20  0          432
-------------------------------------------------------------------
TOTAL DISTANCES BY AIRLINE:
  AMERICAN: 1,046 MILES
  BRANIFF:      0 MILES
  TWA:          0 MILES
  UNITED:   2,528 MILES
  OTHERS:   5,058 MILES
```

Example 1

The Key Box

Basic Level II
Model I
16K RAM
TRSDOS 2.3
Line Printer II

Your best Model I/III peripheral buy is a modem.

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The conversion of a great circle angle into a distance derives from the circumference of the earth and the number of degrees in a complete circle. A great circle angle measuring one degree represents 1/360th of the circumference of the earth. But what is the circumference of the earth? According to the current *World Almanac*, the circumference of the earth at the equator is 24,901.55 miles. It measures 24,859.82 miles over the poles. I used the average 24,880.685 statute miles, making the length of one degree of a great circle arc 69.113 miles.

Latitudes and Longitudes

The best source for latitudes and longitudes of every airport in the continental USA is the *Airport/Facility Directory* (published in seven volumes by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Rockville, MD 20852). A set costs $17.50, or $2.50 per volume.

The Data statements in my program include the geographic location of 72 airports, expressed in decimal degrees of latitude and longitude. To convert degrees, minutes and seconds to decimal degrees divide the minutes by 60 and the seconds by 3,600. The latitude of Chicago O'Hare Airport (41 degrees 58′ 57″) becomes 41 plus 58/60 plus 57/3600 and equals 41.9825 degrees.

The Program

The program is started by entering Run. This is followed by a short delay while airport data loads into storage arrays. You will be asked how many trips there will be in the summary. Next, you will be asked to enter origin city name, destination city name, flying time between cities —hours, minutes and air carrier as AA, BN, TW, UA or other—OT?.

If you misspell a city name or enter one not in the data, an error message appears. A similar error message occurs for not entering the proper option for the airline. When you enter the flying time, hours and minutes should be separated by a comma. Do not include commas in the table title.

After entering the last trip you will be asked to enter the period covered by the summary, such as July 1981.

After you enter the table title, the complete table as shown in Example 1 will be printed. If you modify the program for video display, the table will be printed line by line. If your table contains more lines than screen capacity, the scrolling subroutine holds lines until you hit Enter to continue. A similar Hit Enter message delays the final tabulation of distances by airline in the video version. After the entire table has been printed or video displayed, you will be asked if you want to prepare another summary.

Variations

For the video version, follow the changes noted in lines 220–260.

As written, the program prepares a table printing the three-letter ATC airport code of the two cities, a two-letter airline designation, the distances in statute miles, flying time in hours and minutes and the speed in statute MPH. If you prefer the name of the cities instead of the air traffic control identifiers (and if your printer has enough columns), change the M$ references to N$ in line 940. With this change ORD, for example, becomes Chicago.

Distances in nautical miles and speed in knots can be obtained by substituting line 870 (blocked with a REM) for line 860. Related changes include lines 800 and 1270, in which MPH become knots.

Accomplish metrification of the table by substituting line 880 for line 860 and changing miles to kilometer and KM/HOUR in lines 800 and 1270. ■

Mr. Keneipp is a transportation planning engineer with a national consulting firm.

Program Listing

```
10    'THIS PROGRAM SUMMARIZES YOUR AIR TRAVEL OVER A PERIOD
20    'OF TIME THAT YOU SELECT--ONE OR SEVERAL MONTHS.
30    'EACH TRIP SHOWS THE ORIGIN AND DESTINATION AIRPORT
40    'IN THE ATC IDENTIFIER CODE; THE AIRLINE CODE; THE
50    'DISTANCE IN STATUTE MILES; THE TRIP TIME IN HOURS
60    'AND MINUTES AND THE AVERAGE SPEED IN MILES PER HOUR.
70    '
80    'EACH TABLE SHOWS THE TOTAL DISTANCE; TRIP TIMES AND
90    'OVERALL AVERAGE SPEED FOR YOUR SELECTED PERIOD. A
100   'SECOND TOTAL AT THE BOTTOM OF THE TABLE SUMS THE
110   'MILEAGE BY AIRLINE
120   '
130   'TO RUN THE PROGRAM:
140   '       1. ENTER THE NUMBER OF TRIPS THAT ARE TO BE
150   '          SHOWN IN THE TABLE--CAN BE UP TO 50
160   '       2. TYPE IN THE NAME OF THE ORIGIN CITY
170   '       3. TYPE IN THE NAME OF THE DESTINATION CITY
180   '       4. TYPE IN THE FLYING TIME IN HOURS,MINUTES
190   '          (SEPARATED BY A COMMA)
200   '       5. TYPE IN THE ABBREVIATION OF THE AIRLINE AS:
210   '          AA, BN, TW, UA OR OT (FOR OTHER)
220   'AS WRITTEN THE PROGRAM PRODUCES HARD COPY FROM YOUR
230   'PRINTER. IF YOU WANT A VIDEO TABLE THEN DELETE THE
      L FROM LPRINT IN LINES: 780; 790; 800; 810; 940; 1070
240   '1080; 1090; 1100; 1110; 1120; 1130; 1140; AND 1150
250   'AND REMOVE THE REMS (') FROM LINE 830; LINE 1105 AND
260   'LINES 1240 THROUGH 1290
270   '
280   CLS: PRINT"FLIGHT LOG PROGRAM BY J. M. KENEIPP 7/25/81
290   PRINT:PRINT"    ARRAYS ARE BEING LOADED FROM DATA"
300   'PROGRAM "P" -- "PRINTLOG/BAS" -- LEVEL II BASIC
310   CLEAR 500
320   DIM N1(100),N$(100),M$(100),L(100),G(110),P(50,9),K$(6)
330       FOR Y= 1 TO 5
340   READ N1(Y), K$(Y)
350       NEXT
360   LET C = 72
370       FOR X = 1 TO C
380   READ N1(X),N$(X),M$(X),L(X),G(X)
390       NEXT X
400   CLS:INPUT"HOW MANY TRIPS WILL THERE BE IN THE SUMMARY";T
410   N = 0
420   '
430   INPUT"ENTER ORIGIN CITY NAME";A$
440       FOR X = 1 TO C
450   IF N$(X)=A$ THEN 480  ELSE 460
460       NEXT X
470   IF N$(X) <> A$ THEN 510  ELSE 480
480   N=N+1
490   P(N,1)=X: P(N,2)=L(X): P(N,3)=G(X)
500   GOTO 540
510   PRINT"CITY NOT FOUND IN DATA--TRY AGAIN"
520   GOTO 430
530   '
540   INPUT"ENTER DESTINATION CITY NAME";B$
550       FOR X = 1 TO C
560   IF N$(X)=B$ THEN 590  ELSE 570
570       NEXT X
580   IF N$(X) <> B$ THEN 610  ELSE 590
590   P(N,4)=X: P(N,5)=L(X): P(N,6)=G(X)
600   GOTO 640
610   PRINT"CITY NOT FOUND IN DATA--TRY AGAIN"
620   GOTO 540
630   '
640   INPUT"ENTER FLYING TIME BETWEEN CITIES--HRS,MIN";H,M
650   P(N,7)=H: P(N,8)=M
660   '
670   INPUT"ENTER AIR CARRIER AS AA,BN,TW,UA OR OTHER--OT";C$
680       FOR Y=1 TO 5
690   IF K$(Y)=C$ THEN 720  ELSE 700
700       NEXT Y
710   IF K$(Y) <> C$ THEN 740        ELSE 720
720   P(N,9)=Y
730   GOTO 760
740   PRINT"AIR CARRIER NOT FOUND--TRY AGAIN"
750   GOTO  670
760   IF N = T THEN 770  ELSE 430
770   CLS: INPUT"ENTER PERIOD COVERED BY THE SUMMARY--USE NO

          COMMAS";A1$
780   CLS:LPRINT"AIR TRAVEL SUMMARY FOR ";A1$
790   LPRINT"-----------------------------------------------------------"
800   LPRINT"FROM"TAB(10)"TO"TAB(20)"LINE"TAB(29)" MILES"
      TAB(39)"HRS & MIN"TAB(53)"MPH"
810   LPRINT"-----------------------------------------------------------"
820       FOR N = 1 TO T: FOR J = 1 TO 1
830 '  GOSUB 1240  'SCROLLING SUBROUTINE FOR VIDEO TABLES
840   D = (SIN(P(N,2)*.0174533)*SIN(P(N,5)*.0174533)+COS
       (P(N,2)*.0174533)*COS(P(N,5)*.0174533)*COS((P(N,3)
       -P(N,6))*.0174533))
850   A=(-ATN(D/SQR(-D*D+1))+1.570796)*57.29578
860   D1=A*69.113            'STATUTE MILES
870       ' D1=A*60.0576      NAUTICAL MILES
880       ' D1=A*111.203        KILOMETERS
890   D1=INT(D1+.5)
900   E1=P(N,7)+P(N,8)/60      'DECIMAL HOURS
910   V1=D1/E1                 'SPEED
920   V1=INT(V1+.5)
930   S$="##,###"
940   LPRINT M$(P(N,1))TAB(10)M$(P(N,4));TAB(20)K$(P(N,9))
      "          ";:LPRINT USING S$;D1;:LPRINT TAB(40)P(N,7);
       P(N,8) TAB(52)V1
950   IF P(N,9)=1 THEN TA=TA+D1
960   IF P(N,9)=2 THEN TB=TB+D1
970   IF P(N,9)=3 THEN TT=TT+D1
980   IF P(N,9)=4 THEN TU=TU+D1
990   IF P(N,9)=5 THEN OO=OO+D1
1000   D9=D9+D1                   'CUMULATIVE DISTANCE
1010   E7=E7+E1                   'CUMULATIVE DECIMAL HOURS
1020   E8=INT(E7)
```

Program continues

✓See List of Advertisers on page 386

Program continued

```
1030    E9=INT(60*(E7-E8))
1040    Z=D9/E7                    'AVERAGE SPEED OF ALL TRIPS
1050    Z=INT(Z+.5)
1060        NEXT J: NEXT N
1070    LPRINT TAB(31)"-----"TAB(41)"-----"TAB(52)"-----"
1080    LPRINT"    TOTAL:                    ";:LPRINT USING S$;
        D9;:LPRINT TAB(39)E8;TAB(43)E9;TAB(52)Z
1090    LPRINT"-------------------------------------------------------------"
1100    LPRINT"TOTAL DISTANCES BY AIRLINE:"
1105  ' INPUT"HIT ENTER TO SEE TOTALS BY AIRLINE";V$
1110    LPRINT"  AMERICAN:";:LPRINT USING S$; TA;:LPRINT" MILES"
1120    LPRINT"  BRANIFF: ";:LPRINT USING S$; TB;: LPRINT " MILES"
1130    LPRINT"  TWA:     ";:LPRINT USING S$;TT;:LPRINT " MILES"
1140    LPRINT"  UNITED:  ";:LPRINT USING  S$; TU;: LPRINT" MILES"
1150    LPRINT"  OTHERS:  ";:LPRINT USING S$; OO;:LPRINT" MILES"
1160    LPRINT"  ": LPRINT"  "
1170    INPUT"TO PREPARE ANOTHER SUMMARY ENTER 'Y'--IF NOT ENTER'N'";Q$
1180    IF Q$="Y" THEN 1190 ELSE 1220


1190    D9=0: E7=0: T=0: A1=0: TA=0: TB=0: TT=0: TU=0: OO=0
1200    FOR N=1 TO 20: FOR J=1 TO 8: P(N,J)=0: NEXT J: NEXT N
1210    GOTO 400
1220    END
1230    'SCROLLING SUBROUTINE
1240  '  A1 = A1 + 1
1250  '  IF A1 < 10 THEN 1290   ELSE 1260
1260  '  INPUT"HIT ENTER TO CONTINUE";R$:PRINT @ 832,"                              "
1270  '  PRINT"FROM"TAB(14)"TO"TAB(30)"MILES"TAB(39)"HRS & MIN"TAB(53)"MPH"
1280  '  A1 = 0
1290  '  RETURN
1300     '
1310     'AIR CARRIERS
1320    DATA 1, AA
1330    DATA 2, BN
1340    DATA 3, TW
1350    DATA 4, UA
1360    DATA 5, OT
1370    '
1380    'AIRPORT DATA: NUMBER; CITY; ATC CODE; LATITUDE;
          AND LONGITUDE
1390   DATA 1,ATLANTA,ATL,33.6381,84.4278
1400   DATA 2,BALTIMORE,BWI,39.0175,76.67
1410   DATA 3,BINGHAMTON,BGM,42.2075,75.9794
1420   DATA 4,BOSTON,BOS,42.3642,71.0056
1430   DATA 5,BUFFALO,BUF,42.9406,78.7325
1440   DATA 6,CEDAR RAPIDS,CID,41.8844,91.7086
1450   DATA 7,CHAMPAIGN,CMI,40.0397,88.2781
1460   DATA 8,CHARLESTON SC,CHS,32.8986,80.0400
1470   DATA 9,CHARLESTON WV,CRW,38.3731,81.5933
1480   DATA 10,CHARLOTTE,CLT,35.2147,80.9383
1490   DATA 11,CHICAGO,ORD,41.9825,87.9069
1500   DATA 12,CINCINNATI,CVG,39.0478,84.6667
1510   DATA 13,CLARKSBURG,CKB,39.2956,80.2289
1520   DATA 14,CLEVELAND,CLE,41.4103,81.8489
1530   DATA 15,COLUMBUS,CMH,39.9947,82.8856
1540   DATA 16,DALLAS,DFW,32.8967,97.0336
1550   DATA 17,DAYTON,DAY,39.9011,84.2200
1560   DATA 18,DECATUR,DEC,39.8342,88.8681
1570   DATA 19,DENVER,DEN,39.7742,104.878
1580   DATA 20,DETROIT,DTW,42.2153,83.3486
1590   DATA 21,ELMIRA,ELM,42.1595,76.8925
1600   DATA 22,GREENVILLE,GSP,34.8964,82.2186
1610   DATA 23,HARTFORD,HFD,41.7361,72.6506
1620   DATA 24,HOUSTON,IAH,29.9828,95.3458
1630   DATA 25,HUNTINGTON,HTS,38.3667,82.5581
1640   DATA 26,INDIANAPOLIS,IND,39.7244,86.2833
1650   DATA 27,ITHACA,ITH,42.4903,76.4578
1660   DATA 28,JACKSONVILLE,JAX,30.4925,81.6900
1670   DATA 29,KANSAS CITY,MCI,39.2992,94.7178
1680   DATA 30,LAS VEGAS,LAS,36.0800,115.1522
1690   DATA 31,LEXINGTON,LEX,38.0367,84.6058
1700   DATA 32,LITTLE ROCK,LIT,34.7303,92.2331
1710   DATA 33,LOS ANGELES,LAX,33.9419,118.406
1720   DATA 34,LOUISVILLE,SDF,38.1778,85.7364
1730   DATA 35,MADISON,MSN,43.1389,89.3375
1740   DATA 36,MEMPHIS,MEM,35.05,89.9789
1750   DATA 37,MIAMI,MIA,25.7944,80.2881
1760   DATA 38,MILWAUKEE,MKE,42.9480,87.8964
1770   DATA 39,MINNEAPOLIS,MSP,44.8842,93.215
1780   DATA 40,MOLINE,MLI,41.4486,90.5081
1790   DATA 41,NASHVILLE,BNA,36.1267,86.6819
1800   DATA 42,NEW ORLEANS,MSY,29.9928,90.2564
1810   DATA 43,NEW YORK JFK,JFK,40.6403,73.7783


1820   DATA 44,NEW YORK LGA,LGA,40.7772,73.8742
1830   DATA 45,NEWARK,EWR,40.6931,74.1686
1840   DATA 46,NORFOLK,ORF,36.8953,76.2008
1850   DATA 47,OKLAHOMA CITY,OKC,35.3936,97.5997
1860   DATA 48,OMAHA,OMA,41.3011,95.8850
1870   DATA 49,ORLANDO,MCD,28.4317,81.3247
1880   DATA 50,PEORIA,PIA,40.6642,89.6908
1890   DATA 51,PHILADELPHIA,PHL,39.8703,75.2453
1900   DATA 52,PHOENIX,PHX,33.4361,112.009
1910   DATA 53,PITTSBURGH,PIT,40.4936,80.2317
1920   DATA 54,PORTLAND,PDX,45.5892,122.5925
1930   DATA 55,RENO,RNO,39.4978,119.7678
1940   DATA 56, ROCHESTER,ROC,43.1189,77.6728
1950   DATA 57, ROCKFORD,RFD,42.1994,89.0922
1960   DATA 58, SALT LAKE,SLC,40.7842,111.967
1970   DATA 59,SAN ANTONIO,SAT,29.5333,98.4697
1980   DATA 60,SAN DIEGO,SAN,32.7336,117.1867
1990   DATA 61,SAN FRANCISCO,SFO,37.6194,122.374
2000   DATA 62,SAN JOSE,SJC,37.3614,121.927
2010   DATA 63,SAN JUAN,SJU,18.4414,66.0022
2020   DATA 64,SEATTLE,SEA,47.4492,122.3081
2030   DATA 65,SPRINGFIELD,SPI,39.8433,89.6678
2040   DATA 66,ST LOUIS,STL,38.7481,90.3622
2050   DATA 67,SYRACUSE,SYR,43.1122,76.1089
2060   DATA 68,TAMPA,TPA,27.9739,82.5328
2070   DATA 69,TULSA,TUL,36.1986,95.8878
2080   DATA 70,WASHINGTON D,IAD,38.9436,77.4544
2090   DATA 71,WASHINGTON N,DCA,38.8522,77.0375
2100   DATA 72,WICHITA,ICT,37.6517,97.4308
```

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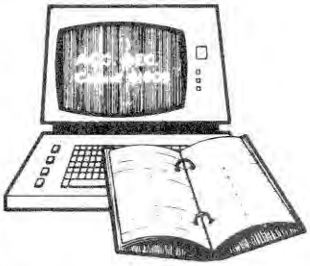

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Access Profile files with this Basic program.

Play a Trick on Profile

Bryan Scott
3135 Jamaica Drive
Corpus Christi, TX 78418

Radio Shack's data management program Profile is an easy data filing program to use, as well as fairly inexpensive. It enables you to design an elegant screen format and it utilizes an interesting method of placing the data on disk, which you can access as either a sequential or a random access file.

Sequential access is easy. Using LINEINPUT#1, A$, read the file one record at a time. Then use the MID$ function to get the portion of A$ you want. I have used this procedure to set up membership files for several organizations, with much more information than a regular mailing list program.

Direct Access

The method for direct access shown in the Profile manual, requiring that the sum of the lengths of the data fields be an even fraction of 256, is restrictive and clumsy. You can access Profile using the TRS-80 Model I's unpublicized ability to handle record lengths other than the 256 bytes that the disk manual insists is required.

Answer the Basic question "How Many Files?" with 3V to enter a whole new world of data handling. You are no longer restricted to the 256-byte record length, with its wasteful use of disk space. For instance, if your record length happens to be 129 bytes, open your file with OPEN "R",1,"FN",129, and you will get almost twice as many records on a disk as you can with the 256-byte restriction. There is one problem with the variable record length function, however. Due to a deficiency in TRSDOS, the LOF function does not work properly; you can not tell how many records are in the file. Also, the buffer has to be filled before Profile will write the last record to the file.

If you add or delete a record in Profile, it keeps count in a special file called INFOFILE, which contains information about the number of records, the maximum allowed, maximum drive number, number of fields, and the highest record number stored on each disk. It also contains data about the fields, including their length, the first 13 characters of the field name, and the screen memory position of the start of each field. A file called FORMFILE contains the exact picture of your screen display. List it in DOS: it is interesting.

When you run Profile according to the book, there is no trouble setting up your screen display and your fields. Make sure that you have all the fields you need, and that there is enough room in each field for the maximum amount of data. Once you accept the screen display you are locked in, and can not change it without starting over. If you are going to sort names alphabetically, enter the last name first, or use a separate field with the name as it should be sorted alphabetically. This is the best way with company names.

Setting up the display and entering data are the easy parts. Finding a record, sorting, and printing any more than a simple listing are slow and clumsy with Profile. Since Profile reads the data files sequentially, finding a record near the end of the file can take several minutes. The sort routine involves moving records on the disk, and can take hours if the file contains several hundred records.

The Program

I wrote PRORAN (see the Program Listing) to enable you to access and edit records easily. If you intend to sort or print records or make labels, you must make some modifications.

Line 40 asks if you have set the file number to 3V. If you have not, it puts you back into the Basic entry routine so you can start out right; if it does this, you will have to load the program again.

Starting with line 70 is the routine for reading INFOFILE, as shown in the Profile manual. If you wish to see this information, answer Y in line 160. Lines 190–340 contain the routine for listing the file information.

One interesting addition to the random file procedure shows up in lines 80 and 90. The TRSDOS manual says you can file an integer in two characters, a single precision number in four, and a double precision number in eight characters. Here is a way to store small numbers (no larger than 255) in one character! Put it into the buffer with LSET A$ = CHR$(N), and restore it to numeric with N = ASC(A$).

Line 350 starts the random access file routine, and will work for a one or two drive system. Line 370 sets the starting point for each of the fields in the FIELD statement, based on information read from INFOFILE. Line 380 fields the buffer. The TRSDOS manual says you can field the buffer more than one way, but does not explain that many different fielding arrangements can be in effect at the same time. In this case, the buffer is fielded separately for each data field, up to the 32 fields allowed.

Line 400 sends the program to a subroutine which reads the sorted field, in this case field 1. If your sorted field (you may only sort by one field) is not field 1, then change the subscripts for D1$() and D2$(). This information is placed into array SS$() and is sorted in ascending sequence. This array is used with the binary search routine at line 600 to locate any record quickly.

Line 410 tells you how many records are in the file, and asks which one you wish to access. You must enter the data exactly as it was originally entered, or

> ***The Key Box***
>
> **Disk Basic**
> **Model I**
> **32K RAM**
> **TRSDOS**
> **One disk drive**
> **Profile**

the program will not find it. If it does, it displays the data for all the fields in the record. You may change any or all of them, one field at a time, and when you enter A to accept, the revised record is written to the disk.

To use PRORAN, load it in Basic, then put the Profile disks in your drives (use backups), then type RUN.

To delete a record, use the standard Profile procedure, so INFOFILE can be kept up-to-date. ■

Mr. Scott has been retired for three years after 44 years with an electric utility company. His hobbies include photography, bird-watching, and swimming.

```
10 'PRORAN       RANDOM ACCESS TO PROFILE FILES
20 'BY BRYAN SCOTT      3135 JAMAICA DR.  CORPUS CHRISTI TX 78418

30 CLEAR2000:DEFINTA-Z:DIM D(4),NM$(32),CU(32),LN(32),SF(32)
39 '             CHECK FOR VARIABLE LENGTH FILE CAPABILITY
40 CLS:PRINT"DID YOU ANSWER '3V' TO THE QUESTION 'HOW MANY FILES
'(Y/N)"
50 QQ$=INKEY$:IFQQ$=""THEN50   ELSE IF QQ$="N"THENCMD"I","BASIC"

60 IF QQ$<>"Y"THEN40
69 '             OPEN AND READ 'INFOFILE'
70 OPEN"R",1,"INFOFILE:0":GET1,1:D(0)=0
80 FIELD1,2ASNR$,2ASMX$,1ASMD$,2ASDR$,1ASRL$,1ASNF$,2ASD$(1),2AS
D$(2),2ASD$(3),2ASD$(4)
90 NR=CVI(NR$):MX=CVI(MX$):MD=ASC(MD$):DR=CVI(DR$)
100 RL=ASC(RL$):NF=ASC(NF$):FORI=1TO4:D(I)=CVI(D$(I)):NEXTI
110 DIM D1$(NF+1),D2$(NF+1),D3$(NF),SS$(NR)
120 GET1,2:J=0:FORI=0TONF-1:IF I=16 THEN GET1,3:J=0
130 FIELD 1,(J*16)AS DUMMY$,13AS N$,2AS CU$,1AS L$
140 NM$(I+1)=N$:CU(I+1)=CVI(CU$):LN(I+1)=ASC(L$)
150 J=J+1:NEXTI:CLOSE
159 '             LIST INFO ABOUT PROFILE FILE
160 CLS:PRINT"DO YOU WISH FILE INFORMATION (Y/N)"
170 YN$=INKEY$:IFYN$=""THEN170  ELSE IF YN$="N"THEN350
180 IFYN$<>"Y"THEN160
190 CLS:PRINT"          PROFILE CONTROL FILE INFORMATION
200 PRINT:PRINT"NUMBER OF RECORDS:";NR
210 PRINT"AVAILABLE UNUSED:";MX-NR
220 PRINT"MAXIMUM ALLOWED:";MX
230 PRINT"MAXIMUM DRIVE USED:";MD
240 PRINT"DELETED RECORDS:";DR
250 PRINT"RECORD LENGTH:";RL
260 PRINT"NUMBER OF FIELDS:";NF
270 PRINT"HIGHEST RECORD NUMBER EACH DRIVE:";:FOR I=0TOMD:PRINTI
;D(I+1)+1;",";:NEXT
280 PRINT:INPUT"PRESS <ENTER> FOR FIELD DATA";Z$:CLS
290 PRINT"FIELD NAME            START                  LENGTH"
300 ZZ$="%           %     ###                    ###"
310 K=1
320 FOR I=1TONF:K=K+LN(I-1):PRINTUSINGZZ$;NM$(I);K;LN(I)
330 IFI=12INPUT"PRESS <ENTER> FOR MORE";Z$
340 NEXT
349 '             OPEN PRODAT FILES, FIELD BUFFERS
350 OPEN "R",1,"PRODAT",RL
360 IF MD=1 THEN OPEN "R",2,"PRODAT:1",RL
370 FOR I=2 TO NF:SF(I)=SF(I-1)+LN(I-1):NEXTI
380 FORI=1 TO NF:FIELD1,SF(I) AS XX$,LN(I) AS D1$(I):NEXTI
390 IF MD=1 THEN FOR I=1 TO NF:FIELD2,SF(I) AS XX$,LN(I) AS D2$(
I):NEXTI
399 '            READ SORTED FIELD, PLACE IN ARRAY
400 GOSUB540
410 PRINT"THERE ARE";NR;"RECORDS IN THIS FILE. WHICH TO ACCESS?
ENTER 0 TO END FILE ACCESS";:INPUTK$:IF K$="0"THENCLOSE:END ELSE
GOSUB600
420 QQ$="                    RECORD NUMBER"+STR$(QQ)
430 IF QQ<=(D(1)+1) THEN FL=1: GET 1,QQ:GOTO450
440 GET 2,QQ-D(1)-1:FL=2:GOTO460
450 CLS:PRINTQQ$:FORI=1 TO NF STEP2:PRINTI;D1$(I);TAB(30)I+1;D1$
(I+1):NEXTI:GOTO470
460 CLS:PRINTQQ$:FORI=1 TO NF STEP2:PRINTI;D2$(I);TAB(30)I+1;D2$
(I+1):NEXTI
470 PRINT:PRINT"ENTER (A) TO ACCEPT, (C) TO CHANGE, (R) TO READ
ANOTHER RECORD";:INPUTCH$
480 IF CH$="A"THENIFFL=1THENPUT1,QQ:GOTO410  ELSEPUT2,QQ-D(1)-1:
GOTO410
490 IF CH$="R"THEN410
500 IF CH$<>"C"THEN470
510  INPUT"PLEASE INDICATE THE FIELD TO CHANGE";CH
520 INPUT"PLEASE ENTER CORRECT DATA";DA$
530 IFFL=1THENLSETD1$(CH)=DA$:GOTO450  ELSE LSETD2$(CH)=DA$:GOTO
460
539 '              ROUTINE TO READ SORTED FIELD INTO ARRAY
540 CLS:PRINT"WAIT WHILE I READ THE FILE":FOR I=1TONR:IF I<=D(1)
+1 THEN GET1,I:SS$(I)=D1$(1):GOTO560
550 GET2,I-D(1)-1:SS$(I)=D2$(1)
560 PRINT@40,SS$(I):NEXTI
570 RETURN
580 QQ=0:FOR I=1 TO NR: IF K$=SS$(I) THEN QQ=I:RETURN
590 NEXTI:RETURN
599 '            ROUTINE TO CONDUCT BINARY SEARCH
600 N=NR:L=1
610 U=N+1
620 I=INT((L+U)/2)
630  IF SS$(I)=K$THEN QQ=I:RETURN
640  IF SS$(I)<K$ THEN
                  IF L=I THEN PRINT K$;" NOT FOUND":GOTO410
                     ELSE L=I:GOTO 620
                     ELSE
                   IF U=I THEN PRINT K$;" NOT FOUND":GOTO410
                     ELSE U=I:GOTO 620
```

Program Listing

PEEK and POKE for the Model II.

The PEEK of Its Career

C. David Wilson
P.O. Box 272
Madawaska, ME 04756

When did you last read an article and head for your Model II to key in the accompanying program—only to realize that you cannot PEEK or POKE with Model II Basic?

The experience, as in my case, may already have made a machine language programmer out of you. Among a large majority of programs published in Level II Basic the only stumbling block for adaptation to Model II Basic is its inability to PEEK and POKE.

The solution is straightforward and assumes you know little about TRSDOS.

First choose a System disk for such conversions. Proceed as follows:

```
TRSDOS READY.......
DEBUG ON <ENTER>
DEBUG <ENTER>
M = 6000
<F1>
5E235636002B1A77C95E2356EB5E23562
  32323237E12C9
<F2>
S
DEBUG OFF <ENTER>
DUMP PEEKPOKE/CIM START=6000,END
  =6016,RELO=(see Table 1),RORT=R
  <ENTER>
```

The RELO address you use in the Dump command depends on your system. Use an address from Table 1. This reloads the small subroutine to the top of RAM for your system.

Your disk should now show PEEKPOKE/CIM in its directory. Now let's consider your Basic program—only three PEEKS and a POKE away from reality. First you must incorporate several statements early in the program (see Table 2).

With these preliminaries out of the way, your program can now PEEK at an address with the function call USR0(address). The address within the parentheses must be an integer constant, an integer variable or an integer expression.

Print USR0(29000), for example, displays (in decimal) the current value of the byte at address 29000:

```
I% = &HF000
A  = USR0(I%+6)
```

This sets A to the value of the byte at address X'F006'.

Since Basic decimal integers fall in the range −32768, +32767 how can we PEEK at a decimal address beyond 32767? I% =40000−256↑2 produces the integer −25536 which is interpreted internally as decimal address 40000. Then USR0(I%) does the job. Model II Basic also permits USR0(&H9C40) if you like hexadecimal notation.

USR1 is the key to POKEing; two values must be passed to the subroutine—the address to be POKEd and the byte value to be placed there. USR1 expects to find these two integer variables side-by-side in RAM. This expectation is met only if you define them consecutively in your program:

```
120 I% = &HE123
130 J% = 249
140 Z  = USR1(VARPTR(I%))
```

Lines 120 and 130 set up the address and byte value consecutively in RAM and 140 executes the POKE. Z is an unused dummy variable. The address and the byte value need not immediately precede the USR1 statement as long as they are created consecutively as integer variables—address first, byte value second.

```
120 DEFINT A,B
130 FOR ADDR = &HE000 to &HE00A
140 READ BYTE
150 Z = USR1(VARPTR(ADDR))
160 NEXT ADDR
170 STOP
180 DATA 255,255,255,0,0,0,0,0,0,0,255
```

Assuming the proper preliminaries, the above routine places the data values consecutively in the RAM block 57344 through 57354 (X'E000', X'E00A').

Run the Program Listing, choosing the proper addresses for your system, to display the first 101 bytes of the TRSDOS system! ■

```
10 '64K, TRSDOS 1.2
20 CLEAR 100,&HF2E8
30 DEFUSR0 = &HF2E9:DEFINT A
40 SYSTEM "LOAD PEEKPOKE/CIM"
50 FOR ADDR = 0 TO 100
60 PRINT ADDR; HEX$(USR0(ADDR)),
70 NEXT ADDR
80 END
```

Program Listing

	TRSDOS 1.2		TRSDOS 2.0	
	32K	64K	32K	64K
RELO address	72E9	F2E9	6FE9	EFE9
Protect address	&H72E8	&HF2E8	&H6FE8	&HEFE8
PEEK entry address	&H72E9	&HF2E9	&H6FE9	&HEFE9
POKE entry address	&H72F2	&HF2F2	&H6FF2	&HEFF2

Table 1. System Addresses

```
10 CLEAR 100, address              'Choose Protect address from Table 1.
20 DEFUSR0 = address               'Choose PEEK entry from Table 1.
30 DEFUSR1 = address               'Choose POKE entry from Table 1.
40 SYSTEM "LOAD PEEKPOKE/CIM"      'Fetch subroutine
   ..
   ...
```

Table 2. Program Statements

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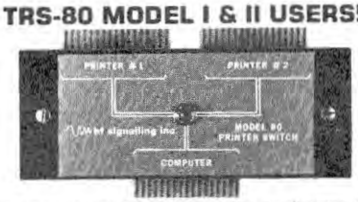

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David Haan
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In my article "Interrupt Mode 1½" (*Encyclopedia for the TRS-80, Vol. 5*, January 1982) I described construction of an interrupt handling board which can distinguish 126 different priority levels of interrupts and pass that information on to the Model I to allow proper interrupt service routine execution. I also listed software examples for demonstration purposes.

I built a 16-channel analog-digital (A/D) board which utilizes that interrupt handling board. If you have not yet built the interrupt handling board or do not plan to, you can still use this A/D board in a poled mode by not using the interrupt generating subcircuit. Some commercially available A/D boards are undesirable because of their cost or the limited number of channels available. I will show you how to build a powerful A/D board at a reduced cost. I built my A/D board around the CMOS National Semiconductor ADC 0817. The chip's best features are its low power consumption (3 ma max), high speed conversion, repeatable accuracy and autozeroing (no adjustments are needed to get to zero).

Figure 1 is a schematic of the A/D board as it would appear when you use it in conjunction with the interrupt handling board. It uses a single port for both read and write functions, and has a selectable interrupt priority level.

The Key Box

Basic Level II
Model I
16K RAM

Operation

Throughout this example and those to follow, I will use 239 (0EFH) as the port number and Line 6 as the analog input line. Also, I will use an interrupt priority level of 96 (60H). I chose these values arbitrarily.

When an output instruction is generated either by a Basic program as OUT 239,6 or by an Assembly language program as OUT (0EFH), A (where the A register contains the line number), a value of six is placed on data line D0–D3. These lines are connected to Pins 36–33 respectively of U4 which represent the analog line address decoded inputs. Next, the port number 0EFH is placed on the address lines A0–A7 and is shortly followed by an OUT strobe.

U1 and U2 decode address lines A0–A7 and allow U3 to pass on the OUT strobe. This OUT strobe is passed to Pins 16 and 32 of U4. It will latch in the data appearing on the analog input line select pins, allowing U4 to select analog input Line 6 and start the analog-to-digital conversion process. As I stated earlier, the conversion process will generate a ratio between the analog value on Line 6 and the reference voltage on Pin 19. This ratio is extremely accurate across the range of 0–255. If the analog input voltage is equal to the reference voltage, the converter generates a value of 255. If the analog input is zero volts, it generates a zero or if 1/2 the reference voltage, it generates a value of 127.

The A/D board consists of three subcircuits. The first is the read/write port (made up of U1, U2 and U3). The second is the A/D itself (made up of U4, U5 and U6), while the third subcircuit (the interrupt subcircuit) is made up of U7, U8, RP-1 and DS-1. Ignore the third subcircuit if you are not using the interrupt handling board.

The A/D board takes a positive unipolar analog input voltage (which can appear on any one of the 16 analog inputs of U4) and converts it to an unsigned eight-bit value. This eight-bit value represents a ratio of the input voltage to the reference voltage which is applied to Pin 19 of U4. As shown in the circuit, the reference voltage comes from the same power supply as the Vcc voltage on Pin 17. The reference voltage and the Vcc sources need not be the same; I did it here for simplicity. The analog input voltages, however, must not exceed the reference voltage, or damage to the A/D may occur. The reference voltage cannot be greater than the power supply voltage. The A/D board will also generate an interrupt to the interrupt handling board signaling the computer that the A/D has processed an analog value and the data is ready to be fetched.

The time required to complete the conversion depends on the clock frequency on Pin 22 of U4. At a 1-MHz clock frequency, as is the case in Fig. 1, the conversion takes about 50 microseconds. Once the conversion process is complete, the data is available on Pins 24–31 of U4, with data Line D0 being Pin 24. Also, at this time, an end of conversion (EOC) signal is available at Pin 13 of U4. You can use this signal from Pin 13 to cause an interrupt to the CPU via the interrupt handling board; however, I have not used it here.

The OUT signal that starts the conversion process initiates the interrupt. Since the A/D conversion process takes about 50 microseconds and the software to process an interrupt takes about 80 microseconds, the A/D converter will be ready with the data before the computer can access the data. However, under two conditions this will not be true. One is if the computer has a CPU speed-up kit and operates faster than the normal 1.78 MHz clock frequency, and the second is if the A/D's clock frequency is significantly less than 1 MHz. In these cases the computer will access the data before the A/D has completed the conversion. This will result in erroneous data since the data bits are in a tri-state mode as the conversion progresses. If, due to your configuration, the CPU will beat the A/D, then you must use the end of conversion signal from Pin 13 of U4. To use it, remove the wire between Pin 10 of U2 and Pin 2 of U7 and add a wire between Pin 13 of U4 and Pin 2 of U7. This option, shown in Fig. 1, results in a total time between the start of the conversion to the access of data to be the total time of the software interrupt service routine plus the A/D's conversion time. No matter which hardware method you use, U7 will receive a signal to initiate an interrupt.

U7, a one-shot, enables U8 for approximately 1.2 microseconds. U8 takes whatever interrupt priority level is on its input pins, as determined by DP-1, and transmits it to the interrupt handling board via the VIB (Vector Interrupt Bus). The dip switch as shown provides an interrupt priority level of 60H (96 decimal). I hardwired Bit 0 on the dip switch to ground. This allows correct offsetting into a table of 16-bit addresses. Refer to my article "Interrupt Mode 1½" for a more detailed explanation of the interrupt service routine's operation.

Once the interrupt handling board processes the interrupt and the interrupt service routine is executed, control will pass to your application software to fetch the data.

Program Listings 1–4 illustrate various software methods you can use to start the A/D and fetch the data. I will discuss these later, but for illustration let's assume you use an Assembly language instruction IN A,0EFH. This accesses the data of U4 by having U1 and U2 decode address lines A0–A7, and allows the IN strobe to enable U5 to put the data on data lines D0–D7. Although U4 has a built-in tri-state output, I used U5 because of its higher drive capability. At this point, the data is in the A register and you can process it as needed. As the last instruction of your A/D access and application routine, RET returns operation to the software which the A/D interrupted. The data will remain available at the A/D until the next conversion process starts. If you need more detailed information on the A/D chip, you should obtain data sheets from National Semiconductor.

Software

Each example to follow requires the loading and running of the Basic software of Listing 1. This loads in the machine language routine listed in Listing 4 sections 1, 2 and 3. The software shown in Listing 4 section 3 is the interrupt service routine, the same as that listed in "Interrupt Mode 1½." It determines which routine to execute as directed by the priority level of the interrupt it receives. It does this by offsetting into a table of addresses by the value of the interrupt priority and executing the routine at the address the entry in the table points to. Section 1 sets up the lookup table that the software of section 3 will use and section 2 sets up a jump to the interrupt processor in section 3 when the CPU is interrupted.

The first software example, shown in Listing 2, is a program that uses only Basic to initiate

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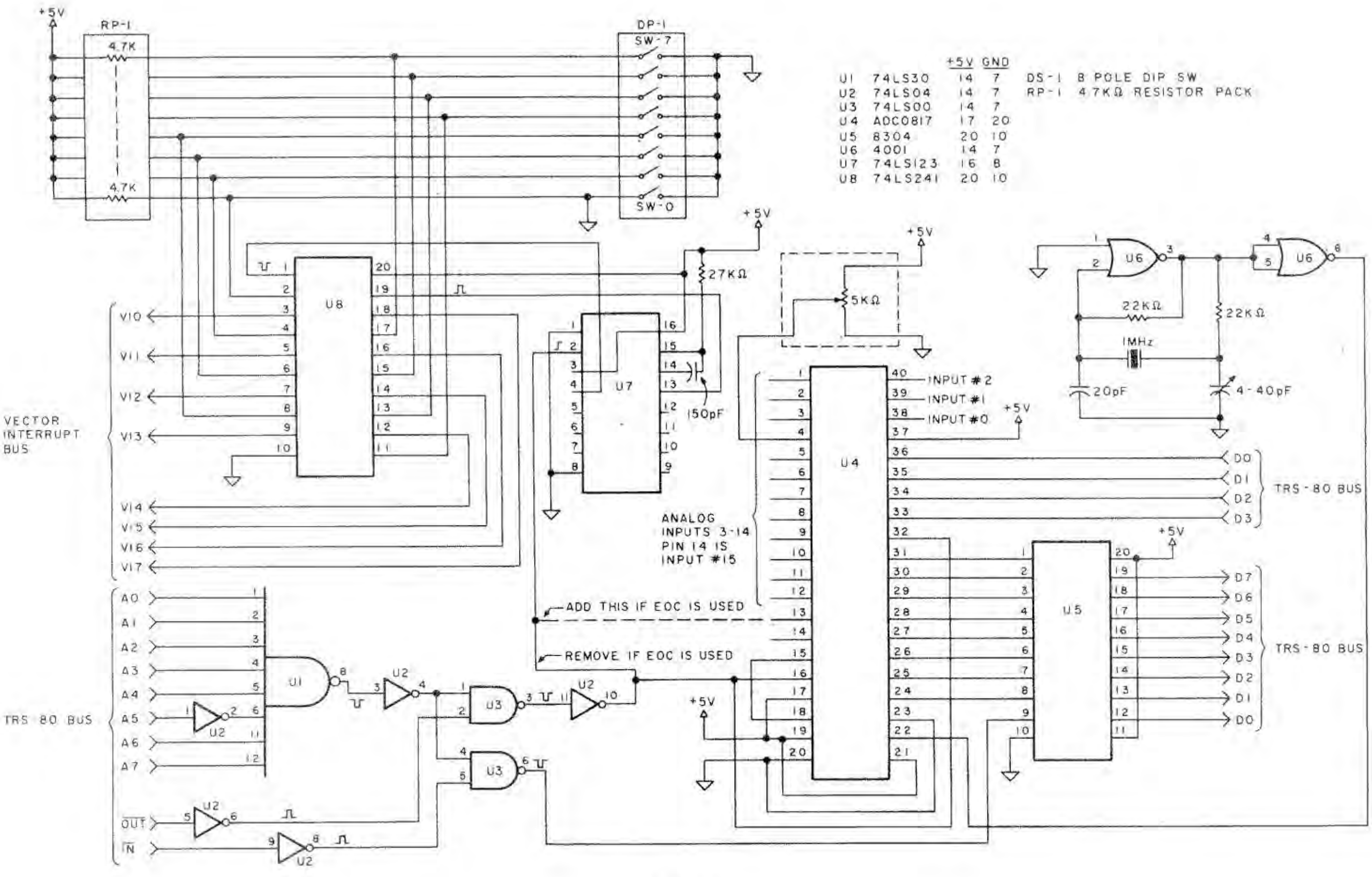

Fig. 1

the A/D conversion and access the resultant data. Line 50 POKEs a RET instruction into the memory location that is the entry point of the A/D service routine. When this instruction is executed, it will result in a return to Basic. Line 60 initiates the conversion process in the A/D. The interrupt will occur at this point. Upon return, line 70 will be executed, and the data put into the variable A. The remainder of the program displays the value on the screen. The potentiometer shown in Fig. 1 is shown connected between five volts and ground with the wiper connected to input 6. This enables you to vary the input voltage between zero and five volts.

The second software example, shown in Listing 3, initiates a conversion as in Listing 2, but processes the data in Assembly language rather than through Basic. The Assembly language program, which is loaded into memory by the Basic program, is shown in Listing 4 section 4. Once the computer enters this routine due to an interrupt from the A/D, the routine fetches the data from the A/D and processes it to display the voltage it has read.

You can also do the same thing from a machine language program with no interface to Basic. No matter which method you use, the end result is the same. The machine language routine provides you with an edge because it executes faster.

Applications

There are many possible applications for an A/D. You could interface up to eight joysticks to the computer, or measure the temperatures or humidity in 16 rooms. You have 16 channels available for a variety of uses.

Construction

I built this circuit on the same wire-wrap board as the interrupt handling board, using the same five-volt power supply. If you do not use the interrupt handling board, you must provide a five-volt, one-amp power supply, appropriate connectors, and ribbon cable to connect to the TRS-80 bus. You might want to use a four-bit latch to latch in

data lines D0–D3 at the time the OUT signal starts a conversion. Tie the OUT signal to the latch enable. You can then use the latch in conjunction with U8 to transmit this same data back as an interrupt priority level on interrupt lines U11–U14. In this way, each analog input can have its own priority level with input line 5 having a higher priority level than line 4. Each line will have its own A/D service routine.

I did not build the 1 MHz clock shown driving the A/D on my A/D board; it is a duplicate of the circuit shown in the *CMOS Cookbook* by Don Lancaster. In my particular application, my S-100 bus has a 2 MHz clock I divide down to 1 MHz. If desired, you can use a 555, but it has a reliable maximum clock rate of less than 1 MHz. Experiment and see. If the clock rate falls too low, then use the EOC signal to cause the interrupt. ■

David Haan is a systems programmer who maintains operating system software in a real-time data acquisition computer system for a gas and electric utility.

```
10 REM                              LISTING 1
15 REM
20 REM THIS ROUTINE MUST RUN BEFORE RUNNING EITHER OF THE
30 REM PROGRAMS IN LISTINGS 2 OR 3.  SET MEMORY SIZE TO
40 REM 32250 AND UNDER 'SYSTEM' ENTER /32000 AFTER RUNNING
50 REM THIS ROUTINE.
60 FOR I = 32000 TO 32027
70 READ A
80 POKE I,A
90 NEXT
100 FOR I = 32256 TO 32289
110 READ A
120 POKE I,A
130 NEXT
140 DATA 33,64,126,34,96,127,243,219,238,211,238,62,195,50,18
150 DATA 64,33,0,126,34,19,64,237,86,251,195,25,26
160 DATA 245,197,219,238,79,6,127,10,50,19,126,12,10,50,20,126
170 DATA 193,241,205,0,0,245,197,219,238,254,0,32,231,211,238
180 DATA 193,241,201
190 END
```

Program Listing 1

```
1 REM                               LISTING 2
5 CLS
10 REM THIS PROGRAM WILL INITIATE AN INTERRUPT FROM THE A/D.
20 REM IT WILL USE PORT 239 AND RETURN THE VALUE TO VARIABLE A.
30 REM THE VALUE WILL BE PROCESSED TO INDICATE AN INPUT VOLTAGE
40 REM AND DISPLAY THE VALUE ON THE SCREEN.
50 POKE 32320,181 :REM SET UP RETURN INSTRUCTION
55 A$="#.####"
60 OUT 239,6
70 A = INP(239) :REM GET INPUT VALUE
80 A = A*5/255 :REM CONVERT TO VOLTAGE INPUT
90 PRINT@512,"THE INPUT VOLTAGE IS ";
95 PRINT USING A$;A;
96 PRINT " VOLTS"
100 GOTO 60 :REM DO IT AGAIN
110 END
```

Program Listing 2

```
200 REM
210 REM                             LISTING 3
220 REM
230 REM THIS PROGRAM WILL POKE A MACHINE LANGUAGE ROUTINE
240 REM INTO HIGH MEMORY.  THIS ROUTINE WILL GET THE A/D
250 REM VALUE AND PROCESS IT FOR DISPLAY ON THE SCREEN.
260 CLS
270 FOR I = 32320 TO 32483
280 READ A
290 POKE I,A
300 NEXT
310 OUT 239,6
320 GOTO 310
330 DATA 229,42,21,126,229,33,201,0,34,21,126,251,245,197,213
340 DATA 221,229,219,239,17,0,0,95,79,6,96,205,159,126,22,100
350 DATA 205,173,126,221,9,221,229,225,22,10,205,173,126,62,48
360 DATA 132,50,221,126,221,229,225,205,173,126,62,48,132,50
370 DATA 220,126,221,229,225,62,48,133,50,218,126,33,205,126,17
380 DATA 0,60,1,23,0,237,176,221,225,209,196,241,243,225,34,21
390 DATA 126,251,225,201,33,0,0,203,56,48,1,25,200,235,41,235
400 DATA 24,245,125,108,38,0,30,0,6,16,221,33,0,0,41,23,48,1
410 DATA 44,221,41,221,35,183,237,82,48,3,25,221,43,16,237,201
420 DATA 84,72,69,32,73,78,80,85,84,32,73,83,32,0,46,0,0,32,86
430 DATA 79,76,84,83
440 END
```

Program Listing 3

Program Listing 4

```
                00010 ;                        LISTING 4
                00020 ;
                00030 ;
                00040 ;                        SECTION 1
                00050 ;
                00060 ;      THIS ROUTINE WILL PLACE THE MANUAL INTERRUPT
                00070 ;      ISR ADDRESS INTO THE TABLE OF ISR'S.
                00080 ;
7D00            00090              ORG     7D00H
                00100 ;
7D00 21407E     00110 START        LD      HL,ADISR          ;A/D INT. ISR LOCATION.
7D03 22607F     00120              LD      (7F60H),HL        ;PLACE IN ISR TABLE.
                00130 ;
                00140 ;
                00150 ;                       SECTION 2
                00160 ;
                00170 ;      THIS IS THE SET UP FOR THE INTERRUPT PROCESSOR.
                00180 ;      IT MUST BE RUN TO ESTABLISH THE LOCATION OF THE
                00190 ;      INTERRUPT PROCESSOR.  IT NEED NOT BE IN PROTECTED
                00200 ;      MEMORY.
                00210 ;
7D06 F3         00220              DI                        ;DISABLE INTERRUPTS.
7D07 DBEE       00230              IN      A,(0EEH)          ;THE IN AND OUT  IN-
7D09 D3EE       00240              OUT     (0EEH),A          ;STRUCTIONS  CLEAR  THE
                00250                                        ;INTERRUPT BOARD.
7D0B 3EC3       00260              LD      A,0C3H            ;LOAD JUMP INSTRUCTION.
7D0D 321240     00270              LD      (4012H),A         ;INTO MEM. LOC. 4012H.
7D10 21007E     00280              LD      HL,IPROC          ;START OF INT. PROCESSOR.
7D13 221340     00290              LD      (4013H),HL        ;PUT IN JUMP ADDRESS.
7D16 ED56       00300              IM      1                 ;SET INT. MODE TO 1.
7D18 FB         00310              EI                        ;ENABLE INTERRUPTS.
7D19 C3191A     00320              JP      1A19H             ;GO TO BASIC ENTRY.
                00330 ;
                00340 ;
                00350 ;                       SECTION 3
                00360 ;
                00370 ;      THIS IS THE INTERRUPT PROCESSOR.  IT MUST
                00380 ;      RESIDE IN PROTECTED MEMORY.
                00390 ;
7E00            00400              ORG     7E00H             ;32256
                00410 ;
7E00 F5         00420 IPROC        PUSH    AF                ;SAVE AF REGISTERS.
7E01 C5         00430              PUSH    BC                ;SAVE BC REGISTERS.
7E02 DBEE       00440              IN      A,(0EEH)          ;GET INT. PRIORITY LEVEL.
7E04 4F         00450 IPROC1       LD      C,A               ;REG. 'C' HAS OFFSET
                00460                                        ;INTO ISR TABLE.
7E05 067F       00470              LD      B,7FH             ;REG. 'B' HAS START  OF
                00480                                        ;ISR TABLE.
7E07 0A         00490              LD      A,(BC)            ;ISR LO ORDER BYTE.
7E08 32137E     00500              LD      (CALL1),A         ;PUT ADDR. IN CALL INSTR.
7E0B 0C         00510              INC     C
7E0C 0A         00520              LD      A,(BC)            ;ISR HI ORDER BYTE.
7E0D 32147E     00530              LD      (CALL2),A         ;PUT ADDR. IN CALL INSTR.
7E10 C1         00540              POP     BC                ;RESTORE 'BC' REGISTERS.
7E11 F1         00550              POP     AF                ;RESTORE 'AF' REGISTERS.
7E12 CD         00560 CALL         DEFB    0CDH              ;CALL INSTRUCTION.
0001            00570 CALL1        DEFS    1                 ;CALL LO ORDER BYTE.
0001            00580 CALL2        DEFS    1                 ;CALL HI ORDER BYTE.
7E15 F5         00590 CNTRL        PUSH    AF                ;SAVE 'AF' REGISTERS.
7E16 C5         00600              PUSH    BC                ;SAVE 'BC' REGISTERS.
7E17 DBEE       00610              IN      A,(0EEH)          ;GET INT. PRIORITY LEVEL.
7E19 FE00       00620              CP      0                 ;TEST IF ONE EXITS.
7E1B 20E7       00630              JR      NZ,IPROC1         ;GET ISR ADDRESS.
7E1D D3EE       00640              OUT     (0EEH),A          ;CLEAR INT. BOARD.
7E1F C1         00650              POP     BC                ;RESTORE 'BC' REGISTERS.
7E20 F1         00660              POP     AF                ;RESTORE 'AF' REGISTERS.
7E21 C9         00670              RET                       ;RETURN FROM INTERRUPT.
                00680 ;
                00690 ;
                00700 ;                       SECTION 4
                00710 ;
                00720 ;      THIS IS THE A/D INTERRUPT SERVICE ROUTINE.
                00730 ;      IT MUST ALSO RESIDE IN PROTECTED MEMORY.
                00740 ;
7E40            00750              ORG     7E40H             ;32320
                00760 ;
7E40 E5         00770 ADISR        PUSH    HL                ;SAVE 'HL' REGISTER.
7E41 2A157E     00780              LD      HL,(CNTRL)        ;GET 2 PUSH INSTRUCTIONS.
7E44 E5         00790              PUSH    HL                ;SAVE PUSH INSTRUCTIONS.
7E45 21C900     00800              LD      HL,0C9H           ;0C9H IS RETURN INSTR.
7E48 22157E     00810              LD      (CNTRL),HL        ;PUT RETURN IN INT. PROC.
7E4B FB         00820              EI                        ;ENABLE INTERRUPTS.
7E4C F5         00830              PUSH    AF                ;SAVE 'AF' REGISTER.
7E4D C5         00840              PUSH    BC                ;SAVE 'BC' REGISTER.
7E4E D5         00850              PUSH    DE                ;SAVE 'DE' REGISTER.
7E4F DDE5       00860              PUSH    IX                ;SAVE 'IX' REGISTER.
7E51 DBEF       00870              IN      A,(0EFH)          ;GET INPUT VALUE.
7E53 110000     00880              LD      DE,0              ;CLEAR 'DE' REGISTER.
7E56 5F         00890              LD      E,A               ;PUT INPUT VALUE IN 'E'.
7E57 4F         00900              LD      C,A               ;ALSO SAVE IT IN 'C'.
7E58 0660       00910              LD      B,96              ;CONVERT INPUT TO
7E5A CD9F7E     00920              CALL    MULT              ;VALUE SUCH THAT AN
7E5D 1664       00930              LD      D,100             ;INPUT OF 255 WILL BE
7E5F CDAD7E     00940              CALL    DIVIDE            ;EQUAL TO 500.  EQUAL
7E62 DD09       00950              ADD     IX,BC             ;TO 255 * 1.96
7E64 DDE5       00960              PUSH    IX                ;PUT CONTENTS OF 'IX'
7E66 E1         00970              POP     HL                ;INTO 'HL' REGISTER.
7E67 160A       00980              LD      D,10              ;DIVIDE 'HL' BY 10.
7E69 CDAD7E     00990              CALL    DIVIDE
7E6C 3E30       01000              LD      A,30H             ;PUT ASCII 0 INTO 'A'.
7E6E 84         01010              ADD     A,H               ;ADD REMAINDER OF DIVIDE
```

Program continues

Program continued

```
7E6F 32DD7E           LD      (ONES),A       ;TO 'A', PUT IN MSG AREA.
7E72 DDE5             PUSH    IX             ;PUT CONTENTS OF 'IX'
7E74 E1               POP     HL             ;INTO 'HL' REGISTER.
7E75 CDAD7E           CALL    DIVIDE         ;DIVIDE BY 10.
7E78 3E30             LD      A,30H          ;PUT ASCII 0 INTO 'A'.
7E7A 84               ADD     A,H            ;ADD REMAINDER OF DIVIDE
7E7B 32DC7E           LD      (TENS),A       ;TO 'A', PUT IN MSG AREA.
7E7E DDE5             PUSH    IX             ;PUT CONTENTS OF 'IX'
7E80 E1               POP     HL             ;INTO 'HL' REGISTER.
7E81 3E30             LD      A,30H          ;PUT ASCII 0 INTO 'A'.
7E83 85               ADD     A,L            ;ADD HUNDREDS PART OF #.
7E84 32DA7E           LD      (HUND),A       ;PUT IN MESSAGE AREA.
7E87 21CD7E           LD      HL,MSG         ;GET START ADDR. OF MSG.
7E8A 11003C           LD      DE,3C00H       ;START OF SCREEN.
7E8D 011700           LD      BC,LENGTH      ;LENGTH OF MSG BUFFER.
7E90 EDB0             LDIR                   ;DISPLAY MESSAGE.
7E92 DDE1             POP     IX             ;RESTORE 'IX' REGISTER.
7E94 D1               POP     DE             ;RESTORE 'DE' REGISTER.
7E95 C1               POP     BC             ;RESTORE 'BC' REGISTER.
7E96 F1               POP     AF             ;RESTORE 'AF' REGISTER.
7E97 F3               DI                     ;DISABLE INTERRUPTS.
7E98 E1               POP     HL             ;GET 2 PUSH INSTRUCTIONS.
7E99 22157E           LD      (CNTRL),HL     ;RESTORE INSTR. TO IPROC.
7E9C FB               EI                     ;ENABLE INTERRUPTS.
7E9D E1               POP     HL             ;RESTORE 'HL' REGISTER.
7E9E C9               RET                    ;RETURN FROM ADISR.
7E9F 210000     MULT  LD      HL,0           ;CLEAR 'HL'.
7EA2 CB38     MULTLP  SRL     B              ;MULTIPLY THE VALUE
7EA4 3001             JR      NC,MULTGO      ;IN 'E' REG BY THE
7EA6 19               ADD     HL,DE          ;VALUE IN 'B' REG.
7EA7 C8       MULTGO  RET     Z              ;SEE NOTE BELOW.
7EA8 EB               EX      DE,HL
7EA9 29               ADD     HL,HL
7EAA EB               EX      DE,HL
7EAB 18F5             JR      MULTLP
7EAD 7D       DIVIDE  LD      A,L            ;DIVIDE THE VALUE IN
7EAE 6C               LD      L,H            ;'HL' REG BY THE VALUE
7EAF 2600             LD      H,0            ;IN 'D'.
7EB1 1E00             LD      E,0            ;SEE NOTE BELOW.
7EB3 0610             LD      B,16
7EB5 DD210000         LD      IX,0
7EB9 29       DIVLP1  ADD     HL,HL
7EBA 17               RLA
7EBB 3001             JR      NC,DIVLP2
7EBD 2C               INC     L
7EBE DD29     DIVLP2  ADD     IX,IX
7EC0 DD23             INC     IX
7EC2 B7               OR      A
7EC3 ED52             SBC     HL,DE
7EC5 3003             JR      NC,DIVGO
7EC7 19               ADD     HL,DE
7EC8 DD2B             DEC     IX
7ECA 10ED      DIVGO  DJNZ    DIVLP1
7ECC C9               RET
7ECD 54          MSG  DEFM    'THE INPUT IS '
0001            HUND  DEFS    1
7EDB 2E               DEFB    '.'
0001            TENS  DEFS    1
0001            ONES  DEFS    1
7EDE 20               DEFM    ' VOLTS'
0017          LENGTH  EQU     $-MSG
              ;THE MULTIPLY AND DIVIDE ROUTINES LISTED ARE THOSE
              ;LISTED IN "TRS-80 ASSEMBLY LANGUAGE PROGRAMMING"
              ;PUBLISHED BY RADIO SHACK AS PUBLICATION # 62-2006.
0000                  END
```


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Do it back and forth as well as up and down.

Horizontal Scrolling

G. M. Foley
4385 Mason
Canal Winchester, OH 43110

Most programs which plot the value of a function place the independent variable (often time or distance) horizontally on the screen. But try to shift the plot from right to left when adding new values—Basic programs run too slowly to be of much use.

Program Listing 1 is the Assembly language version of a relocatable module which shifts all graphics on the screen one cell to the left and erases the graphic characters in the leftmost cell of each line. (It also erases all non-graphic characters from the screen.)

This module can be called by the USR function in any Basic program. The Basic program then plots a new value at the right of the screen with the command SET(127,Y), where Y is the new value (normalized to the range 0-47). The next time the Horizontal Scroll subroutine is called by USR, the new value will shift left and the 128th previous value will disappear off the left of the screen.

Program Listing 2 shows code you can use to enter the Horizontal Scrolling subroutine by Basic Data and POKE statements. Line 100 of Listing 2 sets the memory size to protect the subroutine from being overwritten by the Basic program. If you do not put this line in your Basic program, be sure to set the memory size when you turn the computer on, or when you call Basic in your disk system. If the Horizontal Scroll subroutine is the only one at the top of memory, put it at least 64 bytes below the top (set the memory size accordingly to 32704, 49088 or 65472).

Since disk operating systems use some of the upper bytes, disk owners should place this subroutine 256 bytes below the top of the memory. If you ordinarily load other machine language subroutines (such as KBFIX or RENUM) at the top of memory, load the Horizontal Scroll subroutine module below

```
                 ;SHIFT SCREEN LEFT ONE GRAPHIC UNIT-NO WRAPAROUND
4ØØØ             SCR     EQU    4ØØØH
FFØØ                     ORG    ØFFØØH
FFØØ Ø1ØØØ4      SHIFTL  LD     BC,4ØØH
FFØ3 21ØØ4Ø              LD     HL,SCR
FFØ6 11ØØØØ              LD     DE,Ø
FFØ9 2B          SØ      DEC    HL       ;SHIFT LEFT ONE CHARACTER
FFØA 7E                  LD     A,(HL)   ;PUT CHARACTER IN A REGISTER
FFØB 57                  LD     D,A      ; SAVE IT
FFØC E68Ø                AND    8ØH      ;IS IT A GRAPHIC CHARACTER?
FFØE 2811                JR     Z,S1     ;NO, DO NOT COPY
FF1Ø 7D                  LD     A,L      ;IS
FF11 FEØØ                CP     ØØH      ; THIS
FF13 28ØC                JR     Z,S1     ;  THE
FF15 FE4Ø                CP     4ØH      ;   LEFT
FF17 28Ø8                JR     Z,S1     ;    MOST
FF19 FE8Ø                CP     8ØH      ;     COLUMN?
FF1B 28Ø4                JR     Z,S1     ;IF
FF1D FECØ                CP     ØCØH     ; SO
FF1F 2ØØ2                JR     NZ,S8    ;  DO NOT
FF21 16ØØ        S1      LD     D,Ø      ;    COPY THE MARK
FF23 7A          S8      LD     A,D
FF24 E62A                AND    2AH      ;MASK BITS 1,3,5
FF26 CB2F                SRA    A        ; SHIFT TO Ø,2,4
FF28 B3                  OR     E        ; GET BITS 1,3,5 FROM LAST BYTE
FF29 F68Ø                OR     8ØH      ;  MAKE IT GRAPHIC AND PUT IT
FF2B 77                  LD     (HL),A   ;    IN THE BYTE.
FF2C 7A                  LD     A,D      ; GET THE REST
FF2D E615                AND    15H      ;MASK BITS Ø,2,4
FF2F CB27                SLA    A        ; SHIFT TO 1,3,5
FF31 5F                  LD     E,A      ;  SAVE FOR FOR NEXT BYTE
FF32 ØD                  DEC    C
FF33 2ØD4                JR     NZ,SØ    ;DO IT AGAIN
FF35 79                  LD     A,C
FF36 BØ                  OR     B        ;IS BC=Ø?
FF37 C8                  RET    Z        ;YES, FINISHED
FF38 ØB                  DEC    BC       ;NO, DO IT AGAIN
FF39 18CE                JR     SØ
ØØØØ                     END
ØØØØØ TOTAL ERRORS
```

Program Listing 1. Horizontal Scroll Subroutine

The Key Box

Basic Level II
Model I
16K RAM

them and change the memory size protection accordingly. The address you assign in the Basic DEFUSR statement will be where you loaded your version of Horizontal Scroll.

Listing 2 loads the subroutine at FF00 hex, appropriate to a 48K disk system. If you have a 32K disk system, the second phrase in line 100 should be POKE16562,191, line 110 should begin For I = – 16440 To – 16582 and line 170 should read DEFUSR1 = &HBF00. For 32K without disk use 170 POKE 16526,0: POKE 16527,191. For a 16K system without disk use:

```
100 POKE 16561,191:POKE 16562,127
110 FOR I = 32704 TO 32762:.....
170 POKE 16526,192:POKE 16527,127
```

In addition see Program Listing 3.

Each execution of the scrolling subroutine takes about one-eighth of a second; it will not slow down a Basic program. If more than one value is plotted at the rightmost edge of the display (for instance, by SET (127,X):SET(127,Y):SET(127,Z)), all variables will be scrolled to the left on successive executions of the subroutine. ■

Gerard Foley, a self-employed consulting physicist, enjoys ham radio as well as personal computers.

```
10 CLS
20 PRINTSTRING$(5,13);STRING$(13,32);"HORIZONTAL SCROLL BY G. M.
 FOLEY":PRINT
30 PRINT STRING$(18,32)"FOR 48K DISK SYSTEM":PRINT
40 PRINT"HORIZONTAL SCROLL IS CONTAINED IN LINES 100-170 OF THIS
 PROGRAM."
50 PRINT"THE REST OF THE PROGRAM IS A DEMONSTRATION OF THE PLOTT
ING OF":PRINT
60 PRINT"THE FUNCTIONS SIN(T/35)*SIN(T/6) AND 1-EXP(SIN(T/35)*SI
N(T/6))."
70 FORI=1TO3000:NEXTI
90 DEFINT I-J
100 POKE16561,255:POKE16562,254:CLS
110 FOR I=-256 TO -198:READ J:POKEI,J:NEXTI
120 DATA   1,  0,  4, 33,  0, 64, 17,  0,  0, 43,126, 87
130 DATA 230,128, 40, 17,125,254,  0, 40, 12,254, 64, 40
140 DATA   8,254,128, 40,  4,254,192, 32,  2, 22,  0,122
150 DATA 230, 42,203, 47,179,246,128,119,122,230, 21,203
160 DATA  39, 95, 13, 32,212,121,176,200, 11, 24,206
170 DEFUSR1=&HFF00
200 CLEAR 64
210 X=127
270 T1=T/35:T2=T/6
275 Z=48-15*EXP(SIN(T1)*SIN(T2))
280 Y=24-23*SIN(T1)*SIN(T2)
290 A=USR1(A)
310 IF Y<0 OR Y>47 THEN 330
320 SET(X,Y)
330 IF Z<0 OR Z>47 THEN 350
340 SET(X,Z)
370 T=T+1:GOTO 270
```

Program Listing 2. Use with a 48K disk system

```
60 CLS
65 PRINTSTRING$(5,13);STRING$(10,32);"HORIZONTAL SCROLL BY g. m.
 fOLEY":PRINT:PRINT:PRINT
70 PRINT"HORIZONTAL SCROLL IS CONTAINED IN LINES 100-170 OF THIS
 PROGRAM."
71 PRINT"THE REST OF THE PROGRAM IS A DEMONSTRATION OF THE PLOTT
ING OF":PRINT
72 PRINT"THE FUNCTIONS SIN(T/35)*SIN(T/6) AND 1-EXP(SIN(T/35)*SI
N(T/6))."
75 FORI=1TO3000:NEXTI
80 CLEAR 64
90 DEFINT I-J
100 POKE16561,191:POKE16562,127:CLS
110 FOR I=32704 TO 32762:READ J:POKEI,J:NEXTI
120 DATA   1,  0,  4, 33,  0, 64, 17,  0,  0, 43,126, 87
130 DATA 230,128, 40, 17,125,254,  0, 40, 12,254, 64, 40
140 DATA   8,254,128, 40,  4,254,192, 32,  2, 22,  0,122
150 DATA 230, 42,203, 47,179,246,128,119,122,230, 21,203
160 DATA  39, 95, 13, 32,212,121,176,200, 11, 24,206
170 POKE16526,192:POKE16527,127
210 X=127
270 T1=T/35:T2=T/6
275 Z=48-15*EXP(SIN(T1)*SIN(T2))
280 Y=24-23*SIN(T1)*SIN(T2)
290 A=USR(A)
310 IF Y<0 OR Y>47 THEN 330
320 SET(X,Y)
330 IF Z<0 OR Z>47 THEN 350
340 SET(X,Z)
370 T=T+1:GOTO 270
```

Program Listing 3. Use with a 16K tape system

The second time around and the third and the fourth. . .

Program Begat Son of Program Begat. . .

Kenneth J. Christensen
Craig Sater
Collegiate Living Organization
117 NW 15th Street
Gainesville, FL 32603

Self-reproducing programs have always challenged programmers. Such a program replicates its own image throughout the host computer's memory when it is executed. Each copy of the original program executes independently to continue the reproduction process.

Self-reproducing programs have possible applications in advanced systems programming, but are also important in demonstrating theories of self-reproducing automata. The programs presented here allow TRS-80 users to experiment with a "worm," or self-reproducing program.

Program Listing 1 is the self-reproducing program as written in Z80 Assembly language. We feel this program represents a record for length in self-reproducing programs—only 10 bytes. Program Listing 2 is a Basic routine that POKEs this program into memory beginning at address 18822 (decimal). The machine code POKEd into memory locations 18816–188221 initializes the HL and DE register pairs as required. The program is fully relocatable; the only requirement is to initialize the HL and DE register pairs to the starting address of the program. To run the self-reproducing program you can either enter the assembled version using T-Bug, or you can enter and directly run the Basic routine given in Listing 2.

```
4980          00190          ORG      4980H
4986          00200 START    EQU      4986H
              00210 ;
4980 218649   00220          LD       HL,START
4983 118649   00230          LD       DE,START
              00240 ;
4986 010A00   00250          LD       BC,000AH
4989 EB       00260          EX       DE,HL
498A 09       00270          ADD      HL,BC
498B EB       00280          EX       DE,HL
498C EDB0     00290          LDIR
498E 54       00300          LD       D,H
498F 5D       00310          LD       E,L
              00320 ;
0000          00330          END
00000 TOTAL ERRORS
```

Program Listing 1a

How It Works

At the heart of the self-reproducing program is the powerful Z80 block-load-with-increment instruction (LDIR). The LDIR instruction moves a block of memory whose source address is in the HL register pair and destination address is in the DE register pair. The BC register pair contains the byte count to be moved. The BC pair is decremented to zero at the end of the block move.

The first instruction in the program initializes the BC pair to

```
              00100 ;THIS IS A PROGRAM THAT WILL REPRODUCE ITSELF
              00110 ;THROUGHOUT THE WRITTABLE MEMORY OF THE COMPUTER.
              00120 ;THE VARIABLE "START" MUST BE CORRECTLY DECLARED
              00130 ;AS "ORG VALUE" + 6.
              00140 ;
              00150 ;WRITTEN BY:
              00160 ;                  CRAIG A. SATER
              00170 ;                  KENNETH J. CHRISTENSEN
              00180 ;
4980          00190          ORG      4980H
4986          00200 START    EQU      4986H
              00210 ;
4980 218649   00220          LD       HL,START          ;INITIALIZE HL
4983 118649   00230          LD       DE,START          ;INITIALIZE DE
              00240 ;
4986 010A00   00250          LD       BC,000AH          ;*** BEGIN PROGRAM ***
4989 EB       00260          EX       DE,HL
498A 09       00270          ADD      HL,BC
498B EB       00280          EX       DE,HL
498C EDB0     00290          LDIR
498E 54       00300          LD       D,H
498F 5D       00310          LD       E,L               ;*** END PROGRAM ***
              00320 ;
0000          00330          END
00000 TOTAL ERRORS
```

Program Listing 1

The Key Box

Basic Level II
Model I
16K RAM

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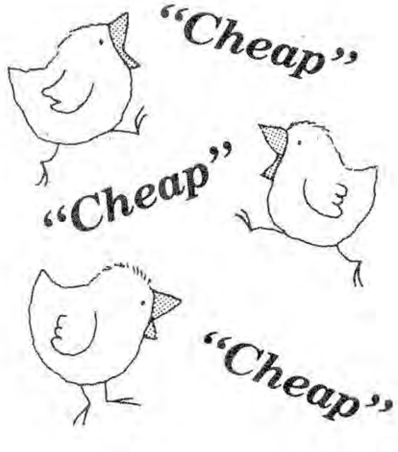

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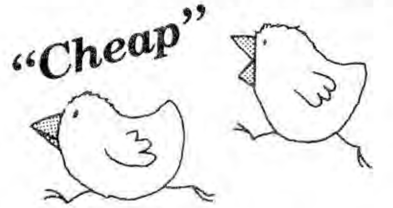

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```
1 CLS
10 DATA 33,134,73,17,134,73
20 DATA 1,10,0,235,9,235,237,176,84,93
30 FOR N=18816 TO 18821
40 READ X : POKE N,X
50 NEXT N
60 FOR N=18822 TO 18831
70 READ X : POKE N,X
80 NEXT N
90 MS=INT(18816/256) : LS=18816-MS*256
100 POKE 16526,LS : POKE 16527,MS
110 PRINT "PROGRAM POKED INTO MEMORY"
120 INPUT "PRESS ENTER TO BEGIN";A$
130 A=USR(0)
140 END
```

Program Listing 2

10 (total byte count). The next three instructions add this value to the DE pair. Since arithmetic operations can only be performed on the HL pair, the DE and HL pairs are exchanged.

After the LDIR instruction the HL pair is copied into the DE pair. At this point both the DE and HL pairs are initialized to the starting address of the next copy of the self-reproducing program.

Running the self-reproducing program crashes the system since it fills the entire writable memory of the host computer. If you want to view the contents of memory after you run the self-reproducing program, press Reset and type in and run the program shown in Listing 3. The program generates the sample output shown in Table 1, a repetitious pattern which is a series of copies of the program you originally POKEd in. ■

Kenneth Christensen, a graduating senior in electrical engineering at the University of Florida, will be pursuing a graduate degree at North Carolina State University and is looking forward to a career in computer systems design.

Craig Sater, a senior chemistry major at the University of Florida, will be attending dentistry school next fall. He enjoys sailing and photography.

```
1 CLS
10 A=18822
20 PRINT A;" : ";
30 FOR N=A TO A+9
40 PRINT PEEK(N);
50 NEXT N
60 PRINT
70 A=A+10
80 GOTO20
90 END
```

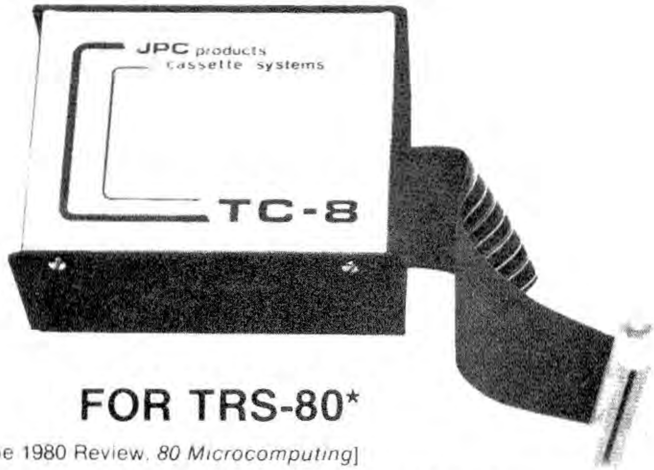
Program Listing 3

18822	:	1	10	0	235	9	235	237	176	84	93
18832	:	1	10	0	235	9	235	237	176	84	93
18842	:	1	10	0	235	9	235	237	176	84	93
18852	:	1	10	0	235	9	235	237	176	84	93
18862	:	1	10	0	235	9	235	237	176	84	93
18872	:	1	10	0	235	9	235	237	176	84	93
18882	:	1	10	0	235	9	235	237	176	84	93
18892	:	1	10	0	235	9	235	237	176	84	93
18902	:	1	10	0	235	9	235	237	176	84	93
18912	:	1	10	0	235	9	235	237	176	84	93
18922	:	1	10	0	235	9	235	237	176	84	93
18932	:	1	10	0	235	9	235	237	176	84	93
18942	:	1	10	0	235	9	235	237	176	84	93
18952	:	1	10	0	235	9	235	237	176	84	93
18962	:	1	10	0	235	9	235	237	176	84	93
18972	:	1	10	0	235	9	235	237	176	84	93
18982	:	1	10	0	235	9	235	237	176	84	93
18992	:	1	10	0	235	9	235	237	176	84	93
19002	:	1	10	0	235	9	235	237	176	84	93
19012	:	1	10	0	235	9	235	237	176	84	93
19022	:	1	10	0	235	9	235	237	176	84	93
19032	:	1	10	0	235	9	235	237	176	84	93
19042	:	1	10	0	235	9	235	237	176	84	93
19052	:	1	10	0	235	9	235	237	176	84	93
19062	:	1	10	0	235	9	235	237	176	84	93
19072	:	1	10	0	235	9	235	237	176	84	93
19082	:	1	10	0	235	9	235	237	176	84	93
19092	:	1	10	0	235	9	235	237	176	84	93
19102	:	1	10	0	235	9	235	237	176	84	93
19112	:	1	10	0	235	9	235	237	176	84	93
19122	:	1	10	0	235	9	235	237	176	84	93
19132	:	1	10	0	235	9	235	237	176	84	93
19142	:	1	10	0	235	9	235	237	176	84	93
19152	:	1	10	0	235	9	235	237	176	84	93
19162	:	1	10	0	235	9	235	237	176	84	93
19172	:	1	10	0	235	9	235	237	176	84	93
19182	:	1	10	0	235	9	235	237	176	84	93
19192	:	1	10	0	235	9	235	237	176	84	93
19202	:	1	10	0	235	9	235	237	176	84	93
19212	:	1	10	0	235	9	235	237	176	84	93
19222	:	1	10	0	235	9	235	237	176	84	93
19232	:	1	10	0	235	9	235	237	176	84	93
19242	:	1	10	0	235	9	235	237	176	84	93
19252	:	1	10	0	235	9	235	237	176	84	93
19262	:	1	10	0	235	9	235	237	176	84	93
19272	:	1	10	0	235	9	235	237	176	84	93
19282	:	1	10	0	235	9	235	237	176	84	93
19292	:	1	10	0	235	9	235	237	176	84	93
19302	:	1	10	0	235	9	235	237	176	84	93
19312	:	1	10	0	235	9	235	237	176	84	93
19322	:	1	10	0	235	9	235	237	176	84	93
19332	:	1	10	0	235	9	235	237	176	84	93
19342	:	1	10	0	235	9	235	237	176	84	93
19352	:	1	10	0	235	9	235	237	176	84	93
19362	:	1	10	0	235	9	235	237	176	84	93
19372	:	1	10	0	235	9	235	237	176	84	93
19382	:	1	10	0	235	9	235	237	176	84	93
19392	:	1	10	0	235	9	235	237	176	84	93
19402	:	1	10	0	235	9	235	237	176	84	93
19412	:	1	10	0	235	9	235	237	176	84	93
19422	:	1	10	0	235	9	235	237	176	84	93
19432	:	1	10	0	235	9	235	237	176	84	93

Table 1

Poor Man's Floppy

HIGH SPEED CASSETTE SYSTEM



FOR TRS-80*

Now the widely acclaimed JPC Cassette System is available for your TRS-80 computer. The price is only $90.00*

[Reprint of June 1980 Review, *80 Microcomputing*]

TC-8 Cassette System
JPC Products
Albuquerque, NM
Kit: $90
Assembled: $120

by Carl A. Kollar

I guess I don't have to tell any TRS-80 owners how frustrating the cassette system that comes with the computer can be. Even with the factory mod that's available, the annoyance of loading and checking programs becomes just barely tolerable.

If you're like me, after you've just plunked down a chunk of money for a Level II 16K machine, "you ain't got nuttin left" for even one disk drive at 500 bucks apiece. So you suffer.

A reasonable alternative is the Exatron Stringy Floppy (ESF). This will cost you about 250 bucks and totally eliminates your loading and saving problems, automatically and fast. I've had one of these for about six months and love it!

But, if the price is still too steep, have I got a device for you!

The Device

The February 1980 issue of *Microcomputing* had an ad that intrigued the hell out of me. It was a high-speed cassette system by JPC Products acclaimed as a "poor man's floppy." It made all sorts of seemingly ridiculous claims such as "loads five times faster," "stores 50,000 bytes on a 10-minute cassette," "less than one bad load in a million bytes with the volume control anywhere between one and eight."

All this for a measly [90] bucks? How could this be? A call to Albuquerque answered a few questions: Yes, it had its own power supply, and, it stored programs five times faster because it utilized higher density data. The computer outputs the information at a higher rate out of the rear keyboard connector.

The ad had even claimed anyone could build it even if you have never soldered before. JPC would make it work, if you couldn't—for free. I was sold. I placed my order, and it arrived about two months later (parts shortage).

I work in electronics, so I found the unit exceptionally easy to build. It took about an hour. The manual is superb. (That's better than great.) It was clear, concise and exact with no ambiguities. Important parts placements are stressed (polarity markings on electrolytics, bands on diodes, etc.).

JPC was right! With these instructions, you couldn't go wrong. The board quality is excellent. It is double-sided and parts locations are clearly marked on the component side of the board. There are no jumper wires to install. JPC utilizes PC traces and plated-through holes for connections to traces on the other side of the board.

Also, there are absolutely no adjustments or settings to bother with.

The documentation is a sheaf of 8½ × 11 papers stapled together. It is written in the nicest format I've seen in a while. Each command and/or subjects is covered on its own sheet in large type. All explanations are in easy to read English—not computerese.

Commands and Features

SAVE"filename": Saves your BASIC program on cassette.

LOAD: Reads the next BASIC program from the cassette.

LOAD"filename": Searches for and loads the specified file from cassette.

LOAD? and LOAD?"filename": Reads file from cassette, and compares contents to memory.

LOADN: Prints a list of all the programs on a cassette, until interrupted by the "break" key.

LOADN"filename": Same as above except the tape will stop at the end of the program named.

KILL: Removes the file manager program from memory so that the extra memory can be used by large programs.

RSET: Allows the operator to rewind and position the tape on tape recorders that have these functions tied to the motor control jack.

RUN"filename": TC-8 searches for a specified program and runs it immediately.

PUT"filename": Same as SAVE "filename", except it is for use with system tapes.

GET: Same as LOAD, except it is for use with system tapes.

GET"filename": Same as LOAD "filename", except it is for use with system tapes.

GET? and GET?"filename": Same as LOAD? and LOAD?"filename", except it is for use with system tapes.

GETN and GETN"filename": Same as LOADN and LOADN"filename", except it is for use with system tapes.

OPEN: Required before cassette input or output of a data file can be attempted.

CLOSE: Required to end a cassette data file.

PRINT#: Allows numerical or string data to be output to a cassette file.

INPUT#: Allows numerical or string data to be input from a cassette file.

I haven't counted them, so I don't know about the "one load in a million bytes" claim, but my son, Anthony (age 11), loaded about 30 of his programs from his Radio Shack format tape to a new TC-8 format tape. He's run them all and found no bad loads.

Unlike the standard tape system, you can position your tape anywhere before the program you want and not have to look for a blank spot between programs. The TC-8 patiently waits for the program you want and then starts loading without getting confused by the portion of the previous program you just fed it.

Try that on your regular cassette system; you'll wear out the reset button. ■

ORDER NOW

To order your TC-8 kit, send your check or money order for $90.00 plus $3.50 postage and handling to JPC PRODUCTS CO., 12021 Paisano Ct., Albuquerque, NM 87112 (New Mexico residents add 4% sales tax). Credit card orders accepted by phone or mail. Personal checks will delay shipment. We will otherwise immediately ship you the TC-8 kit, the cabinet, the ribbon cable, the power adapter, an instruction manual, and a cassette containing the software.

For Mod I Level II only.

✓ 42

JPC PRODUCTS CO.
Phone (505) 294-4623
12021 Paisano Ct.
Albuquerque, N.M. 87112

The Key Box

Model I
32K RAM
Disk Basic
1 disk drive

This terminal program is easy to modify.

Basic Communication

Richard C. McGarvey
221 Hirschfield Drive
Williamsville, NY 14221

I'm sure that most computer communicators have occasionally wondered why all of the available telephone communication programs are written in machine language. For many people, machine language is a mystery.

Yes, machine language provides an execution speed you can appreciate, but do you really understand how a program works?

To communicate with a network such as The Source or Compuserve, commercial programs are readily available. You may not understand the programs, but as long as you know which keys to hit and when, you can use them.

But what do you do when you want to talk to another TRS-80 owner and can't find a program to do it; or, perhaps, you find a machine language program that works, but really doesn't do all you would like. If you are not familiar with machine language (and, sometimes, even if you are) the problem of customizing the program seems insurmountable.

That's why John Storfer and I decided to write this Basic communication program. With it, you can communicate with any other TRS-80 owner via the telephone.

In addition, this program gives you the option of sending disk files or programs in any format to a receiver's disk.

Genesis

We chose to write the program in Basic so you could easily alter it to your own needs.

At first we didn't know exactly how to go about the transfer routines. Then, in the May issue of *80 Microcomputing*, I saw an article by Dan Keen and Larry Pezzuto titled "One Wheel Drive." This utility, that allows one-drive file copy, was the spark we needed.

We decided to open the files, take in one record, break it down, send it and reassemble it into a record on disk at the other end.

Our first program worked, but was too complicated and too long to be practical.

After some extra labor, John and I came up with DISK/XFR, the program that is shown in Program Listings 1 and 2. Listing 1 is a single-statement listing, with explanatory remarks for easy reading and alteration. Listing 2 is a compressed version with no remarks; this is the one that should be keyed into your TRS-80.

Once loaded and run, the program prints a message instructing you to hit any key to go into the communication mode. The message also states that hitting the @ key will switch the program to transfer mode.

First decide who will answer and who will originate; then set up the modems. Once the modems' tones are detected, hit any key. Now, anything you type shows up on your CRT as well as on your friend's.

Once you are ready to send or receive a program or file simply hit the @ key. You are given three options: to send a disk file, to receive a disk file, or to return to communication mode.

The first two options produce the same message. You are asked for the FILESPEC of the program or file you are sending or receiving. Enter the FILESPEC in the usual manner, including all extensions, any password and the drive number the program is on or is going to. The FILESPEC you send must be available on a disk drive. The FILESPEC you receive need not be the same.

When the FILESPEC is entered you are prompted to place the disk in the correct drive and to hit Enter. Now—be patient, Basic is slow and there is a lot of work to do.

If you receive some type of error or the program crashes, be sure to enter CLOSE before doing anything else. This closes the file without damaging it. An error-catching routine also closes the file, if an error occurs, but you can't depend on it under all circumstances.

Now you ask, "What about the other computer? How does it know when I'm ready?" Good question.

This is another reason why the exchange is slow. Each computer continually checks with the other to see if it is ready. You can enter your FILESPEC any time, but no bit is transferred until both computers are ready.

Processing

Once the transfer portion of the program is running, the file is opened. Next, the LOF(X) is determined (that is the length of the file). This is the first byte sent out, one bit at a time.

At the receiving end the bits are reassembled into the value of LOF(X) and assigned to variable EF. Now the receiver knows how many records are in the file.

If the program is in the send mode, the first record is read in-

Program Listing 1

```
1 REM 'BASIC' TERMINAL PROGRAM
2 REM INCLUDES TRANSFER OF DISK BASIC PROGRAMS (SAVED IN ASCII)
3 REM WRITTEN BY RICHARD MCGARVEY AND JOHN STORFER
1Ø CLS:PRINT"
        HIT ANY KEY TO START COMMUNICATION MODE:
        HIT THE '' @ '' TO SELECT
        TRANSFER MODES. AN OPTION IS
        AVAILABLE TO RETURN TO COMM.
        MODE.
2Ø CLEAR25ØØ
3Ø DEFINTA-F,R,X                'DEFINES VARIABLES AS INTEGERS
4Ø DEFSTRH-M                    'DEFINES VARIABLES AS STRINGS
5Ø ONERRORGOTO93Ø
6Ø H=INKEY$                     'HIT ANY KEY TO START PROGRAM
7Ø IFH=""THEN6Ø
        'IF NONE HIT CHECK AGAIN
8Ø OUT232,A                     'RESET RS-232
9Ø A=INP(233)AND248OR5          'GET SWITCHES, REMOVE BAUD RATE,
1ØØ '                            SET BREAK, REQ. TO SEND, DATA TER
.
11Ø OUT234,229                  'LOAD RS-232 WITH CONTROL INFO
12Ø OUT233,85                   'LOAD RS-232 WITH BAUD RATE
13Ø P=INP(232)AND32             'CHECK FOR MODEM TONE
14Ø IFPTHEN13Ø                  'P NOT EQUAL ZERO GO CHECK AGAIN
15Ø CLS
16Ø PRINT"COMMUNICATION MODE"
17Ø PRINTCHR$(14)
18Ø RS=Ø                        'SET RECEIVE/SEND CODE TO Ø COMM.
19Ø GOSUB75Ø                    'GET ANY INPUT FROM RS-232
2ØØ IFATHENPRINTCHR$(INP(235)); 'IF A=Ø NO INPUT ELSE PRINT INP
21Ø H=INKEY$                    'GET KEYBOARD INPUT
22Ø IFH=""THEN19Ø               'IF NO INPUT GO BACK ELSE CONTINUE
23Ø C=ASC(H)                    'CHANGE INPUT TO INTEGER, PUT IN C
24Ø IFC=31THENCLS               'IF CLEAR SCREEN PRESSED, DO IT
25Ø IFC=64THEN29Ø               'IF "@" PRESSED GOTO OPTION SELECT
26Ø GOSUB8ØØ                    'TRANSMIT PRESSED KEY
27Ø PRINTH;                     'PRINT PRESSED KEY
28Ø GOTO19Ø                     'CONTINUE IN COMMUNICATION MODE
29Ø CLS
3ØØ PRINT"PROGRAM TRANSFER MODE"
31Ø PRINT,"ENTER 1 TO SEND DISK",,,"ENTER 2 TO RECEIVE DISK FILE
",,,
"ENTER 3 TO RETURN TO COMMUNICATION MODE"
32Ø PRINT,;
33Ø INPUTA                      'GET 1,2 OR 3 TO DETERMINE MODE
34Ø ONAGOTO38Ø,57Ø,16Ø          'GOTO PROPER LINE
35Ø PRINT:PRINT"ERROR",         'NUMBER ENTERED WAS NOT 1, 2 OR
36Ø PRINT"NUMBER MUST BE 1, 2 OR 3.":PRINT:PRINT
37Ø GOTO3ØØ                     'TRY ENTERING NUMBER AGAIN
38Ø RS=1                        'SET RECEIVE/SEND CODE - 1=SEND
39Ø J="TRANSMIT"                'PRINT ROUTINE CODE
4ØØ GOSUB85Ø                    'GET FILESPEC,OPEN FILE,FIELD FILE
41Ø C=LOF(1)                    'SET C EQUAL TO NUMBER OF RECORDS
42Ø GOSUB75Ø                    'SEND NUMBER OF RECORDS
43Ø FORX=1TOLOF(1)              'X=CURRENT RECORD NUMBER
44Ø GET1,X                      'GET RECORD X INTO BUFFER 1
45Ø FORF=1TO255                 'F=CURRENT BYTE LOCATION IN BUFFER
46Ø C=ASC(MID$(MX,F,1))         'SET C= TO CURRENT BYTE IN BUFFER
47Ø GOSUB75Ø                    'SEND BYTE
48Ø NEXTF
49Ø C=ASC(LX)                   'SET C= TO LAST BYTE OF RECORD
5ØØ GOSUB75Ø                    'SEND BYTE
51Ø PRINT@384,"TRANSFER OF RECORD NUMBER";X;"OF";LOF(1);"COMPLET
E"
52Ø NEXTX
53Ø CLOSE                       'CLOSE FILE
54Ø CLS
55Ø PRINT"TRANSFER COMPLETE"
56Ø GOTO16Ø                     'GOTO COMMUNICATION MODE
57Ø RS=2                        'RECEIVE/SEND CODE = 2 - RECEIVE
58Ø J="RECEIVE"                 'J TO BE USED BY PRINT ROUTINE
59Ø GOSUB85Ø                    'GET FILESPEC,OPEN FILE,FIELD FILE
6ØØ GOSUB8ØØ                    'SEND READY TO RECEIVE, GET BYTE
61Ø EF=B                        'SET EF = TO EOL (NO. OF RECORDS)
62Ø FORX=1TOEF                  'X = RECORD NUMBER
63Ø MY=""                       'RESET MY TO NULL STRING
64Ø FORF=1TO255                 'F= BYTE BEING RECEIVED
65Ø GOSUB8ØØ                    'GET INCOMMING BYTE FROM RS-232
66Ø MY=MY+CHR$(B)               'PUT INCOMMING BYTE AT END OF MY
67Ø NEXTF
68Ø LSETMX=MY                   'PUT MY INTO BUFFER 1
69Ø GOSUB8ØØ                    'GET 256TH BYTE
7ØØ LSETLX=CHR$(B)              'PUT LAST BYTE INTO BUFFER 1
71Ø PRINT@384,"SAVING RECORD NUMBER";X;"OF";EF;"TO DISK"
72Ø PUT1,X                      'SAVE RECORD TO DISK
73Ø NEXTX
74Ø GOTO53Ø                     'GOTO CLOSE
75Ø A=INP(234)AND128           'TEST FOR DATA RECEIVED
76Ø IFRS=ØTHENRETURN           'IF COMMUNICATION MODE RETURN
77Ø IFA=ØTHEN75Ø               'KEEP CHECKING FOR INPUT
78Ø B=INP(235)                 'SET B= TO RECEIVED BYTE
79Ø IFRS=2THENRETURN           'IF IN RECEIVE MODE RETURN
8ØØ A=INP(234)AND64            'TEST TRANS. HOLDING REGISTER FLAG
81Ø IFA=ØTHEN8ØØ               'TEST TILL LAST BYTE TRANSMITTED
82Ø OUT235,C                   'LOAD HOLDING REG WITH NEW BYTE
83Ø IFRS=2THEN75Ø              'IF IN RECEIVE MODE GOTO INPUT
84Ø RETURN
85Ø CLS
86Ø PRINT"PROGRAM TRANSFER MODE: ";J
87Ø PRINT,"ENTER FILESPEC: ";
88Ø LINEINPUTJ                  'GET FILESPEC INTO J
89Ø INPUT"PLACE DISK IN PROPER DRIVE AND HIT ENTER WHEN READY TO
 CONTINUE";H
9ØØ OPEN"R",1,J                 'OPEN FILE J FOR RANDOM ACCESS
91Ø FIELD1,255 AS MX,1 AS LX 'FIELD 256 BYTE FILE
92Ø RETURN
93Ø PRINT"OPERATIONAL ERROR":CLOSE
94Ø PRINT"FILE CLOSED","STAND-BY"
95Ø D=(ERR/2)+1                 'GET ERROR CODE NUMBER
96Ø IFD>24THEND=(D/2)+2
97Ø C=Ø                         'SET COUNTER TO Ø
98Ø A=2Ø995                     'LOCATION OF FIRST ERROR MESSAGE

                               IN TRS DOS.
99Ø 'IN LINE 98Ø  CHANGE A = 2Ø995 TO A = 19767 IF YOU ARE USING
 NEWDOS 8Ø.
1ØØØ B=PEEK(A)                  'PUT BYTE INTO B
1Ø1Ø A=A+1                      'ADD 1 FOR NEXT PEEK LOCATION
1Ø2Ø IFB=ØTHENC=C+1             'IF B=Ø AT TERMINATOR OF STRING
1Ø3Ø IFC<>DTHEN1ØØØ             'IF COUNTER = ERROR CODE,FOUND
1Ø4Ø '                           PROPER ERROR MESSAGE
1Ø5Ø PRINTCHR$(PEEK(A));        'PRINT LETTER
1Ø6Ø A=A+1                      'GET NEXT PEEK LOCATION
1Ø7Ø IFPEEK(A)THEN1Ø5Ø          'IF NOT Ø GOTO PRINT
1Ø8Ø PRINT" ERROR HAS OCCURED IN LINE ";ERL'ERL= LINE NUMBER OF
ERROR
1Ø9Ø END                        'END PROGRAM EXECUTION.
```

to memory as one 255-byte string and one one-byte string. Next, the string (255 bytes) is taken apart one byte at a time from left to right. Then, each byte is transmitted one bit at a time. When the 255-byte string is done, the 256th byte is transmitted, completing the transfer of one record.

At the receive end, the bits are assembled into bytes, which are in turn placed into a 255-byte string and a 1-byte string. LSET places them in the buffer and PUT transfers them to the receiving disk.

As always such routines can cause problems. Basic is slow and the extensive record processing really slows down transfer. The transfer time of the first record depends on when both computers are ready. After that the transfer rate is approximately 44 to 46 seconds per record.

We did add a routine that tells you how many records are being transmitted or received, and which record is being processed.

Once the program is finished with all records, it automatically returns to the communication mode and prints Transfer Completed on both terminals.

The rest of the problems are related to phone connections. If you have poor phone connections, or if you use an acoustic modem, you may get occasional errors.

These errors are easy to spot in a Basic program by carefully watching listings. (Checking of machine language file transfers is not that easy.) How much you can depend on the received program depends on your phone connection and your experience with testing the transfer.

One final note to programmers who wish to modify this program. Line 90 in Program Listing 1 is not needed. It is a vestige of an earlier program. You can delete it with no problem but, if you modify the program, you may need it. ■

```
1Ø CLS
2Ø PRINT"
      HIT ANY KEY TO START COMMUNICATION MODE:
      HIT THE '' @ '' TO SELECT
      TRANSFER MODES. AN OPTION IS
      AVAILABLE TO RETURN TO COMM.
      MODE."
3Ø CLEAR25ØØ:DEFINTA-F,R,X:DEFSTRH-M:ONERRORGOTO27Ø
4Ø H=INKEY$:IFH=""THEN4Ø  ELSEOUT232,A:A=INP(233)AND248OR5:OUT234,229:OUT233,85
5Ø P=INP(232)AND32:IFPTHEN5ØELSECLS
6Ø PRINT"COMMUNICATION MODE:":PRINTCHR$(14):RS=Ø
7Ø GOSUB22Ø:IFATHENPRINTCHR$(INP(235));
8Ø H=INKEY$:IFH=""THEN7ØELSEC=ASC(H):IFC=31THENCLS
9Ø IFC=64THEN1ØØELSEGOSUB23Ø:PRINTH;:GOTO7Ø
1ØØ CLS
11Ø PRINT"PROGRAM TRANSFER MODE"
12Ø PRINT,"ENTER 1 TO SEND DISK",,,"ENTER 2 TO RECEIVE DISK FILE",,,
"ENTER 3 TO RETURN TO COMMUNICATION MODE"
13Ø PRINT,;:INPUTA:ONAGOTO15Ø,19Ø,6Ø
14Ø PRINT:PRINT"ERROR",:PRINT"NUMBER MUST BE 1, 2 OR 3.":PRINT:PRINT:GOTO11Ø
15Ø RS=1:J="TRANSMIT":GOSUB24Ø:C=LOF(1):GOSUB22Ø:FORX=1TOLOF(1):GET1,X:FORF=1TO255:C=ASC(MID$(MX,F,1))
16Ø GOSUB22Ø:NEXTF:C=ASC(LX):GOSUB22Ø:PRINT@384,"TRANSFER OF RECORD NUMBER";X;"OF";LOF(1);"COMPLETE"
17Ø NEXTX
18Ø CLOSE:CLS:PRINT"TRANSFER COMPLETE":GOTO6Ø
19Ø RS=2:J="RECEIVE":GOSUB24Ø:GOSUB23Ø:EF=B:FORX=1TOEF:MY="":FORF=1TO255:GOSUB23Ø:MY=MY+CHR$(B):NEXTF
2ØØ LSETMX=MY:GOSUB23Ø:LSETLX=CHR$(B):PRINT@384,"SAVING RECORD NUMBER";X;"OF";EF;"TO DISK":PUT1,X:NEXTX
21Ø GOTO18Ø
22Ø A=INP(234)AND128:IFRS=ØTHENRETURNELSEIFA=ØTHEN22ØELSEB=INP(235):IFRS=2THENRETURN
23Ø A=INP(234)AND64:IFA=ØTHEN23ØELSEOUT235,C:IFRS=2THEN22ØELSERETURN
24Ø CLS:PRINT"PROGRAM TRANSFER MODE: ";J:PRINT,"ENTER FILESPEC: ";:LINEINPUTJ
25Ø INPUT"PLACE DISK IN PROPER DRIVE AND HIT ENTER WHEN READY TO CONTINUE";H:OPEN"R",1,J
26Ø FIELD1,255ASMX,1ASLX:RETURN
27Ø PRINT"OPERATIONAL ERROR":CLOSE:PRINT"FILE CLOSED","STAND-BY":D=(ERR/2)+1:IFD>24THEND=(D/2)+2
28Ø C=Ø:A=19767
29Ø B=PEEK(A):A=A+1:IFB=ØTHENC=C+1
3ØØ IFC<>DTHEN29Ø
31Ø PRINTCHR$(PEEK(A));:A=A+1:IFPEEK(A)THEN31ØELSEPRINT" ERROR HAS OCCURED IN LINE ";ERL:END
```

Program Listing 2

LOAD 80

Learn by doing at your own pace.

OJT

Frank Tymon
1213 Topaz Way
Santa Maria, CA 93454

The personal computer is a powerful educational tool whose potential remains untapped. High schools and colleges are increasing their use of the computer as an educational aid but home users are not. One reason is the lack of quality, relevant, educational programs. Today the pages of computer magazines offer few ads that are education-oriented. The need is there and so is the market but an individual often finds himself searching for educational programs.

My program fills a need in this area. It does not provide a specific educational program for a given field; rather, it provides a basis for "rolling your own" educational programs.

Self Reliance

What is the best way to use your computer for your own education? You must develop the tool you need.

Self-developed learning programs have many advantages. First, and probably most important, the subject is interesting to you. This interest will motivate you to complete the project.

A second advantage is the specific tailoring associated with such a package. You, better than any other person, recognize your weak points. You know where to target your educational program. You can cut and sew the fabric of the course to closely fit your mental physique.

You can tailor not only the subject matter, but also the academic level. The result is a product appropriate for your interest, knowledge level, and even for your vocabulary. It would be a rare instance when you could find a commercial product with such unique properties.

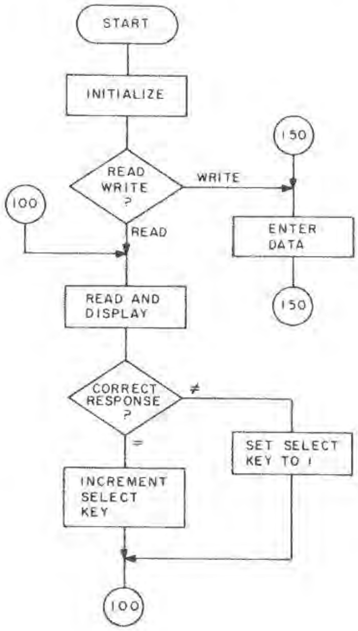


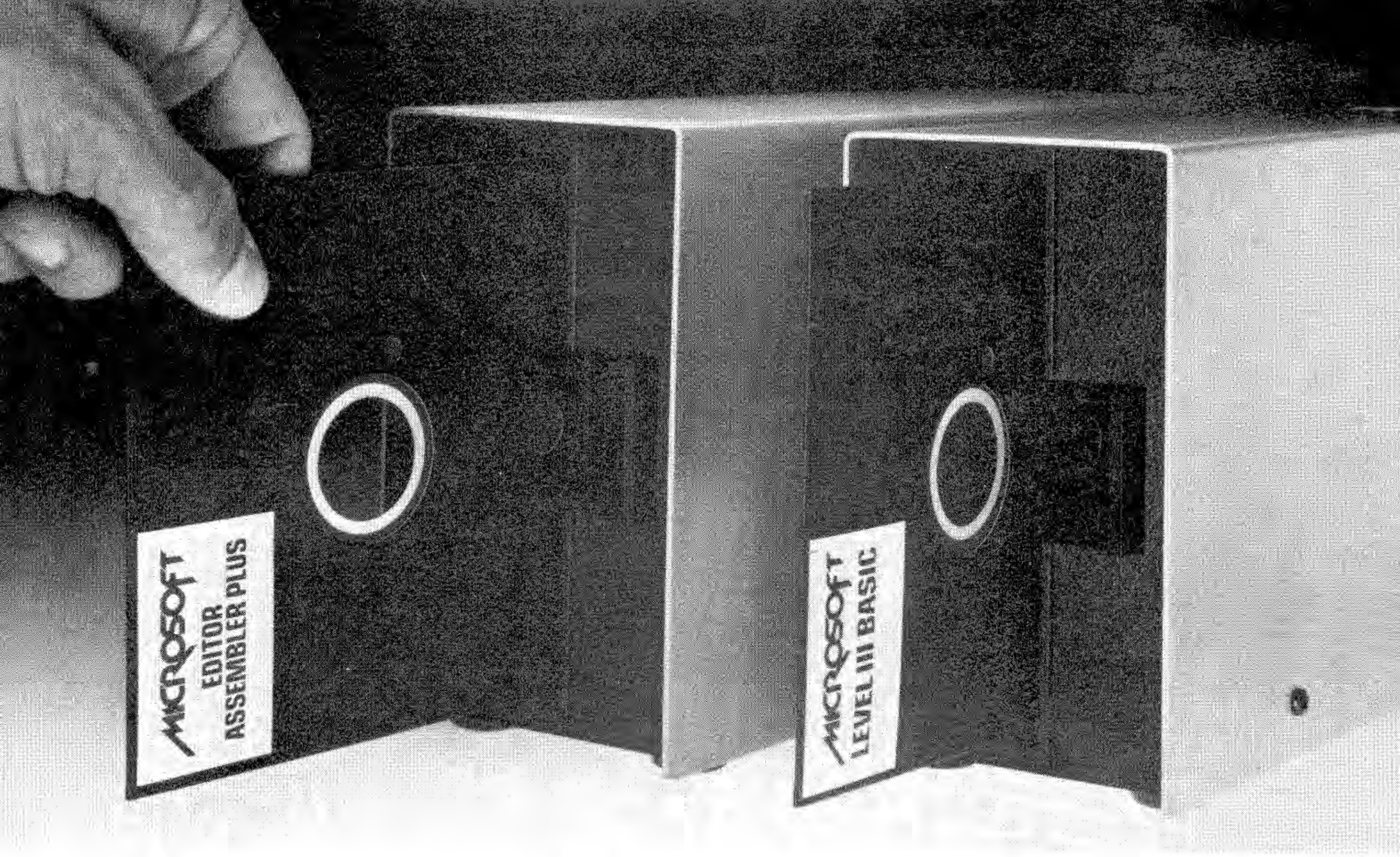
Figure 1

Finally, a self-designed learning program is packaged to hold only those elements that concern you. Irrelevant branches, generalities, excess volume, and extraneous vocabulary are excised. The package addresses your needs. The overhead found in commercial packages does not exist.

My program allows you to tailor learning packages to your needs. It is a tool for the learning process. With it you can learn, review, and progress at your own rate. At the same time it wastes no time on known facts. You establish your schedule, enter the relevant data, proceed at your own pace, and learn what is important to you.

Before proceeding, one caution. A pitfall exists. That pitfall is misinformation. If you enter false information—if you treat such information as true—you have wasted your effort. Even worse, you have uneducated yourself. Avoid this pitfall. Be sure of the information going into your educational program. Research the appropriate sources.

The program supports three basic functions: teaching in a test mode; testing on key mate-



More powerful programming tools for the TRS-80.™ Now on disk.

Better results. Microsoft's Level III BASIC and Editor/Assembler-Plus are programming tools that help you write complex programs in less time, with less effort and utilizing less memory. Better programs. No matter what your programming skill. And for the first time these tools are available on disk.

Editor/Assembler-Plus. A powerful editing, assembly and debugging tool with many sophisticated features that make writing TRS-80 assembly language programs easier, faster and more efficient.

- Full disk capabilities.
- Assembly directly into memory. No need to save object code then reload for execution.
- Macro capability that allows you to define macros for commonly used sequences of instructions.
- Conditional assembly that allows you to generate more than one version of a program.
- Eight breakpoints at a time for program debugging.
- The INCLUDE statement that allows you to call additional disk files for assembly.
- Other features include extensive operators, automatic origin, symbol table printout, quash command, hex, decimal and octal constants, single step-through instructions in memory, five type-out modes, four type-in radices, plus extensive edit commands.

A more powerful BASIC. With Level III BASIC, you get power to perform tasks in BASIC that used to require assembly language. Plus, new ease-of-use features for your TRS-80.

- Advanced graphics. Develop charts, graphs, even animation in Level III BASIC. Draw a line, an outline box or a solid box by specifying just two points. Then save and recall it with BASIC commands.
- MENU. One command that allows you to construct an entire menu.
- CHAIN and COMMON commands allow you to call another program and pass variables to it.
- Powerful editing commands such as COPY/TRANSFER, FIND and CHANGE.
- DUMP command that makes debugging easier.
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rial; and introducing new material each session.

The program accomplishes this using the disk file in a random access mode primarily to allow extraction and modification of a key. The approach is an ineffective use of disk space. However, you will probably reprogram the disks with learning material from time to time, so such inefficiency becomes a minor issue.

The key identifies whether the material is known or unknown. The user codes unknown or unlearned material in the key to assure its frequent review. He codes better known material to be less frequently checked. The key identifies each question for current study, or for one of several spaced reviews over a selected time period. If, for example, the key is set to 1, the material is for current review. If set at 2, the material is for later review. A key of 3 provides for an even later review of relatively well-known information.

When your knowledge of the material is satisfactory the program increments the key number. As a result you will review this material less frequently. The program accomplishes this automatically. The change is triggered by how well you answer a specific question. A wrong answer moves the reviews closer, whereas a right answer displaces it. You find yourself reviewing only those areas which you have not learned adequately.

Sequentially, the key is initially designated as 1. If you answer a question wrong, the current value of the key is replaced by 1. If your answer is correct, the value of the key is incremented by 1 (in this instance, going to a value of 2). When you elect to study only those questions which are new, or which you have missed, the program presents only items with a key of 1. When you want to review material, the program presents items with a key value of 2, 3, and so on. The questions addressed are only those at the review level you selected.

The process is the same for each study session. You are always confronted by material you wish to learn, or, if you select, by review material.

The flowchart shown in Fig. 1 reflects in an overview how the program works. Its use is relatively straightforward.

This program can aid in language learning. To best use it in this fashion, the routine provides the English meaning of a foreign word or phrase. When you enter the appropriate response the program compares the input string with the value it has stored, and responds accordingly. If the answer is right it increments the key and passes on to the next entry. If the answer is wrong, it sets the key to 1 and tells the right answer. Thus, on my next session, I will review again the words or phrases I missed. As a result I do not waste time on known subjects.

In the program file two acts as a lookup identifying the record number. The instructions lead the user through entry of data to develop a learning vehicle, or to use a previously developed learning vehicle. In the latter case the user is guided in selecting a weekly review, monthly review, or the like. When the user correctly answers a displayed question, the program increments the key value, and replaces the old record with this one. If the user answers incorrectly, the key is set to 1, and the record saved. There are other activities, such as truncating entries to correspond to the length of the saved field to allow comparison, testing for end of file, and so on.

The program as provided, in conjuction with the flowchart and remarks, should be easy to use. Use of the program is not limited to learning languages. You can use it for vocabulary, math, or a wide variety of other disciplines. Realistically, you should supplement it with other learning approaches, reading, and application of learned material.

Three supplements that reinforce each other quite well are reading, use of flash cards, and use of tapes. A well-planned study approach taking advantage of all of these is generally desirable. They provide effective supplements to the program.

Program Listing

```
1  REM THIS IS PROGRAM LEARNA/BAS
2  REM PROGRAM COPYRIGHT NOVEMBER 1981 BY FRANK TYMON
10 CLS
20 CLEAR 5000
30 KNT=0
40 ' OPEN FILE 2 TO ACCESS/SAVE MAX RECORD COUNT
45 ' OPEN FILE 1 TO ACCESS/SAVE RECORDS
50 OPEN "R",2,"SAVEKNT/BAS"
60 FIELD 2,3 AS KNT$
70 OPEN "R",1,"TRIAL/BAS"
80 FIELD 1,2 AS KEY$,6 AS DT$,25 AS WD$,25 AS MEANING$
85 ' ***************************************************
90 INPUT "IN TO ENTER DATA;OU TO READ FROM DISK ";ACT$
100 IF VAL(KNT$)<=1 LSET KNT$=STR$(1)
110 IF ACT$="IN" KNT=VAL(KNT$)
120 CLOSE 2
130 ' SUB 360 PERMITS READING; 340 ENDS ROUTINE
140 IF (ACT$="OU") GOSUB 360  :GOTO 340
145 ' ***********************************************
150 'NEXT SECTION ALLOWS ENTRY OF DATA UNDER KEY 1
160 INPUT "INPUT DATE";DTE$
170 PRINT "KEY IS 1,2,3,4,5,6 FOR DAY,WEEK,MONTH,QUARTER,SEMI-AN
NUAL,ANNUAL"
180 PRINT "ALWAYS USE 1 FOR INITIAL ENTRY."
190 PRINT "TO STOP, ENTER LAST,,"
200 INPUT "INPUT KEY, WORD,MEANING";KY$,WRD$,MN$
210 IF KY$="LAST" THEN 280
220 ' NEXT SECTION WRITES RECORD
230 KY$=STR$(VAL(KY$))
240 LSET KEY$=KY$:LSET DT$=DTE$:LSET WD$ = WRD$:LSET MEANING$=MN
$
250 KNT=KNT+1
260 PUT 1,KNT
270 GOTO 200
275 ' ********************************************
280 IF ACT$="OU" GOTO 340
290 ' NEXT SECTION DISPLAYS RECORDS
300 CLS:FOR G=1 TO KNT:GET 1,G
310 PRINT KEY$,DT$,WD$,MEANING$
320 NEXT G
330 GOSUB 540
340 CLOSE 1:END
345 ' ***********************************************
350 'NEXT SECTION READS RECORDS BY SELECTED PERIOD
360 CLS
370 PRINT "FOR DAY, THE INITIAL INPUT, ENTER (BETWEEN QUOTATION
MARKS) SPACE AND 1"
380 PRINT "INPUT FOLLOWING NUMBERS (PRECEDED BY A BLANK, AND ";
390 PRINT "BETWEEN QUOTATION MARKS): 2,3,4,5,6 FOR WEEK,";
400 INPUT " MONTH,QUARTER,SEMI-ANNUAL,ANNUAL";PER$
410 KNT=KNT+1
420 GET 1,KNT
430 IF EOF(1) GOTO 540
440 FOR Z=1 TO 300:NEXT Z
450 IF(KEY$<>PER$)GOTO 410
460 ' NEXT SECTION TESTS YOU ON WORD
470 CLS
480 PRINT CHR$(23)
490 PRINT @ 450, MEANING$
500 FOR I=1 TO 300:NEXT I
510 GOSUB 610
520 GOTO 410
525 ' *******************************************
530 ' NEXT SECTION SAVES RECORD KOUNT
540 IF ACT$="OU" KNT=KNT-1
550 KT$=STR$(KNT)
560 OPEN "R",2,"SAVEKNT/BAS"
570 LSET KNT$=KT$
580 PUT 2,1
590 CLOSE 2
595 IF EOF(1) END
600 RETURN
605 ' ********************************************
610 CLS
620 GOTO 800
630 ' NEXT SECTION DETERMINES SUCCESS OF TEST
640 INPUT "INPUT WORD ";WRD$
650 IF (WRD$=BUFF$) GOTO 740
660 CLS
670 PRINT CHR$(23)
680 PRINT @ 450,WD$
690 PRINT @482,MEANING$
700 FOR I=1 TO 300:NEXT I
710 LSET KEY$=STR$(1)
720 PUT 1,KNT
730 RETURN
735 ' ********************************************
740 A%=VAL(KEY$):B$=STR$(A%)
750 IF(B$>=" 6") LSET KEY$=" 6":GOTO 780
760 LSET KEY$=STR$(A%+1)
770 PUT 1,KNT
780 GOTO 730
785 ' ********************************************
790 ' NEXT SECTION CUTS WORD DOWN TO SIZE
800 BUFF$=WD$
810 N=15
820 B$=RIGHT$(BUFF$,1)
830 IF (B$=" ") N=N-1:BUFF$=LEFT$(BUFF$,N):GOTO 820
840 GOTO 640
```

This is only a minimal version of a useful learning tool. You can expand it to incorporate more extensive questions and answers. The simplest way to incorporate this mode would be by use of multiple answers, using numerical or alphabetical identifiers. In this approach we study the new, review the old, and waste no effort on the already known. ■

See List of Advertisers on page 386

GAME

LOAD 80

Or is that a light at the end of grid?

You Light Up My Grid

David R. McGlumphy
4429 Paula Lane
Red Bank, TN 37415

Imagine a tic-tac-toe grid. It has nine squares: one in the center and eight around the periphery. The goal of this game is to light all the squares except the center one.

Rules

Each square corresponds to a number. The top row is to 7, 8, and 9. The middle row is 4, 5 and 6, and the bottom row is 1, 2 and 3.

You change a square from dark to light or light to dark by pressing its corresponding number. If you change a corner, you also change every place which is immediately adjacent to that corner, for a total of four places changed. If you change the center, you also change the squares directly above, below, to the right, and to the left of the center for a total of five places changed. If you change squares 2 or 8, you also change the two squares horizontally adjacent to 2 or 8 (1 and 3 or 7 and 9), for a total of three places changed. If you change squares 4 or 6, you also change the two squares vertically adjacent to 4 or 6 (1 and 7 or 3 and 9), for a total of three places changed.

It's easier to play the game than to read the rules!

The Program

80 Microcomputing published my version of Simon in the August 1981 issue. In that article I asked if anyone had worked on a program like the Merlin game; SMSGT Kanach sent me a listing of his version written for the Color Computer. I used much of his logic in my program although I have changed some of his techniques. I wrote this Basic program for a Model I Level II or disk system.

I used David Morr's Super Sound routine (see *80 Microcomputing*, May 1980). Model III users will have to use a different subroutine to produce sound. Color Computer users can substitute the Sound command for the USR calls or GOSUBs to the USR call in this program. They can eliminate lines 50 and 1420–1620; they must replace any GOSUB 1610 with their Sound command.

The GOTO in the first line of code helped me write and debug the program. I used a disk system to write this program, and I couldn't simply insert or change a few lines and run the program again. If you look at line 1430 in the listing, you will see 29 numbers between the quotes. Run the program, press Break, and then look at line 1430. It will look like garbage because it has been packed with a sound-producing machine language program. (The Data statement contains the program.) The machine language program also has a zero embedded in it, which confuses the Basic interpreter. Basic thinks it means the end of a line of code instead of just a part of a machine language program. If you run the program several times without loading it from disk or tape first, you will get Syntax Error messages.

I made program changes and then typed RUN 20. That automatically saved my program to disk, then ran the program to test it. When I found something I wanted to change, I typed RUN 30 to get a fresh copy of the program from the disk so that line 1430 would be correct. After I finished the programming work, I could have deleted the first three lines, but I left them in to share them with you. You may want to use this technique when you write your own programs.

Disk Basic allows ten different USR calls while Level II Basic allows only one (easily). They use completely different techniques to set up these calls to a machine language subroutine. Level II Basic requires you to POKE the address of the subroutine into addresses 16526 and 16527 while in Disk Basic you can use DEFUSR0 = J (where J is the address of the subroutine). Line 1510 finds out if the program is running in Level II or Disk Basic. If you PEEK (16396) and find the value 201, you are dealing with a Level II machine.

If you have other Merlin-type programs you would like to share or if you have a sound routine like Super Sound which works on the Model III, drop me a line. ■

The Key Box

Basic Level II
Model I
16K RAM

Program Listing

```
10 GOTO 40
20 CLS : PRINT"SAVE MERLIN" : SAVE"MERLIN" : RUN
30 CLS : LOAD"MERLIN"
40 CLEAR 500
50 GOSUB 1420 : REM BUILD SOUND ROUTINE
60 CLS
70 PRINT@704,"SQUARE GAME ADAPTED FROM MERLIN BY"
80 PRINT"SMSGT CHUCK J KANACH JR, PSC#1 BOX 28749, APO SF 96230"
90 PRINT"WRITTEN ON TRS-80 COLOR COMPUTER 4K SYSTEM"
100 PRINT"MODIFIED FOR MODEL 1 LEVEL II BY DAVE MCGLUMPHY"
110 PRINT"4429 PAULA LANE, RED BANK, TN 37415.   10/15/81";
120 TN=0 : REM TRY #
130 REM NUMBERS EACH SQUARE
140 PRINT@170,"7";
150 PRINT@178,"8";
160 PRINT@186,"9";
170 PRINT@298,"4";
180 PRINT@306,"5";
190 PRINT@314,"6";
200 PRINT@426,"1";
210 PRINT@434,"2";
220 PRINT@442,"3";
230 REM DRAWS HORIZONTAL LINES
240 FOR X=8 TO 56
250 FOR Y=5 TO 29 STEP 8
260 SET(X,Y)
270 NEXT Y
280 NEXT X
290 REM DRAWS VERTICAL LINES
300 FOR X=8 TO 56 STEP 16
310 FOR Y=6 TO 28
320 SET(X,Y)
330 NEXT Y
340 NEXT X
350 REM RANDOMLY SELECTS THE DOTS
360 FOR PX=16 TO 48 STEP 16
370 FOR PY=9 TO 25 STEP 8
380 IF RND(2)=1 THEN 410
390 SET(PX,PY)
400 GOTO 420
410 RESET(PX,PY)
420 NEXT PY
430 NEXT PX
440 REM PLAYER SELECTS #1-9.
450 REM DEPENDING ON NUMBER, THE DOTS WILL SET OR RESET.
460 A$=INKEY$
470 IF A$<"1" OR A$>"9" THEN 460
480 ON VAL(A$) GOTO 490,560,620,690,750,840,900,970,1030
490 PI=80
500 GOSUB 1610 : REM SOUND
510 FOR X=16 TO 32 STEP 16
520 IF POINT(X,17)=0 THEN SET(X,17) ELSE RESET(X,17)
530 IF POINT(X,25)=0 THEN SET(X,25) ELSE RESET(X,25)
540 NEXT X
550 GOTO 1090
560 PI=60
570 GOSUB 1610 : REM SOUND
580 FOR X=16 TO 48 STEP 16
590 IF POINT(X,25)=0 THEN SET(X,25) ELSE RESET(X,25)
600 NEXT X
610 GOTO 1090
620 PI=50
630 GOSUB 1610 : REM SOUND
640 FOR X=32 TO 48 STEP 16
650 IF POINT(X,17)=0 THEN SET(X,17) ELSE RESET(X,17)
660 IF POINT(X,25)=0 THEN SET(X,25) ELSE RESET(X,25)
670 NEXT X
680 GOTO 1090
690 PI=40
700 GOSUB 1610 : REM SOUND
710 FOR Y=9 TO 25 STEP 8
720 IF POINT(16,Y)=0 THEN SET(16,Y) ELSE RESET(16,Y)
730 NEXT Y
740 GOTO 1090
750 PI=35
760 GOSUB 1610 : REM SOUND
770 FOR X=16 TO 48 STEP 16
780 IF POINT(X,17)=0 THEN SET(X,17) ELSE RESET(X,17)
790 NEXT X
800 FOR Y=9 TO 25 STEP 16
810 IF POINT(32,Y)=0 THEN SET(32,Y) ELSE RESET(32,Y)
820 NEXT Y
830 GOTO 1090
840 PI=30
850 GOSUB 1610 : REM SOUND
860 FOR Y=9 TO 25 STEP 8
870 IF POINT(48,Y)=0 THEN SET(48,Y) ELSE RESET(48,Y)
880 NEXT Y
890 GOTO 1090
900 PI=25
910 GOSUB 1610 : REM SOUND
920 FOR X=16 TO 32 STEP 16
930 IF POINT(X,9)=0 THEN SET(X,9) ELSE RESET (X,9)
940 IF POINT(X,17)=0 THEN SET(X,17) ELSE RESET (X,17)
950 NEXT X
960 GOTO 1090
970 PI=20
980 GOSUB 1610 : REM SOUND
990 FOR X=16 TO 48 STEP 16
1000 IF POINT(X,9)=0 THEN SET(X,9) ELSE RESET (X,9)
1010 NEXT X
1020 GOTO 1090
1030 PI=19
1040 GOSUB 1610 : REM SOUND
1050 FOR X=32 TO 48 STEP 16
1060 IF POINT(X,9)=0 THEN SET(X,9) ELSE RESET(X,9)
1070 IF POINT(X,17)=0 THEN SET(X,17) ELSE RESET(X,17)
1080 NEXT X
1090 TN=TN+1
1100 PRINT@704,CHR$(31)"TRY #";TN
1110 IF POINT(32,17)=0 THEN 1120 ELSE 460
1120 IF POINT(16,9)<>0 THEN 1130 ELSE 460
1130 IF POINT(32,9)<>0 THEN 1140 ELSE 460
```

Program continues

Program continued

```
1140 IF POINT(48,9)<>0 THEN 1150 ELSE 460
1150 IF POINT(16,17)<>0 THEN 1160 ELSE 460
1160 IF POINT(16,25)<>0 THEN 1170 ELSE 460
1170 IF POINT(48,17)<>0 THEN 1180 ELSE 460
1180 IF POINT(32,25)<>0 THEN 1190 ELSE 460
1190 IF POINT(48,25)<>0 THEN 1210 ELSE 460
1200 REM DECLARES THAT YOU ARE A WINNER
1210 FOR X=1 TO 20
1220 SS=USR(256+RND(70)+10)
1230 PRINT@199,"****** WINNER! ******";
1240 SS=USR(256+RND(70)+10)
1250 CLS
1260 NEXT X
1270 PRINT"YOU WON ON TRY #";TN
1280 PRINT
1290 PRINT"PRESS ANY KEY TO RUN THE GAME AGAIN."
1300 I$=INKEY$
1310 I$=""
1320 FOR X=10 TO 90
1330 SS=USR(256+X)
1340 NEXT X
1350 IF INKEY$<>"" THEN 1410
1360 FOR X=89 TO 11 STEP -1
1370 SS=USR(256+X)
1380 NEXT X
1390 IF INKEY$<>"" THEN 1410
1400 GOTO 1320
1410 GOTO 60 : REM STARTS GAME AGAIN.
1420 'SUPERSOUND BY DAVID G MORR-6599 RED FOX RD, REYNOLDSBURG,
OH 43068, & 80 MICROCOMPUTING-05/80, PAGES 130-135, MODIFIED BY
DAVE MCGLUMPHY, 4429 PAULA LANE, RED BANK, TN  37415   05/23/81
1430 SS$="12345678901234567890123456789"
1440 SS=VARPTR(SS$)
1450 J=PEEK(SS+1)+256*PEEK(SS+2)
1460 FOR K=JTOJ+28
1470 READ SS
1480 POKE K,SS
1490 NEXT
1500 DATA 205,127,10,62,1,14,0,237,91,61,64,69,47,230,3,179,211,
255,13,40,4,16,246,24,242,37,32,241,201
1510 IF PEEK(16396)<>201 THEN 1580 : REM TO DEAL WITH  DOS
1520 REM SET UP THE USR ROUTINE FOR LEVEL II BASIC
1530 MSB=INT(J/256)
1540 LSB=J-256*MSB
1550 POKE 16526,LSB
1560 POKE 16527,MSB
1570 RETURN
1580 CMD"T" : REM DISABLE INTERRUPTS TO MAKE SOUND CLEAR
1590 DEFUSR0=J : POKE 14308,0 : REM ENSURE SOUND AT CASSETTE 1
1600 RETURN
1610 SS=USR(1024+PI) : REM MAKE A NOISE
1620 RETURN
```

Decimal to octal to binary to hexadecimal.

16, 10, 2 or 8— Which Base Do We Appreciate?

Karl Sarnow
Salzwedeler Hof 9
3000 Hannover 1
West Germany

Every programmer must occasionally translate numbers from one system to another. Although not really difficult, the process is time-consuming and error-prone. After all, how many of us are really proficient with the hexadecimal, binary or octal systems? I wrote a program to smooth my path through conversions—you may wish to use it, too.

Representing a Number

Each natural number (or positive integer) can be decomposed into a sum of products of the following form (Eq. 1):

$$A = q_t * n\uparrow t + q_{t-1} * n\uparrow(t-1) + \ldots + q_2 * n\uparrow 2 + q_1 * n\uparrow 1 + q_0$$

where n is the base of the number A, q is a numeral with a value $0 \leqslant q_i < n$. In the best known base system, the decimal system, it sounds a lot easier. For example, the number 3190 means $3 \cdot 10\uparrow 3 + 1 \cdot 10\uparrow 2 + 9 \cdot 10\uparrow 1 + 0$. In this example the base n is 10, the numerals q_0–q_3 are all less than 10 (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) and the position of a numeral in the number represents the exponent of the base.

As long as you are working in a base system with n less than 10, there is no problem for the numerals. If, for example, the base is two, then the numerals q_i are 0 and 1. In the octal base system (n equals eight) the numerals q_i are 0, 1, 2, 3, 4, 5, 6, 7.

But what if the base is larger than 10? Letters in alphabetical order are usually used for numerals greater than nine. The numeral meaning 10 would be A, 11 would be B, 12 is C, 13 is D and so on. This works as long as the base is less than or equal to the number of letters in the alphabet plus 10 (36). Most computer applications are restricted to the decimal, binary, octal or hexadecimal base systems. The program shown in the listing will transform numbers between these four systems.

The Main Program

The main program consists of three parts: (1) input (lines 10–50); (2) computing the number in different representations (lines 60–140); and (3) output in different base systems (lines 150–180).

Parts 1 and 3 are simple and need no further comment. Part 2 computes the various representations of the number in the following way.

The input number N$ contains as a first character the code for the base system used. Line 60 truncates this code from the number. Lines 70–100 assign the corresponding value to BB, the base of the system. Line 100 asks if the input number N$ is decimal. If so, ND is taken as the value of N$. If not, the subroutine at line 250 computes the decimal value ND from N$ and BB.

Once ND is known, all other representations of the number N$ are computed from the decimal value ND by the subroutine at line 200. The If...Then ...Else statement in lines 120–140 is not necessary, but saves time when N$ is input in a base system different from the decimal system.

Subroutines

The two subroutines at line 200 and line 250 are the heart of the program. The first (line 200) converts a decimal number ND into the representation Y$ in the base B. The second (line 250) converts a number N$ in the base BB into the decimal value ND.

To explain how the conversion of N$ in the base BB to decimal ND works I will give an example. Assume the number N$ is given as H4FC. This means that the number N$ is given in the hexadecimal system, with BB = 16 as base and a value of $4 \cdot 16\uparrow 2 + 15 \cdot 16\uparrow 1 + 12$ (Eq. 2) according to Eq. 1.

To obtain this value the computer first sets the value of ND and Z to zero (line 250). Line 260 begins a For...Next loop which examines each character in N$. Remember that line 60 has removed the base code (B, O, D or H) from N$. Line 270 then sets Z equal to the ASCII value of the character being examined. Line 280 determines if the character is alphabetic or numeric; then the value for the character is set equal to Z-K where K = 55 for alphabetics and 48 for numerics. This value is added to NB*BB in line 290.

After the For...Next loop in lines 260–300, ND contains the decimal value of H4FC = D1276. Use your pocket calculator to prove that Eq. 2 gives the same result as $1 \cdot 10\uparrow 3 + 2 \cdot 10\uparrow 2 + 7 \cdot 10\uparrow 1 + 6$ (Eq. 3).

The Key Box

Basic Level II
Model I or III
4K RAM

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INSIDE LEVEL II is a comprehensive reference guide to the Model I and Model III ROMs which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the SYSTEM command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer including tape formats, RAM useage, relocation of Basic programs, USR call expansion, creating SYSTEM tapes of your own programs, interfacing of Basic variables directly with machine code, and special precautions for disk systems. INSIDE LEVEL II is a clearly organized reference manual. 80 Microcomputing calls it "a volume of valuable information...immensely thoughtful, literate, and cleanly designed." Byte Magazine says: "I recommend this book to serious machine language programmers."
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To explain the subroutine at line 200 I will go back and transform ND = 1276 decimal to Y$ in the hexadecimal system. First, I will do it by hand. Divide the number by the base: $1276 \div 16 = 79.75$ (Eq. 4). The fractional part of the result in Eq. 4 gives the last hexadecimal numeral in our new representation: $0.75 * 16 = 12 = C$ (Eq. 5). Next divide the integer part of the result of Eq. 4 by the base number: $79 \div 16 = 4.9375$ (Eq. 6). Again, the fractional part gives the next hexadecimal numeral: $0.9375 * 16 = 15 = F$ (Eq. 7). Because the integer part of Eq. 6 is less than 16 (the base), it is the highest hexadecimal numeral. Therefore the hexadecimal representation of decimal 1276 is 4FC.

Line 200 assigns ND to Z and the empty string to Y$. Line 210 computes the integer part of Z/B and leaves in Y the value of the corresponding hexadecimal numeral. Line 220 computes the ASCII code for this numeral and line 230 adds this character leading to Y$. This procedure repeats until there is no integer part left (Z equals 0).

Editor's note: This program is not error-trapped for incorrect binary, octal and hexadecimal inputs. Therefore restrict your binary inputs to 0 and 1; your octal inputs to 0–7; and your hexadecimal inputs to O–F. ■

```
1 '************************************************************
2 '*                                                          *
3 '*                    BASE CONVERSIONS                      *
4 '*                           BY                             *
5 '*                    DR. KARL SARNOW                       *
6 '*                                                          *
7 '************************************************************
10 CLS:CLEAR(200):PRINTTAB(10)"NUMBER REPRESENTATION PROGRAMM"
20 PRINT:PRINT"ADD ONE OF THE FOLLOWING PREFIXES TO THE NUMBER YOU WANT TO"
:PRINT"REPRESENT:"
30 PRINT"B - BINARY, O - OKTAL, D - DECIMAL, H - HEXADECIMAL"
40 PRINT"FOR EXAMPLE: HFF = D255."
50 PRINT:INPUT"YOUR NUMBER";N$
60 B$=LEFT$(N$,1):N$=RIGHT$(N$,LEN(N$)-1)
70 IF B$="B" THEN BB=2
80 IF B$="O" THEN BB=8
90 IF B$="D" THEN BB=10
100 IF B$="H" THEN BB=16
110 IF BB<>10 THEN GOSUB 250 ELSE ND=VAL(N$)
120 IF BB<>2 THEN B=2:GOSUB 200 :NB$=Y$ ELSE NB$=N$
130 IF BB<>8 THEN B=8:GOSUB 200 :NO$=Y$ ELSE NO$=N$
140 IF BB<>16 THEN B=16:GOSUB 200 :NH$=Y$ ELSE NH$=N$
150 PRINTTAB(20)"NUMBER REPRESENTATION"
160 PRINT"HEX","DECIMAL","OCTAL","BINARY"
170 PRINTNH$,ND,NO$,NB$
180 PRINT:INPUT"HIT 'ENTER' WHEN READY";N$:GOTO 10
190 'SUBROUTINE TO CONVERT DECIMAL NUMBER ND TO BASE B
200 Z=ND:Y$=""
210 Y=Z:Z=INT(Z/B):Y=Y-B*Z
220 IF Y>9 THEN K=55 ELSE K=48
230 Y$=CHR$(Y+K)+Y$:IF Z>0 THEN 210 ELSE RETURN
240 'SUBROUTINE TO CONVERT NUMBER OF BASE BB TO DECIMAL FORM ND
250 ND=0:Z=0
260 FOR I=1 TO LEN(N$)
270 Z=ASC(MID$(N$,I,1))
280 IF Z>64 THEN K=55 ELSE K=48
290 ND=ND*BB+Z-K
300 NEXT
310 RETURN
```

Program Listing

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the EVERYTHING checker

```
PRESS:  (L) LEARN WORD  (R) REPLACE WORD  (S) SKIP WORD
WORD IN ERROR: misstake

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

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- WHAT DO ALL THE MODEL NUMBERS MEAN?
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  B-91= 80 TRACKS SINGLE HEAD SINGLE SIDE   B-92= 80/80 TRACKS DOUBLE HEAD DOUBLE SIDE
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Small business is a vague term used to describe any business size from 0–500 employees. Yet the needs of a business employing one person are vastly different from those of a business employing 50, let alone 500. A small business considering the use of a TRS-80 for bookkeeping purposes has many programs from which to choose. Those on the larger end of the small-business definition probably should select a complete, integrated business system of payroll, general ledger, accounts payable and accounts receivable. Those at the low end in size may find such systems too expensive and/or too complicated. They might be better served by some type of check register program, which is basically an elementary general ledger.

Three such programs now on the market can be used by individuals as well as businesses. However, all are time consuming to use compared to a simple in-memory household checkbook program. These programs do much more than balance the checkbook: They are sophisticated record-keeping systems. If you normally itemize deductions, or have special financial problems such as rental income/expenses, these programs may be well worth the time and expense. Otherwise, they may be more program than you need or want.

	Chk-80	M.CRAS	CRP
Prints Checks	Yes	Yes	No
Quarterly Payroll	No	No	Yes
Reconciles Bk. Stmt.	Yes	Yes	No
Accounts debit	33	Varies	Varies
Accounts credit	33	Varies	Varies
Accounts Total	66	223	400
Multiple Bk. Accts.	Yes	No	No
Pro rate expenses	No	Yes	Indirect
Security	No	No	Yes
VisiCalc interaction	No	Yes	No
Lowercase commands	No	Yes	Usually
Report flexibility	No	No	Some
Balance available	No	Yes	No
Entries retained after posting	Totals	Transacts	Totals
Error correction	Yes	Reenter	Yes

Check Register System Comparison

Features and Specifications

The three programs do not perform the same functions. Two of the programs, Maxi Check Register Accounting System (Maxi CRAS) and Checkwriter-80, print the checks, if desired, to avoid the double work of typing an entry into the computer and typing it again on a check. Both programs also balance the checkbook, cancel checks and reconcile the bank statement. Maxi CRAS has the additional feature that it interacts with VisiCalc. Check Register Plus (CRP) is quite different from the other two since it does not balance the checkbook, write checks, or reconcile the bank statement. It does maintain payroll records and totals for tax and FICA purposes, and can even print W2 forms, with the purchase of

"The usefulness of any of these programs depends on your ability to organize your financial accounts."

an extra module.

Maxi CRAS requires a Model I or III with 48K and two drives, or Model II with 64K and one drive. Printers which require special drivers may be used. Capacity is 223 accounts, divided as needed between expense accounts and income accounts. Several disks may be used, if necessary, to store all the transactions for a year. The program was formerly marketed by The Bottom Shelf as the Check Register Accounting System. it has been totally rewritten for release as Maxi CRAS.

Checkwriter-80 is for the Model III only. It requires 48K and two drives. Printers which require special drivers are not supported; a parallel printer must be on-line before the program will run. The program is written in Cobol. It allows 33 expense accounts, 33 income accounts, 75 payee names/addresses, and nine bank accounts.

Check Register Plus needs a Model I or III, 48K and two drives. Special printer drivers are not supported. Capacity is 400 accounts, divided as needed between income and expense. A Model II version is also available. The Model II version needs 64K, one drive, and includes check reconciliation; it costs $129.95.

Program Operation

The usefulness of any of these programs depends in large part on your ability to organize your financial accounts. It is important to list all your expense and income categories in as much detail as will be meaningful. For example, an expense might be insurance. For some people, this becomes a single expense account. For others, it may be necessary to have several expense accounts for insurance, such as health insurance, auto insurance and office insurance. All the programs allow changing of account titles, but if an account has a balance, major switching should only be done at the end of the year. Therefore it is important to plan accounts carefully.

Checkwriter-80

Checkwriter-80 is a well written, easy-to-use program. Screens in various parts of the program all use the same control keys, and errors are simple to correct. A minor annoyance is that control key entries must be in uppercase. The manual is well organized and easy to understand.

Program initialization involves entering expense and income account titles, preferably in alphabetical order, as well as name and account number for each bank account. A payee name and address file is also created. This file of up to 75 names should include every firm to which checks are regularly written.

When a check is entered, it must be assigned to an expense account and a payee by entering the appropriate code number (obtained from a printout). If the code number is unknown, you can ask the computer to scan the file and find the appropriate payee or expense. This involves pulling the records in from the disk, however, so this method is rather slow. If there is no expense account or payee which fits the transaction, both may be typed in directly by entering 00 as the code. This process uses extra space on the disk, however, so it should not be done too often. The program limits of 33 account and expense names and 75 payee names, though, are flexible rather than absolute limits.

Checks are numbered internally by the program, and the actual check number is not used until the checks are printed. At that time, the starting number on the forms may be used. If the check is written manually, there is no way to enter the actual check number into the program.

Any error may be corrected at any time. Even if the check has already been printed, it is possible to fix the error and reprint the check. A check which is cancelled accidentally may be restored.

One deposit is allowed per account per day. A deposit entry consists of date, amount and income codes.

When you receive bank statements, the program reconciles the balance. This is the only point at which it is easy to obtain a checking account balance. Normally, to find the balance one must note the beginning balance, obtain a printout of the check register, and manually add the total deposits and subtract the total checks. This is a lot of work for such an important piece of information.

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"A most unusual feature is the ability to transfer files to VisiCalc."

After the monthly statement is reconciled, the cancelled checks and deposits are cleared off the disks. Only the totals are retained in the income and expense accounts, not the actual transactions. At the end of the year, a final clearing gives totals for the whole year in each account.

Maxi CRAS

Like Checkwriter-80, Maxi CRAS is initialized by deciding on expense and income account titles. It is wise to include a few empty accounts in case more are needed later. After you enter accounts, obtain a printout for reference when entering transactions.

A unique feature is this program's ability to allocate a check, in one transaction, to more than one expense category. For example, a check to an office supplies store might be for a desk and envelopes. You may specify the dollar amount for each category, perhaps $150 for the desk, assigned to the account for office equipment, and $10 for the envelopes, assigned to office supplies. You may also allocate to accounts by percent or by fractions, rather than actual dollar amount. It is not unusual for a single check to cover various expenses; this is an important feature. Furthermore, individual expense entries are saved by the system for the entire year, so that the final summary lists every item in each expense category. This is not true of the other two programs, which are cleared monthly and retain only expense totals, not the individual entries.

Check entry involves typing the payee, amount and purpose of the check. You type a check number if you write the check manually. For printed checks, you enter the starting number at printout time. The expense account(s) are chosen by account number, but their names do not print on the screen, so it is easy to make an error and not notice it. To correct an error, the entire transaction is erased and you must begin again. During check entry, the balance is available at any time—an important convenience, particularly for personal use. Check entry is made as rapid as possible by liberal use of default values when you press Enter. For example, the date has to be typed only if it is different from the current date, and even then only the day, not month and year.

If you find an error after a check has been written to disk, it is not possible to alter or delete the check. A memo transaction is created to fix the error. If you do not find the error until after the check is printed, the check may not be reprinted. The advantage of this system is that all entries are permanent and cannot be maliciously or inadvertently altered. For personal use, however, the system is not as simple as Checkwriter-80's check edit function.

The program maintains a payee and address file quite different from Checkwriter-80's. The limit in each file is 40 names or addresses (75 on the Model II). You may use either file, both or none, depending on your needs. A business or individual printing checks would want both files. A person writing checks manually would never need the address file, but might want to use the payee file to increase the speed of check entry. The payee file automatically prints the purpose of the check on the proper line. Both of these files are accessed not by a code number, but by an exact match with the first line of the typed entry. Whether or not these files are used, the amount of disk space used by the transaction is the same.

"The purpose of Check Register Plus is somewhat different from the other two programs."

A most unusual feature is the ability to transfer files to VisiCalc. Account titles are placed on each VisiCalc row, and account balances are entered in the columns (one per month). This type of interaction between programs is a great time saver, but is almost never seen in programs produced by different companies. The author should be congratulated for incorporating this transfer function.

Check Register Plus

The purpose of Check Register Plus (CRP) is somewhat different from the other two programs. It is actually a general ledger program, whose function is solely to chart the flow of money, not to balance the checkbook. As such, it does not have any of the checkbook features of the other two programs, and it does not print checks.

Surprisingly, this is the only program of the three which has password security. The security is on three levels, and passwords may be easily changed by the person having the top-level password. This is also the only program which does not allow back-up of the program disk. CRP is shipped with a back-up disk provided by Softco. If the original disk is harmed, the back-up may be used while you wait for replacement at no charge. The programs also may not be listed. I would feel more comfortable with this system if the program disk could be write-protected. However, during operation the program disk is used as a back-up for data before posting. Since the program disk is used regularly for write as well as read, and must remain in the drive whenever the program is in use, eventual damage to the disk seems likely. As long as Softco will replace it at no charge, however, it is difficult to object to their policy.

The CRP manual is well written and nicely presented, with important points well marked. However, at the end the reader may still have some unanswered questions, such as, "How do you handle income?" Income is never mentioned in the manual. The sample data provided with the program lists one income account, so it must be possible to use the program to track income. One way to do so is to enter any income via the check-entry choice, but place a D for deposit in front of the check number. Deposits can be allocated to various income accounts and placed on a separate printout. Since the program does not maintain a checkbook balance, this system works. But it would have been helpful to have some suggestions in the manual.

CRP allows the user to choose his own account categories, or the samples provided may be used. Each account may be assigned to any of five printouts. The user chooses the headings for the printouts; if 30 income accounts were needed, a printout to list and total these can also be obtained. The program automatically sorts alphabetically on the account number, so it is helpful to group similar expenses and give them sequential account numbers.

Because the program does not maintain a checkbook balance, cash entries can be handled as easily as checks. Check numbers may contain letters, so entries which are not real checks can be flagged with a code letter. There is also no reason why a single check has to be a single entry. A check can be broken up as #1415a, 1415b and so on to allocate different portions of the check to different accounts.

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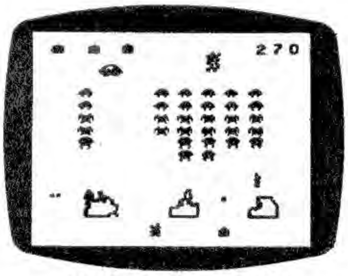

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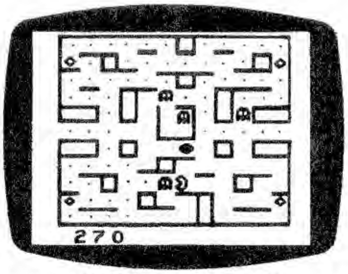

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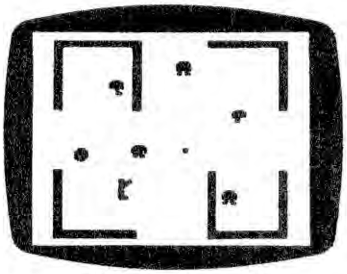

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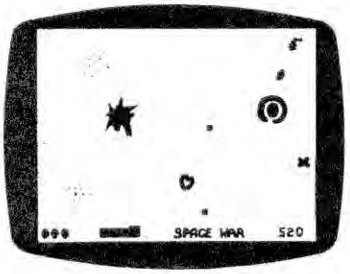

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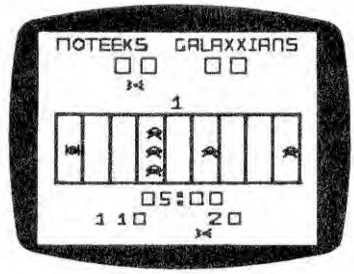

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"Assuming all three programs are compatible with your equipment, the choice will largely be dictated by the intended use."

The program has a particularly effective method of handling dollar entries. As you type each digit, it is printed on the right side and pushed left by the next digit. The decimal point is already on the screen and does not need to be typed. Errors may not be corrected at the time of check entry (except for payroll checks), but may be corrected later with the check-edit feature.

CRP maintains payroll totals. Each payroll check must still be calculated by hand, but you may then enter the check and its deductions in the program, where totals accumulate for quarterly reports. You may also obtain a printout of W2 forms, if an extra module is purchased ($50). This section is time consuming to use if you make an error. You enter the net amount of the check, with an uppercase P in front of the check number. The gross amount and four deductions must then be entered: FICA, federal tax, state tax and other. If the check doesn't balance, the transaction is invalid and the entire entry must be retyped. A business with 20 or more employees would probably already be using a separate payroll program. Very small businesses, however, might find the module useful.

At regular intervals (usually once a month), the checks must be posted to the accounts. A back-up of the check data is automatically made on the program disk before posting occurs. If anything goes wrong during posting, the accounts may be restored to their former condition, which makes error correction easier. As in Checkwriter-80, posting accumulates totals in each expense account. The individual entries are not retained. Files are cleared after a successful posting.

Reports

In programs such as these, the reports are the most important part. At the very least, they are used to prepare income tax returns, but are probably also used on a monthly basis to review the status of the business. In general, the more different types there are, the more useful the program will be. All three programs print a list of the accounts for reference, in order by account number.

Checkwriter-80 provides a list of payee names/addresses, sorted by number and by name. Every time the program is run the check-register statement should be requested. It includes a list of which expense categories have been used during the period, and how much was allocated to them. There is also a list of each check and deposit, in order of entry, showing payee, date, expense account number, amount, status and totals. Finally, there is a checkbook reconciliation statement, which lists and totals checks which are cancelled and checks still outstanding. Then it determines if the bank balance and program balance are in agreement. At the end of the year, a printout of the expense category list shows totals allocated to each category for the year. Of course the program also prints the checks using Trinity Form Co. # MPC 3-1 or MPC 3-2 checks.

The check register printout for Maxi CRAS is somewhat different from Checkwriter-80 in that the amount is not printed on the same page as the payee. There is a list of check numbers, payees (payors for deposits), and descriptions of the check or deposit on one page, and then the amount paid or received listed in order, with running balance, on another page. This report is designed to be placed in a notebook with one page on the left and one page on the right, providing a 160-column printout. There are also reports of the accounts file, payee file, and address file for user convenience when entering transactions.

Maxi CRAS places great emphasis on tracing expenses. You may enter a brief description of each check, as well as a longer (64 characters) note on the transaction. The brief descriptions shows up on the check register printout, and the notes may be retrieved on a separate printout. Checkwriter-80 does not allow any comments about transactions.

Maxi CRAS also has an account distribution statement for each month, listing the payee/payor, amount, account number to which it was assigned and account name. Another report lists the monthly subtotals for each account and current account balance. Printouts of individual accounts may also be requested for any range of months. This audit trail shows all transactions assigned to that account, what the transaction was for, check number, amount and running subtotal. If errors were made, the memory transactions which corrected them appear on the printouts.

As in Checkwriter-80, Maxi CRAS prints a bank reconcilliation statement and indicates any unbalanced condition. Checks are printed using NEBS form 9020.

Check Register Plus gives the user more control over what is printed on a report, but there are fewer report types available. When setting up the accounts, the user specifies which reports will include each account. There are five possible reports, all identical in format, but having user selected heading and contents. Each of the five lists the account name, account number and amount charged to that account with a page total.

There is also a check-register printout, showing each transaction, the account number to which it was assigned, amount, and payee.

The quarterly payroll reports show employee name, gross, net, YTD gross, state, Federal, FICA and other. Totals of all these categories are then reported, and it shows the employer's share of FICA, FUTA and SUTA (based on percentages entered by the user).

A very welcome feature of the report section of this program is an on-screen message advising how to abort a printout. With the other two programs, a printout is aborted at your own risk via Reset with Maxi CRAS or Break with Checkwriter-80. Although the author of Maxi CRAS has informed this reviewer that pressing Reset does no harm, I prefer an abort within the control of the program, such as CRP allows.

A minor annoyance is that the printer goes to top of form with every request for a printout. If you are obtaining several printouts in one session, this is annoying, not so much because of the waste of paper as the delay while a sheet is fed through unnecessarily.

Conclusion

The comments in the chart summarize some of the differences in the programs. Assuming all three programs are compatible with your equipment, the choice will largely be dictated by the intended use. If you wish the program to maintain the checkbook, choose between Checkwriter-80 and Maxi CRAS. Of these two, bear in mind that Maxi CRAS allows many more income/expense accounts, whereas Checkwriter-80 allows multiple bank accounts. It is possible to use Maxi CRAS for more than one bank account, however, by maintaining separate sets of disks for each account.

If you want quarterly payroll data maintained, the logical choice is CRP. It also allows the greatest total number of accounts and has password security.

For personal use, any of the three are acceptable, but probably Maxi CRAS would be the most satisfactory, principally because the account balance is always available, the checks may be assigned to multiple accounts, and each transaction is stored for the year. ■

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RAM, that is, on your Model III.

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Colin Alexander
28 Gladys
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With 4116 RAM chips reaching bargain basement prices, I couldn't resist the urge to upgrade my Model III to its full 48K capability.

For about one-sixth the cost of a Radio Shack memory kit (not to mention the required installation fee), you can install your own RAM in 16K increments! Your Radio Shack warranty is voided when you break the seal, but with patience and common sense, installing RAM is not difficult. The logic board in your Model III stands at the rear of the cabinet and is fully socketed for easy RAM expansion. I highly recommend the purchase of an IC Inserter/Extractor set (Radio Shack #276-1574) to protect the sensitive RAM chips from static discharge and bent pins. When shopping for the memory kits, be sure to find a supplier of only prime 4116 chips correctly rated for Model III operation (200 nS.).

After your new memory is safely implanted, you will undoubtedly want to test it for possible defects. I found myself in the same situation and after a fruitless search for a Model III memory test program either for sale or as a published listing, I modified the Model I RAM Test program from the March 1980 issue of *80 Micro*.

The listing is Mr. Chepko's original program modified for the Model III with at least 16K of memory. RAM chip designation has changed in the Model III but

The Key Box

Level II Basic
Model III
16K RAM
Printer required

```
100 CLEAR(21):CLS:PRINTTAB(16)"*** MODEL III MEMORY TEST ***":PR
INT
130 DEFINTA-Z
135 S=PEEK(16562):POKE30005,S
140 PRINT:PRINT"THIS PROGRAM WILL TEST FOR RAM STORAGE ERRORS IN
 A MODEL III     (16K OR LARGER).  MEMORY CAPACITY IS MEASURED BY
 THE PROGRAM,   AND ALL UNUSED RAM WILL BE TESTED.  EACH PHASE O
F THE TEST WILL APPEAR ON YOUR CRT."
240 PRINT:PRINTTAB(15)"*****    ACTIVATE PRINTER    *****":PRINT
245 PRINTTAB(16):INPUT"CONTINUOUS TESTING (Y OR N)";R$:IFR$="Y"T
HENPOKE30000,1
250 PRINT:PRINTTAB(5):INPUT"PRESS <BREAK> TO STOP           PRESS
<ENTER> TO BEGIN";A
260 LPRINT"BEGIN RAM TEST:":LPRINT:LPRINT"16K - PART 1:":S=PEEK(
30005):A(1)=19690:A(2)=22498:IFPEEK(20000)=1THENPOKE30000,1
300 'POKE RAM
330 LPRINT:LPRINT"    TEST - A":LPRINT
340 X=170:Y=85:B$="< POKE 1":PRINT:GOSUB440
350 IFJ=0LPRINT"      NO ERRORS.
370 LPRINT:LPRINT"    TEST - B":LPRINT
380 X=85:Y=170:B$="< POKE 2":PRINT:GOSUB440
390 IFJ=0LPRINT"      NO ERRORS.
410 LPRINT" ":LPRINT"TEST OF MEMORY ADDRESSES ";A(1);"TO ";A(2);
"COMPLETED.":LPRINT:LPRINTSTRING$(20,"*"):LPRINT
413 'MEM SIZE
415 POKE16561,255:POKE16562,S:CLEAR(21):IFPEEK(25000)<>170THENRU
N700
417 IFPEEK(-16385)=170ORPEEK(-1)=170THEN420
418 IFMEM>29000ANDMEM<32000THENRUN800ELSEIFMEM>45000THENRUN900EL
SE420
420 LPRINTCHR$(7):LPRINTCHR$(7):LPRINTCHR$(7):IFPEEK(20000)=1ORR
$="Y"THEN423ELSEPRINT:PRINTTAB(15)"RAM TEST COMPLETED.":PRINT:IN
PUT"RE-TEST: PRESS <ENTER>      STOP: PRESS <BREAK>";A
422 'RE-START TEST
423 RUN425
425 POKE16561,255:POKE16562,(PEEK(20005)):CLEAR(21):S=PEEK(20005
):POKE30005,S:POKE25000,0:POKE32766,0:POKE-16385,0:POKE-1,0:GOTO
260
430 'SET BIT PATTERNS
440 J=0:FORI=A(1)TOA(2)STEP2
450 POKEI,X:POKEI+1,Y:PRINTI;B$,
460 NEXTI
470 'PEEK X
480 Z=X:FORI=A(1)TOA(2)STEP2
490 B=PEEK(I):PRINTI;": PEEK X",:IFB<>ZGOSUB570
500 NEXTI
510 'PEEK Y
520 Z=Y:FORI=(A(1)+1)TOA(2)STEP2
530 B=PEEK(I):PRINTI;": PEEK Y",:IFB<>ZGOSUB570
540 NEXTI
550 RETURN
560 'BAD BIT
570 LPRINTCHR$(7):J=J+1:FORK=0TO7
580 E=INT(B/2[K)-2*INT(B/2[(K+1))
590 D=INT(Z/2[K)-2*INT(Z/2[(K+1))
600 IFE=DGOTO650
610 LPRINT:LPRINT"BIT #";K;"INCORRECT AT ADDRESS";I
620 'BAD CHIP
625 IFI>17385LPRINT"   RAM CHIP U";14-K;"DEFECTIVE":GOTO650

630 IFI>-16385ANDI<-1LPRINT"   RAM CHIP U";50-K;"DEFECTIVE":GOTO
650
640 LPRINT"   RAM CHIP U";32-K;"DEFECTIVE
650 NEXTK:PRINT" ":RETURN
699 '16K HIGH RAM
700 POKE16561,225:POKE16562,87:CLEAR(21):A(1)=22499:A(2)=32766:S
=PEEK(30005):POKE20005,S:IFPEEK(30000)=1THENPOKE20000,1
720 LPRINT"16K - PART 2:":GOTO330
799 '32K TEST
800 POKE16561,253:POKE16562,127:CLEAR(21):S=PEEK(20005):A(1)=-32
768:A(2)=-16385
820 LPRINT"32K - RAM BLOCK 2:":GOTO330
899 '48K TEST
900 POKE16561,253:POKE16562,127:CLEAR(21):S=PEEK(20005):A(1)=-32
768:A(2)=-1
920 LPRINT"48K - RAM BLOCKS 2 & 3:":GOTO330
```

Program Listing

the addressing scheme remains the same as that in the Model I. Unlike the original program, you need not reserve memory when you turn on the computer and you are not restricted to testing high RAM. When you run the program, it not only measures available RAM in your system, but also automatically reserves and releases space during execution. It will test all addresses unused for program storage, the operating system or string space—even within the first 16K!

Another useful modification is the option for continuous or single testing. Should you choose continuous testing, the program will re-cycle until you press the Break key.

For Model III owners without printers, simply change all LPRINTs to PRINTs and insert a pause routine (see lines 420 and 250) in line 640 to prevent scrolling until you write down crucial information.

Testing a full 48K system takes approximately one hour and 22 minutes. Since the program is written in Basic, it will be easy to modify. Beware—if you add any extra bytes to the program (or delete bytes from it) you will have to change A(1) in line 260! The program is packed so tightly and memory reservation is so precise that byte-count is critical. Also you should run the program only after initial power-up to ensure proper execution.

The screen displays are easy to understand. I have crammed much information on the CRT for each portion of the test and video RAM is hard at work. At a glance, you will know exactly which phase of the RAM test is being executed and the addresses being affected. ■

Mr. Alexander is a bookkeeper for Otis Elevator Co. His hobbies include archaeology and fine and applied arts.

Machine code into Basic statements.

DATAGEN

John Heusinkveld
2161 E. Cerrado Brio
Tucson, AZ 85718

The worst thing about using USR routines is translating the code into Data statements that can be POKEd into memory. Translating very short programs is not too bad, but when you have to translate several hundred bytes of code, a mistake is bound to happen. Just try checking five hundred Data elements for the one that you left out!

I decided I needed a program for my Color Computer that would translate the contents of an area of memory into Data statements which I could then use as part of a Basic program.

The program would have to allow me to specify the area of memory to be used, the number of elements per Data line, and the line numbers of the Data statements. I set up the Data lines as strings and then print them in an ASCII tape file, which I can then access using CLOAD.

My Solution

The Program Listing shows the results of my labor. This program does everything I wanted. It asks for the file name under which the program is to be saved, the line number of the first line, the increment between successive line numbers, and the start and end addresses of the area in which the routine is located. The program should run under either standard or Extended Color Basic.

You must protect the memory in which your routine is located; otherwise, it may be overwritten during string or cassette I/O operations. Remember, you do not necessarily need to locate the routine in the area in which it will be POKEd by the program that uses it; I suggest locating it in high memory. You could also put it in graphics memory if you have Extended Basic.

A final problem is linking your main program to the data created by Datagen. You can CLOAD one and retype the other, but this is inefficient. Color Disk Basic has a Merge command, so if you have a disk or know someone who does, you may be able to do a quick, efficient Merge of your Basic program and Data statements or you can use my Color Merge program which will appear in a future issue of *80 Microcomputing.* ■

John Heusinkveld is a high school student.

```
10 CLS:CLEAR1000:PRINT"DATA GENERATOR":PRINT"BY JOHN HEUSINKVELD","10/3/81"
20 INPUT"HOW MANY ELEMENTS PER LINE";EL
30 INPUT"INCREMENT";LI:INPUT"STARTING AT";LN
40 INPUT"FILE NAME";FT$
50 INPUT"START,END";S,E
60 INPUT"READY CASSETTE";P$:OPEN"O",-1,FT$
70 FORX=S TO E STEPEL:L$=STR$(LN)+"DATA":LN=LN+LI
80 FORS=0TOEL-1:IFX+S>E THEN90 ELSEL$=L$+MID$(STR$(PEEK(X+S)),2)+",":NEXTS
90 Q$=LEFT$(L$,LEN(L$)-1):PRINT#-1,Q$:PRINTQ$
100 NEXTx
110 END
```

Program Listing

The Key Box

Color Computer
Extended Color Basic optional

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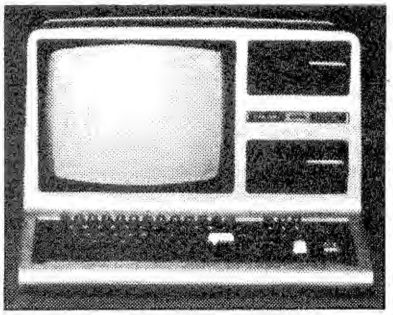

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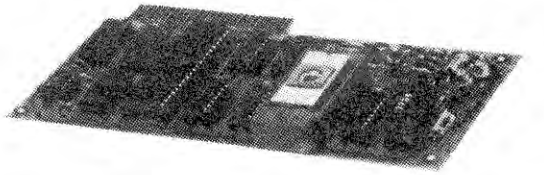

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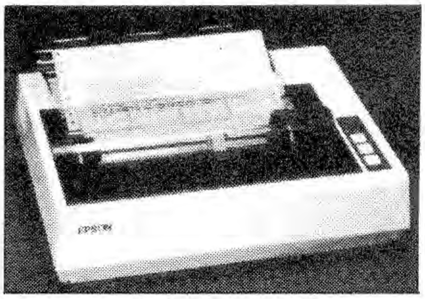

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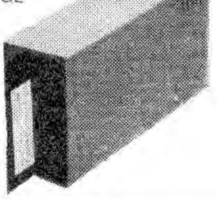

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Schedule your work projects.

A Gentle Reminder

Jeff Rosen
985 Torrey Hill Drive
Columbus, OH 43228

I'll give you 30 days to complete this project! Be done by June 25th or else. . .!

Demands such as these are common in the business world; now your TRS-80 can help you meet them. My Project Calendar program will print a planning calendar for any type of activity. In addition to the month, day, year, and day of the week, the calendar includes counts of the number of calendar days, and work days elapsed and remaining. You can include or exclude weekends and holidays from the work day counts.

If you are currently using a project scheduling aid (such as CP/M or PERT) which provides the day number on which various activities should begin or be completed, the Project Calendar program will assign the day numbers to actual calendar dates.

How the Program Works

The program prompts you for the start date of the project and its duration. You may specify the duration as the number of work or calendar days, or alternately you may specify an ending calendar date. The computer also allows you to enter a project name to be used as the title of the calendar.

The program will ask you whether to include Saturdays or Sundays as work days, and you can specify as many nonworking holidays as necessary. Now the program has all the information it needs to generate the project calendar.

Depending on the option you select for specifying when the calendar will end (number of calendar days, work days, or

The Key Box

Basic Level II or
Disk Basic
Model I or III
16K RAM

A$	User responses
DAY	Days elapsed counter
DAY$	Array for names of days (Sunday, Monday, and so on)
DCNT	Total number of days to be printed
HCNT	Number of holidays defined
HDAY$	Holiday dates (form = mmddyy)
HOL	Holiday indicator switch (0 = no, 1 = yes)
MDAY	Day of month
MNTH	Month number (1-12)
MO$	Array contains names of months and their lengths
P$	Print using format
PG	Page number
PROJ$	Project name
PWDAY$	Work day number in string format (blank for non-work days)
RCDAY	Calendar days remaining
RM$	Remarks, contains word holiday on holidays
RWDAY	Work days remaining
S2W	Switch which bypasses printing on dry run
SAT	Switch indicates if Saturdays are work days
STP$	Ending date of calendar if specified by user
SUN	Switch which indicates if Sundays are work days
SW	Switch indicates option selected for ending calendar
WDAY	Work day counter
WEEK	Day of week number (1-7)
YEAR	Calendar year

All other variables are temporary holders or counters

Table 1

Program Listing

```
100 CLEAR3000:DEFINTA-Z:DIMDAY$(7),MO$(12,2)
110 REM***LOAD MONTH NAMES, MONTH LENGTHS, AND DAY NAMES***
120 FORX=1TO12:READMO$(X,1),MO$(X,2):NEXTX:FORX=1TO7:READDAY$(X)
:NEXTX
130 DATAJAN,31,FEB,28,MAR,31,APR,30,MAY,31,JUN,30,JUL,31,AUG,31,
SEP,30,OCT,31,NOV,30,DEC,31,MONDAY,TUESDAY,WEDNESDAY,THURSDAY,FR
IDAY,SATURDAY,SUNDAY
140 P$="#### %  %  %        % % %   ##  ####   #### ####  %
  %"
150 REM***INPUT PROJECT NAME AND START DATE***
160 CLS:INPUT"ENTER PROJECT NAME";PROJ$
170 PRINT:PRINT"ENTER DAY #1 OF PROJECT":INPUT"MONTH (1-12)";MNT
H:INPUT"DAY (1-31)";MDAY:INPUT"YEAR (4 DIGITS)";YEAR:FORX=1TO7:P
RINT X") "DAY$(X):NEXTX:PRINT"DAY OF WEEK (1-7)":GOSUB690 :WEEK=
VAL(A$):IFWEEK<1ORWEEK>7ORMNTH<1ORMNTH>12ORMDAY<1ORMDAY>31GOTO17
0
180 REM***INPUT DURATION IN DAYS OR ENDING DATE***
190 CLS:PRINT"DO YOU WANT TO SPECIFY THE NUMBER OF DAYS (1) OR A
":PRINT"SPECIFIC CALENDAR DATE TO END THE CALENDAR (2)";:GOSUB69
0  :CLS:IFA$="2"THENSW=0:GOTO210
200 INPUT"HOW MANY DAYS DO YOU WANT ON CALENDAR";DCNT:PRINTDCNT"
 WORKDAYS (1) OR CALENDAR DAYS (2)?":GOSUB690  :SW=VAL(A$):IFSW<
1ORSW>2THEN200  ELSE230
210 PRINT"WHAT DAY DO YOU WANT TO RUN THE CALENDAR TO (MMDDYY)";
:INPUTSTP$:IFLEN(STP$)<>6THEN210
220 REM***CONFIRM INPUT INFORMATION***
230 CLS:PRINT PROJ$ " STARTS ON "DAY$(WEEK)" "MO$(MNTH,1)" "MDAY
" "YEAR:IFSW>0THENPRINT"CALENDAR IS PROJECTED FOR "DCNT" DAYS":E
LSEPRINT"CALENDAR WILL END ON "STP$
240 PRINT:PRINT"CORRECT (Y OR N)?":GOSUB690  :IFA$<>"Y"GOTO160

250 REM***INPUT IF SATURDAY AND SUNDAYS ARE WORKDAYS***
260 PRINT"WILL SATURDAYS BE WORK DAYS (Y OR N)?":GOSUB690  :IFA$
="Y"THEN SAT=0 ELSE SAT=1
270 PRINT"WILL SUNDAYS BE WORK DAYS (Y OR N)?":GOSUB690  :IFA$="
Y"THEN SUN=0 ELSE SUN=1
280 REM***DEFINE HOLIDAYS, IF ANY***
290 INPUT"HOW MANY HOLIDAYS WILL THERE BE DURING THE PROJECT";HC
NT:IFHCNT=0THEN330
300 DIMHDAY$(HCNT)
310 FORX=1TOHCNT
320 PRINT"ENTER HOLIDAY ";X;" FORM: MMDDYY";:INPUTHDAY$(X):IFLEN
(HDAY$(X))<>6THEN320  ELSENEXTX
330 GOSUB670  :GOTO710
340 GOSUB670
350 CLS:INPUT"ALIGN PAPER. HIT ENTER";A$:POKE16425,1:GOSUB630
360 REM**********************************************************
**************
370 REM***START MAIN LOGIC. SW DEPENDS ON OPTION SELECTED IN LIN
ES 190-200****
380 REM**********************************************************
**************
```

specific ending date) the program will execute one of three possible loops. The first execution of the loop computes the number of work days and calendar days in the project in order to initialize the days remaining counters. This dry run may take several minutes depending on the duration of the calendar.

The computer passes through the loop once for each calendar day, beginning with the first day of the project. The day-of-week and day-of-month counters are advanced by one each time through the loop. If the day-of-week counter goes over seven it is reset back to one. If the day-of-month counter exceeds the number of days in the current month (defined in the MO$ array) it is reset to one and the month counter is advanced by one. If the month counter exceeds 12, it is reset to one and the year counter is incremented. Each time the year counter is advanced, the program determines if the new year is evenly divisible by four (leap year) and adjusts the number of days in February accordingly.

The days elapsed and days remaining counters are increased and decreased by one, respectively. The day-of-week and date are checked to determine if the day is a work day; if it is, the work days elapsed and remaining counters are adjusted accordingly.

When the appropriate number of days has been processed or the desired ending date is reached, the dry run is completed. Now the days remaining counters (which started from zero and decreased by one each day) represent the number of work days and calendar days in the project, except they are negative. The signs are changed to positive via the ABSolute value function.

Now the whole process repeats, but this time the calendar is printed as each day is processed. The program automatically paginates the calendar. Table 1 lists the variables used in the program. ■

Jeff Rosen is a self-employed CPA. His hobby is running.


```
390 IFSW=2FOR RCDAY=DCNT-1TO0 STEP-1:RWDAY=RWDAY-1:DAY=DAY+1
400 IFSW=0FORDAY=1TO30000:RWDAY=RWDAY-1:RCDAY=RCDAY-1
410 IFSW=1FOR RWDAY=DCNT-1TO 0 STEP-1:DAY=DAY+1:RCDAY=RCDAY-1
420 REM***DETERMINE IF HOLIDAY OR WEEKEND***
430 IFHCNT=0THEN460
440 FORX=1TOHCNT:IFMNTH=VAL(LEFT$(HDAY$(X),2))AND MDAY=VAL(MID$(
HDAY$(X),3,2))AND YEAR-1900=VAL(RIGHT$(HDAY$(X),2))THEN HOL=1:GO
TO460
450 HOL=0:NEXTX
460 IF(WEEK=6 AND SAT=1)OR(WEEK=7 AND SUN=1)OR HOL=1THEN:PWDAY$=
"":RWDAY=RWDAY+1:GOTO470  :ELSEWDAY=WDAY+1:PWDAY$=STR$(WDAY)
470 IF HOL=1 RM$="HOLIDAY" ELSE RM$=""
480 REM***PRINT DETAIL LINE***
490 IFS2W=0LPRINTUSINGP$;DAY,PWDAY$,DAY$(WEEK),MO$(MNTH,1),MDAY,
YEAR,RCDAY,RWDAY,RM$:IFWEEK=7LPRINT" ":IFPEEK(16425)>55LPRINTCHR
$(12);:GOSUB630
500 REM***CHECK FOR LAST DAY IF SW=0***
510 IFMNTH=VAL(LEFT$(STP$,2))ANDMDAY=VAL(MID$(STP$,3,2))ANDYEAR-
1900=VAL(RIGHT$(STP$,2))THEN610
520 REM***ADVANCE COUNTERS TO THE NEXT DAY***
530 MDAY=MDAY+1:IFMDAY>VAL(MO$(MNTH,2))MNTH=MNTH+1:MDAY=1:IFMNTH
>12YEAR=YEAR+1:MNTH=1:GOSUB670
540 WEEK=WEEK+1:IFWEEK>7WEEK=1
550 REM***RETURN TO BEGINNING OF LOOP DEPENDING ON SW***
560 IFSW=1THENNEXT RWDAY ELSE IFSW=2THENNEXT RCDAY ELSE NEXTDAY
570 REM*************************************************************
**************
580 REM******************************END OF MAIN LOOP*************
**************
590 REM*************************************************************
**************
600 REM***PRINT ANOTHER COPY OR END***
610 IFS2W=1THEN RETURN ELSE PRINT"DO YOU WANT ANOTHER COPY (Y OR
 N)?":GOSUB690  :IFA$="Y"THENMNTH=T1:MDAY=T2:YEAR=T3:WEEK=T4:PG=
0:GOTO720  ELSEEND
620 REM***PRINT PAGE HEADING***
630 PG=PG+1:LPRINTTAB(62)"PAGE "PG
640 LPRINTTAB(20)"PROJECT CALENDAR":LPRINTTAB(28-LEN(PROJ$)/2)PR
OJ$:LPRINT" "
650 LPRINT" -ELAPSED-  ----------DATE----------  --TO GO--  REMA
RKS":LPRINT"      WORK  DAY OF  MNTH  DAY  YEAR        WORK":LPR
INT       "DAYS  DAYS   WEEK                       DAYS DAYS":LPR
INT" ":RETURN
660 REM***CHECK FOR LEAP YEAR***
670 IF INT(YEAR/4)=YEAR/4 THEN MO$(2,2)="29" ELSE MO$(2,2)="28"
680 RETURN
690 A$=INKEY$:IFA$=""THEN690  ELSERETURN
700 REM***SET UP DRY RUN TO DETERMINE TOTAL NUMBER OF DAYS AND T
OTAL NUMBER OF WORKDAYS***
710 T1=MNTH:T2=MDAY:T3=YEAR:T4=WEEK
720 CLS:PRINT@400,"***PLEASE WAIT***":S2W=1:GOSUB390  :WDAY=0:S2
W=0:MNTH=T1:MDAY=T2:YEAR=T3:WEEK=T4:IFSW=0THENDCNT=DAY:RWDAY=ABS
(RWDAY):RCDAY=ABS(RCDAY):ELSEIFSW=2THENRWDAY=ABS(RWDAY):ELSERCDA
Y=ABS(RCDAY)
730 DAY=0:GOTO340
```


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Use the interpreter's built-in exits to make modifications.

ROM Breakout!

J. C. Sprott
5002 Sheboygan #207
Madison, WI 53705

Having the Basic interpreter stored in read-only memory (ROM) as the Models I and III do is both a blessing and a curse. It is nice to have the computer ready to go without loading any cassettes or disks, but you're out of luck if you want to add or change something.

ROM Exits

The authors of the Basic interpreters anticipated the need to modify and upgrade their operation. At a number of critical places in the interpreter program a Call is executed to a location in the random-access memory (RAM) where the interpreter previously stored a Return instruction during its power-up sequence. The inventive programmer can reroute the interpreter to a subroutine to make the cassette port beep or the cursor blink, for example.

In the Model I Level II, and Model III, memory locations 16806–16868 contain a block of 21 such exits. To see what they look like, enter the following from the Basic command mode:

```
>FOR I=16806 TO 16868: PRINT
PEEK(I);: NEXT
```

You should see 201, a machine language Return instruction (C9H), followed by two bytes of garbage, repeated 21 times. Radio Shack provides the extra two bytes so you can replace the Return with a Jump, followed by the two-byte memory address (least significant byte first) where your subroutine is located. End your subroutine with a Return instruction and the interpreter will continue merrily along its way.

Although Radio Shack is notably secretive about where in the interpreter these exits occur (ostensibly because they are subject to change), enterprising programmers have studied the ROM routines and written extensively about them. But why not let your computer tell you when and where it exits to one of these Return instructions? Program Listing 1, a Basic program, does just that.

Exit Identifier Program

The ROM Exit Identifier program sets its own memory size (27904) and then loads a machine language program into memory locations 27905 (6D01H) to 28062 (6D9EH). This leaves over 10K for Basic programs and almost 5K (in a 16K system) in high memory for System programs.

The program loads Jump (195 or C3H) instructions into each of the 21 exit points, and prints a letter (A–U) in the lower right corner of the screen whenever it encounters the corresponding exit. In addition, you can specify that an audio amplifier connected to the cassette port emit a beep whenever a chosen exit occurs.

Upon running the program you discover that 16815 (D) is called whenever Ready appears on the screen. In fact, the program itself becomes a useful utility: The computer summons you with a beep after completing a calculation or loading a cassette tape and returning to the command mode. It continues to work even after you delete the Basic program, as long as nothing overwrites the protected memory locations from 27905 to 28062 or changes the Jump instructions in the dedicated RAM area 16806–16868. You may find, however,

```
10 POKE 16561,254: POKE 16562,108: CLEAR 50: CLS
20 PRINT "ROM EXIT IDENTIFIER": PRINT
30 FOR I=0 TO 5: READ X: FOR J=0 TO 20: POKE 27905+I+6*J,X
40 NEXT J,I: FOR J=1 TO 20: POKE 27907+6*J,65+J: NEXT
50 FOR I=28031 TO 28062: READ X: POKE I,X: NEXT
60 FOR J=0 TO 20: POKE 16808+3*J,109
70 POKE 16807+3*J,1+6*J: POKE 16806+3*J,195
80 PRINT CHR$(65+J);":";16806+3*J,: NEXT: PRINT: PRINT
90 INPUT "BEEP ON WHICH LETTER";A$: POKE 28035,ASC(A$)
100 DATA 245,62,65,195,127,109,50,255,63,254,0,32,23,197,14,99,6
,91,62,1,211,255,16,254,6,91,62,2,211,255,16,254,13,32,237,193,2
41,201
```

Program Listing 1

The Key Box

Basic Level II
Model I or III
16K RAM

that some utility programs loaded previously work improperly because they use the ROM exits that this program changes. Program Listing 2 is a disassembled version of the ROM Exit Identifier program.

Scroll Control

Let's use this information to enhance our computer's operation. One of the things that annoys me about the TRS-80 is the rapid scrolling when I list a long Basic program. I wrote an Assembly program to list one line at a time and proceed to the next line only when I press a particular key. By holding down that key I get the complete list in the usual fashion.

The first problem is to find an exit from the ROM before or after a line of Basic is listed. The ROM Exit Identifier program shows a jump to the RAM address 16863 (T). The program must intercept the computer's operation when it jumps to that location, and put it into an endless loop until the appropriate key is pressed.

Next, we must know when a particular key has been pressed. In a memory-mapped system such as this, the keys directly control the contents of certain addresses. For Models I and III these locations are from 14337 (3801H) to 14464 (3880H). We need a table telling which address is controlled by which key and what value is present at that location when the key is pressed. Why not let the computer do the work for us? Carefully type the following line while in the command mode:

```
>CLS: FOR I = 0 TO 7: X(I) = 14336 + 2↑I: PRINT@128*I,X(I): NEXT: FOR J = 0 TO 32000: FOR I = 0 TO 7: PRINT@128*I + 8,PEEK(X(I)),: NEXT I,J
```

Now press the various keys (except Break) and see what happens. In particular, note that the Enter key causes a one to appear at address 14400, whereas it is zero otherwise.

Armed with this information, we can write a short Assembly program such as the one in Program Listing 3. The program has two parts. The first loads a JP, 6E0FH into the ROM exit at 16863 and then returns to Basic. This runs only once when the program is initially loaded into memory. The second part, starting at 6E0FH (28175), is the loop halting the list until the Enter key is pressed.

You can assemble the program using EDTASM or enter it directly into memory locations 6E01H through 6E16H using T-Bug. To run the program, set the memory size to 28160, and use /28161 (6E01H) as the system mode entry point. You can relocate the program by changing the address of the LD HL, 6E0FH instruction to the appropriate value.

Alternately, you can POKE the program into memory using the Basic Program Listing 4. The Basic program also sets the memory size (28174) and tests to see if there is a jump instruction at 16863. Return at the end of the program with the appropriate Jump so that this utility is compatible with any others in use.

Caution: whenever you insert a patch in the interpreter as we have done here, the routine you write might change the value of a register used by the interpreter. Although Listing 3 uses the AF and HL registers without causing any difficulty, save the values of any registers that your program uses by PUSHing them into the stack before you begin and POPing them back just before you return. Listing 2 does this with the AF and BC registers.

With the aid of these programs and a little practice, you should be well on your way toward making your computer do things that would be difficult, slow, or even impossible using only the ROM Basic interpreter. ■

J.C. Sprott is a Professor of Physics at the University of Wisconsin. He is the author of an electronics textbook and the principal investigator in a plasma physics research group.

```
ADDRESS  DECIMAL  ASCII  OPCODE   SOURCE CODE
 27905    245            F5       PUSH   AF
 27906    62       >A    3E41     LD     A, 65
 27908    195            C37F6D   JP      28031
 27911    245            F5       PUSH   AF
 27912    62       >B    3E42     LD     A, 66
 27914    195            C37F6D   JP      28031
 27917    245            F5       PUSH   AF
 27918    62       >C    3E43     LD     A, 67
 27920    195            C37F6D   JP      28031
 27923    245            F5       PUSH   AF
 27924    62       >D    3E44     LD     A, 68
 27926    195            C37F6D   JP      28031
 27929    245            F5       PUSH   AF
 27930    62       >E    3E45     LD     A, 69
 27932    195            C37F6D   JP      28031
 27935    245            F5       PUSH   AF
 27936    62       >F    3E46     LD     A, 70
 27938    195            C37F6D   JP      28031
 27941    245            F5       PUSH   AF
 27942    62       >G    3E47     LD     A, 71
 27944    195            C37F6D   JP      28031
 27947    245            F5       PUSH   AF
 27948    62       >H    3E48     LD     A, 72
 27950    195            C37F6D   JP      28031
 27953    245            F5       PUSH   AF
 27954    62       >I    3E49     LD     A, 73
 27956    195            C37F6D   JP      28031
 27959    245            F5       PUSH   AF
 27960    62       >J    3E4A     LD     A, 74
 27962    195            C37F6D   JP      28031
 27965    245            F5       PUSH   AF
 27966    62       >K    3E4B     LD     A, 75
 27968    195            C37F6D   JP      28031
 27971    245            F5       PUSH   AF
 27972    62       >L    3E4C     LD     A, 76
 27974    195            C37F6D   JP      28031
 27977    245            F5       PUSH   AF
 27978    62       >M    3E4D     LD     A, 77
 27980    195            C37F6D   JP      28031
 27983    245            F5       PUSH   AF
 27984    62       >N    3E4E     LD     A, 78
 27986    195            C37F6D   JP      28031
 27989    245            F5       PUSH   AF
 27990    62       >O    3E4F     LD     A, 79
 27992    195            C37F6D   JP      28031
 27995    245            F5       PUSH   AF
 27996    62       >P    3E50     LD     A, 80
 27998    195            C37F6D   JP      28031
 28001    245            F5       PUSH   AF
 28002    62       >Q    3E51     LD     A, 81
 28004    195            C37F6D   JP      28031
 28007    245            F5       PUSH   AF
 28008    62       >R    3E52     LD     A, 82
 28010    195            C37F6D   JP      28031
 28013    245            F5       PUSH   AF
 28014    62       >S    3E53     LD     A, 83
 28016    195            C37F6D   JP      28031
 28019    245            F5       PUSH   AF
 28020    62       >T    3E54     LD     A, 84
 28022    195            C37F6D   JP      28031
 28025    245            F5       PUSH   AF
 28026    62       >U    3E55     LD     A, 85
 28028    195            C37F6D   JP      28031
 28031    50       2 ?   32FF3F   LD     ( 16383 ),A
 28034    254       D    FE44     CP      68
 28036    32             2017     JR     NZ, 28061
 28038    197            C5       PUSH   BC
 28039    14             0E63     LD     C, 99
 28041    6         [    065B     LD     B, 91
 28043    62       >     3E01     LD     A, 1
 28045    211            D3FF     OUT     255 ,A
 28047    16             10FE     DJNZ    28047
 28049    6         [    065B     LD     B, 91
 28051    62       >     3E02     LD     A, 2
 28053    211            D3FF     OUT     255 ,A
 28055    16             10FE     DJNZ    28055
 28057    13             0D       DEC    C
 28058    32             20ED     JR     NZ, 28041
 28060    193            C1       POP    BC
 28061    241            F1       POP    AF
 28062    201            C9       RET
```

Program Listing 2

```
6E01             00100          ORG   6E01H        ;MEM SIZE 28160
6E01 3EC3        00110          LD    A,0C3H       ;JUMP TO START
6E03 32DF41      00120          LD    (16863),A    ;  ON ROM EXIT
6E06 210F6E      00130          LD    HL,6E0FH     ;  AT 16863
6E09 22E041      00140          LD    (16864),HL
6E0C C3191A      00150          JP    6681         ;RETURN TO BASIC
6E0F 3A4038      00160 START    LD    A,(14400)    ;STROBE ENTER KEY
6E12 FE01        00170          CP    1            ;SEE IF PRESSED
6E14 20F9        00180          JR    NZ,START     ;GOTO START IF NOT
6E16 C9          00190          RET                ;OTHERWISE RETURN
0000             00200          END
00000 TOTAL ERRORS
```

Program Listing 3

```
10 POKE 16561,12: POKE 16562,110: CLS
20 PRINT "SCROLL CONTROL"
30 FOR I=28175 TO 28182: READ X: POKE I,X: NEXT
40 IF PEEK(16864)+256*PEEK(16865)=28175 THEN 60
50 FOR I=0 TO 2: POKE 28182+I,PEEK(16863+I): NEXT
60 FOR I=16863 TO 16865: READ X: POKE I,X: NEXT
70 DATA 58,64,56,254,1,32,249,201,195,15,110
```

Program Listing 4

Unless you know the road signs!

Do Not Pass

James W. Wood
424 North Missouri
Atwood, IL 61913

My fellow teachers at Atwood Hammond High School are astonished: My students are eager to learn. Why? With TRS-80 computers and my math, chemistry and physics programs, learning is challenging, rewarding and fun! Several teachers are afraid of the gray plastic monster and others are jealous of its ability to captivate students. But the driver education teacher saw its potential and suggested the program Signs.

The Key Box

Extended Color Basic
Color Computer
16K RAM

Signs runs on a 16K Extended Color Basic TRS-80 computer. The program contains high resolution graphics for 21 road signs. The high school driver education student should recognize the signs by their color and shape. Some colors are wrong (the Color Computer cannot display red and white on the same graphics page), but our driver education teacher was pleased with the program's ability to drill students on road sign recognition.

The program shuffles the signs and asks the student to identify them. If he answers correctly he will not be asked to identify that sign again. If he answers incorrectly the sign will reappear. It should take students no more than 15 minutes to learn all signs on the road test using Signs. ■

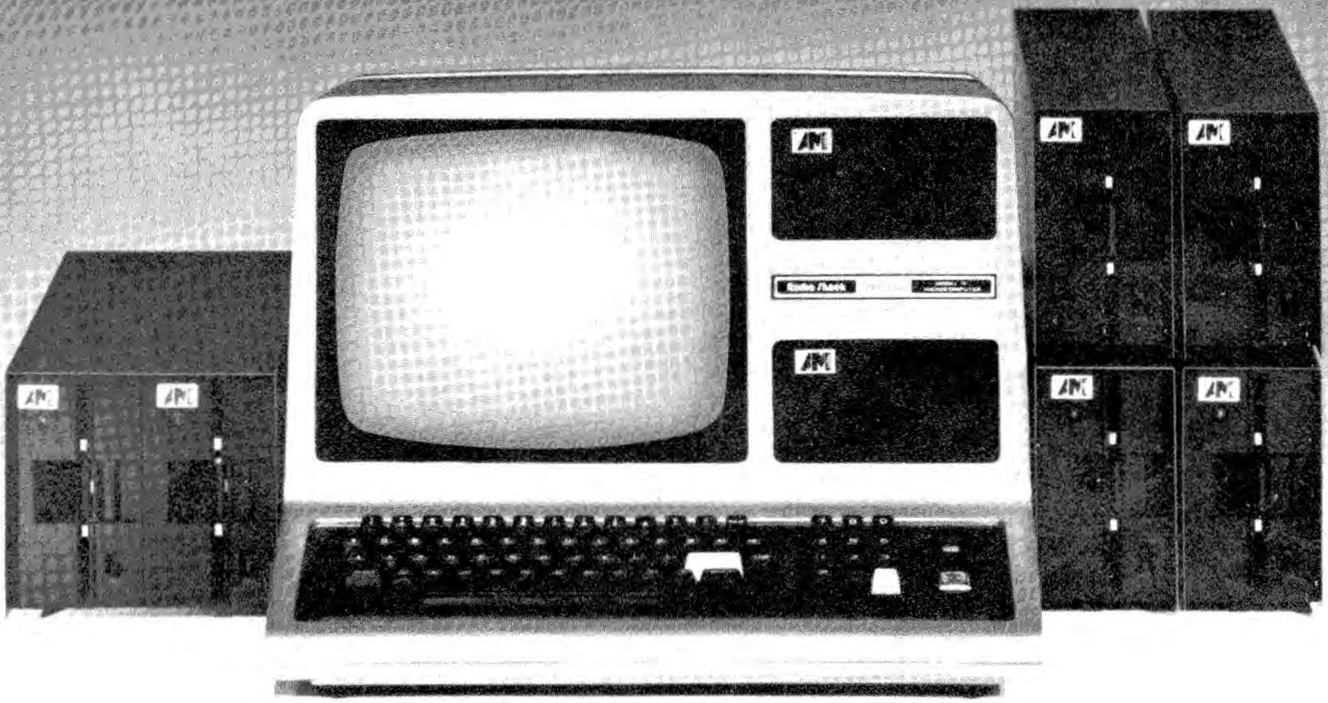
James Wood teaches math and science at Atwood Hammond High School. His hobbies are photography and ham radio.

Program Listing

```
0 DIM A$(21), A(21):REM JAMES W. WOOD, 424 N. MISSOURI, ATWOOD,
ILL, 61913, NOV, 1981
1 A$(1)="STOP":A$(2)="RAILROAD":A$(3)="HAZARD":A$(4)="YIELD":A$(
5)="SCHOOL ZONE":A$(6)="NO PASSING ZONE":A$(7)="NO RIGHT TURN":A
$(8)="SERVICES OR FACILITIES":A$(9)="DISTANCE OR DIRECTION":A$(1
0)="CONSTRUCTION":A$(11)="TWO LANES MERGING TO ONE"
2 A$(12)="SLOW VECHICLE":A$(13)="CROSSROAD":A$(14)="DO NOT ENTER
":A$(15)="TRAFFIC LIGHT AHEAD":A$(16)="ROAD CURVES TO RIGHT":A$(
17)="MERGE":A$(18)="SIDE ROAD":A$(19)="NO U-TURN":A$(20)="CROSSW
ALK":A$(21)="GUIDE"
3 CLS:PRINT"YOU WILL BE SHOWN ROAD SIGNS.":PRINT"TYPE THE LETTER
 IN FRONT OF":PRINT"THE NAME OF THE SIGN.":PRINT:INPUT"YOUR NAME
";NA$
4 PRINT:INPUT"PRESS 'ENTER' TO CONTINUE";Q$
5 CLS:GOTO200
10 CLS
50 FORQ=1TO15:PRINT"  ";+CHR$(64+Q);+"  ";+A$(Q):NEXTQ:PRINT"  P
  ";+A$(16);
60 FORQ=1TO5:PRINT@Q*32-13,CHR$(80+Q);+"  ";+A$(16+Q);:NEXTQ
170 K$=INKEY$
180 A$=INKEY$:IFA$=""THEN180
190 RETURN
200 N=RND(21)
220 IF A(N)=1 THEN 200
230 ON N GOSUB 5000,2000,6000,4000,1000,3000,7000,19000,20000,17
000,11000,12000,13000,14000,15000,16000,10000,18000,8000,9000,21
000
235 FORTI=1TO400:NEXTTI
240 GOSUB10
250 IF ASC(A$)-64=N THEN A(N)=1:CLS:PRINT@260,"GOT IT RIGHT ";NA
$:C=C+1 ELSE CLS:PRINT@260,"MISSED THAT ONE ";NA$:IC=IC+1:PRINT:
```

Program continues

BORN TO RUN



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Program continued

```
PRINT"IT WAS '";A$(N);" '"
255 FORTI=1TO300:NEXTTI
260 IFC=21THEN 50000
270 GOTO200
1000 REM:SCHOOL ZONE
1010 PMODE1,1:PCLS
1020 COLOR2,1
1030 LINE(116,24)-(196,92),PSET:LINE-(196,164),PSET:LINE-(36,164
),PSET:LINE-(36,92),PSET:LINE-(116,24),PSET
1040 PAINT(116,28),2,2
1045 SCREEN1,0
1050 RETURN
2000 REM:RAILROAD
2010 PMODE1,1:PCLS
2020 COLOR3,1
2030 CIRCLE(128,96),75,3
2040 PAINT(128,24),2,3
2050 COLOR3,1
2060 LINE(168,32)-(128,80),PSET:LINE-(88,32),PSET
2070 LINE(68,48)-(112,96),PSET:LINE-(68,144),PSET
2080 LINE(88,160)-(128,112),PSET:LINE-(168,160),PSET
2090 LINE(188,48)-(144,96),PSET:LINE-(188,144),PSET
2100 PAINT(80,44),3,3
2105 SCREEN1,0
2110 RETURN
3000 REM:NO PASSING
3010 PMODE1,1:PCLS
3020 COLOR2,1
3030 LINE(56,36)-(232,88),PSET:LINE-(56,142),PSET:LINE-(56,36),P
SET
3040 PAINT(64,52)
3045 SCREEN1,0
3050 RETURN
4000 REM:YIELD
4010 PMODE1,1:PCLS
4020 COLOR4,1
4030 LINE(20,10)-(200,10),PSET:LINE-(110,170),PSET:LINE-(20,10),
PSET
4040 PAINT(24,12),4,4
4045 SCREEN1,0
4050 RETURN
5000 REM:STOP
5010 PMODE1,1:PCLS
5020 COLOR4,1
5030 LINE(84,24)-(156,24),PSET:LINE-(192,60),PSET:LINE-(192,124)
,PSET:LINE-(156,160),PSET:LINE-(84,160),PSET:LINE-(48,124),PSET:
LINE-(48,60),PSET:LINE-(84,24),PSET
5040 PAINT(88,30),4,4
5045 SCREEN1,0
5050 RETURN
6000 REM:HAZARD
6010 PMODE1,1:PCLS
6020 COLOR2,1
6030 LINE(116,12)-(202,92),PSET:LINE-(116,168),PSET:LINE-(28,92)
,PSET:LINE-(116,12),PSET
6040 PAINT(116,14),2,2
6045 SCREEN1,0
6050 RETURN
7000 REM:NO RIGHT TURN
7010 PMODE1,1:PCLS2:
7020 COLOR3,2
7030 LINE(68,28)-(190,28),PSET:LINE-(190,148),PSET:LINE-(68,148)
,PSET:LINE-(68,28),PSET
7035 COLOR4,2
7040 CIRCLE(128,88),60
7050 CIRCLE(128,88),48
7060 PAINT(128,35),4,4
7070 LINE(106,46)-(166,116),PSET:LINE(94,54)-(154,126),PSET
7080 PAINT(104,52),4,4
7090 LINE(108,72)-(108,112),PSET:LINE-(120,112),PSET:LINE-(120,8
8),PSET
7095 LINE(138,84)-(148,84),PSET:LINE-(148,88),PSET:LINE-(160,76)
,PSET:LINE-(148,64),PSET:LINE-(148,72),PSET:LINE-(128,72),PSET
7096 PAINT(112,100),3,4:PAINT(140,80),3,4
7100 SCREEN1,0
7110 RETURN
8000 REM:NO U-TURN
8010 PMODE1,1:PCLS2
8020 COLOR3,2
8030 LINE(68,28)-(190,28),PSET:LINE-(190,148),PSET:LINE-(68,148)
,PSET:LINE-(68,28),PSET
8040 CIRCLE(128,68),32,3,1,.5,1
8050 CIRCLE(128,88),42,3,1,.5,1
8060 LINE(160,88)-(160,114),PSET:LINE-(170,114),PSET:LINE-(170,8
8),PSET
8070 LINE(86,88)-(86,94),PSET:LINE-(80,92),PSET:LINE-(92,114),PS
ET:LINE-(102,92),PSET:LINE-(96,94),PSET:LINE-(96,88),PSET
8080 PAINT(92,110),3,3
8090 COLOR4,2
8100 CIRCLE(128,88),60
8110 CIRCLE(128,88),50
8120 PAINT(128,30),4,4
8130 LINE(104,44)-(176,108),PSET:LINE(92,52)-(168,120),PSET
8140 PAINT(104,52),4,4:SCREEN1,0:RETURN
9000 REM:CROSSWALK
9010 PMODE1,1:PCLS
9020 COLOR2,1
9030 LINE(116,12)-(202,92),PSET:LINE-(116,168),PSET:LINE-(28,92)
,PSET:LINE-(116,12),PSET
9040 PAINT(116,14),2,2
9050 COLOR3,2
9060 CIRCLE(108,48),10
9070 LINE(116,56)-(140,68),PSET:LINE-(144,84),PSET:LINE-(140,88)
,PSET:LINE-(130,70),PSET:LINE-(142,128),PSET:LINE-(138,130),PSET
:LINE-(120,96),PSET:LINE-(108,140),PSET
9080 LINE-(104,140),PSET:LINE-(110,92),PSET:LINE-(104,80),PSET:L
INE-(88,88),PSET:LINE-(84,84),PSET:LINE-(100,72),PSET:LINE-(108,
60),PSET:LINE-(116,56),PSET:LINE-(108,60),PSET:LINE-(116,56),PSE
T
9090 PAINT(108,42),3,3:PAINT(116,60),3,3
9100 LINE(56,104)-(100,108),PSET,BF
9110 LINE(144,104)-(176,108),PSET,BF
9120 LINE(96,144)-(136,148),PSET,BF
9130 SCREEN1,0:RETURN
10000 REM:MERGE
10010 PMODE1,1:PCLS:COLOR2,1
10020 LINE(116,12)-(202,92),PSET:LINE-(116,168),PSET:LINE-(28,92
),PSET:LINE-(116,12),PSET
10030 PAINT(116,14),2,2
10040 COLOR3,1
10050 LINE(116,32)-(92,56),PSET:LINE-(108,56),PSET:LINE-(108,140
),PSET:LINE-(124,140),PSET:LINE-(124,112),PSET:LINE-(140,128),PS
ET:LINE-(152,116),PSET:LINE-(124,92),PSET:LINE-(124,56),PSET:LIN
E-(140,56),PSET:LINE-(116,32),PSET
10060 PAINT(116,37),3,3
10070 SCREEN1,0:RETURN
11000 REM:2LANES MERGE TO 1
11010 PMODE1,1:PCLS:COLOR2,1
11020 LINE(116,12)-(202,92),PSET:LINE-(116,168),PSET:LINE-(28,92
),PSET:LINE-(116,12),PSET
11030 PAINT(116,14),2,2
11040 COLOR3,1
11050 LINE(92,44)-(108,140),PSET,BF:LINE(120,44)-(132,84),PSET,B
F:LINE(132,100)-(144,136),PSET,BF:LINE(120,64)-(132,100),PSET:LI
NE(132,84)-(144,100),PSET:PAINT(128,88),3,3
11060 SCREEN1,0
11070 RETURN
12000 REM:SLOW VECHICLE
12010 PMODE1,1:PCLS
12020 COLOR4,1
12030 LINE(102,8)-(144,8),PSET:LINE-(224,128),PSET:LINE-(196,156
),PSET:LINE-(40,156),PSET:LINE-(16,128).PSET:LINE-(102,8),PSET
12040 LINE(124,32)-(196,128),PSET:LINE-(48,128),PSET:LINE-(124,3
2),PSET
12041 PAINT(104,16),4,4:PAINT(124,40),2,4
12044 SCREEN1,0
12045 RETURN
13000 REM:CROSSROAD
13010 PMODE1,1:PCLS:COLOR2,1
13020 LINE(116,12)-(202,92),PSET:LINE-(116,168),PSET:LINE-(28,92
),PSET:LINE-(116,12),PSET
13030 PAINT(116,14),2,2
13040 COLOR3,2
13050 LINE(104,40)-(128,140),PSET,BF:LINE(60,80)-(168,104),PSET,
BF
13060 SCREEN1,0
13070 RETURN
14000 REM:DO NOT ENTER
14010 PMODE1,1:PCLS:COLOR4,1
14020 CIRCLE(128,96),70,4
14030 LINE(53,21)-(204,170),PSET,B
14040 LINE(72,80)-(184,112),PSET,B
14050 PAINT(120,32),4,4
14060 PAINT(76,84),2,4
14065 PAINT(68,36),2,4
14070 SCREEN1,0
14080 RETURN
```

Program continues

Program continued

```
15000 REM:TRAFFIC LIGHT
15010 PMODE1,1:PCLS:COLOR3,1
15020 LINE(116,12)-(202,92),PSET:LINE-(116,168),PSET:LINE-(28,92
),PSET:LINE-(116,12),PSET
15050 LINE(92,48)-(140,136),PSET,B
15060 CIRCLE(116,64),10
15070 CIRCLE(116,92),10
15080 CIRCLE(116,120),10
15090 PAINT(116,18),2,3
15100 PAINT(96,52),3,3
15110 PAINT(116,60),4,3
15120 PAINT(116,88),2,3
15130 SCREEN1,0
15140 RETURN
16000 PMODE1,1:PCLS:COLOR2,1
16010 LINE(116,12)-(202,92),PSET:LINE-(116,168),PSET:LINE-(28,92
),PSET:LINE-(116,12),PSET
16020 PAINT(116,15),2,2
16025 COLOR3,1
16030 LINE(84,88)-(84,126),PSET:LINE-(104,126),PSET:LINE-(104,88
),PSET
16040 CIRCLE(128,88),24,3,1,.5,.75
16050 CIRCLE(128,88),44,3,1,.5,.75
16060 LINE(128,44)-(128,36),PSET:LINE-(146,56),PSET:LINE-(128,76
),PSET:LINE-(128,64),PSET
16070 PAINT(132,44),3,3
16080 SCREEN1,0:RETURN
17000 PMODE1,1:PCLS:COLOR8,5
17010 LINE(116,12)-(202,92),PSET:LINE-(116,168),PSET:LINE-(28,92
),PSET:LINE-(116,12),PSET
17015 PAINT(116,16),8,8
17020 SCREEN1,1
17030 RETURN
18000 PMODE1,1:PCLS:COLOR2,1
18010 LINE(116,12)-(202,92),PSET:LINE-(116,168),PSET:LINE-(28,92
),PSET:LINE-(116,12),PSET
18020 PAINT(116,16),2,2
18030 COLOR3,1
18040 LINE(104,40)-(128,140),PSET,BF:LINE(60,80)-(104,104),PSET,
BF
18050 SCREEN1,0:RETURN
19000 PMODE1,1:PCLS:COLOR3,1
19010 LINE(80,20)-(170,170),PSET,BF:SCREEN1,0:RETURN
20000 PMODE1,1:PCLS2:COLOR1,2
20010 LINE(40,30)-(210,160),PSET,BF:SCREEN1,0:RETURN
21000 CLS0:FORXX=1TO12:PRINT@38+32*XX,STRING$(20,207);:NEXTXX:RE
TURN
21010 LINE(40,30)-(210,160),PSET,BF:SCREEN1,1:RETURN
50000 CLS:PRINT"YOU NEEDED"IC+C;"TRIES FOR 21 SIGNS":PRINT:PRINT
"TRY AGAIN ? (Y/N) ";NA$
50010 A$=INKEY$:IF A$="Y" THEN RUN ELSE IF A$="N" THEN END ELSE
50010
```


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Use INSTR as you build this phone log.

Phonfind

Robert Eldridge
3184 Kingsley Place
Lafayette, CA 94549

Do you make many business calls? Do you find it difficult to sort out the business calls from your personal calls when your monthly bill arrives? I tried to log my business calls as I made them, but often in the heat of business I overlooked this duty. I thought, "There must be a better way," so I wrote a program for my TRS-80.

Phonfind

With the Phonfind program I set up a list of numbers and names from my phone directory. Now, when I get my phone bill, I load Phonfind, key in the phone numbers, and find out in seconds who belongs to each number. If a number is not in the Phonfind list I have to search for it manually; when I find the new number I add it to the list for future reference.

The heart of Phonfind is the INSTR command, which uses the rapid string comparison functions of the Z80 chip. INSTR performs them at machine language speed by searching a main string for a substring. If it finds the substring it returns an integer representing the character location in the main string where the substring starts. If it does not find the substring, it returns a zero.

For example, searching the main string "My wife thinks I'm crazy" for the substring "crazy" would return 20, the starting location of crazy in the main string. Searching the same main string for the substring "nuts" would return zero.

I used the INSTR command twice in the Phonfind program. A subroutine (lines 200–240) uses it to search the main Phonfind list for a number or name. The main selection menu uses it to branch to different sections of the program (line 1020).

The program needs lots of room for string data, so line 25 clears string space. Because there are no fancy calculations, line 30 defines all variables as integers (except Z, which is defined as a string variable). I used integers V0 and V1 within routines where I wanted speed. Defining them here puts them at the top of the variables list, where they are available more quickly than analyzing the numbers zero and one each time they are used.

Next, string array Z is filled from a sequential disk file. A password protects the file from inadvertent deletion from the disk. The counter KK keeps track of the number of entries in the list. When the list input is complete, the main selection menu is displayed.

An INKEY$ subroutine (line 100) gets keyboard input for function selection. This way, there is no need to follow keyboard input with Enter. The INKEY$ subroutine returns string ZZ, which is then used in line 1020's INSTR command. The On...GOTO command uses the location of ZZ within "LRSPC" to branch to the desired program section. Notice that V1 (value of one) is added to the INSTR value; INSTR would return the value zero if you pressed a key other than L, R, S, P or C. Since the On...GOTO command starts branching with one we have to add one to the INSTR function to cover this contingency. If you press a

Program Listing. Phonfind

```
10 '      **********************************
11 '      *             PHONFIND            *
12 '      *                                 *
13 '      *      A Utility Program by       *
14 '      *       Robert G. Eldridge        *
15 '      *         September, 1981         *
16 '      **********************************
20 CLS
25 CLEAR3000
30 DEFINTA-Y:DEFSTRZ:DIMZ(200)
35 OPEN"I",1,"NUMBER/SEQ.BOB"
39 ' ---- Input file of phone numbers to array Z
40 KK=1
45 IFEOF(1)THEN60
50 INPUT#1,Z(KK)
55 KK=KK+1:GOTO45
60 CLOSE1:GOTO1000
61 ' ---- Housekeeping complete, begin main menu

99 ' ---- Inkey Subroutine to get character from keyboard
100 Y$=INKEY$:IFY$=""THEN100ELSERETURN
199 ' ---- Subroutine to search array Z for String ZX
200 FORX=1TOKK
210 IFINSTR(Z(X),ZX)=V0THENNEXT:GOTO230
220 PRINT:PRINTZ(X):GOTO240
230 PRINT"NUMBER OR LABEL NOT IN LIST"
240 PRINT:RETURN
999 '
 ---- Begin main program
1000 PRINTSTRING$(23,143);" SELECT FUNCTION ";STRING$(23,143)
1005 PRINT" (L) Lookup Name or Number        (R) Record New Name o
r Number"
1006 PRINT" (S) Store List on Disk           (P) Print List"
1007 PRINTTAB(13);"(C) Change or delete a number or label"
```

Program continues

The Key Box

Model I or III
TRSDOS
32K RAM
Line printer required

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"Phonfind saves me lots of time when the phone bill comes. . ."

non-function key, the program branches back to the INKEY$ subroutine for another keystroke.

Program Routines

The Lookup routine (lines 2000–2030 and the subroutine starting at line 200) prompts for the number or name (or piece of either) to be looked up in the list. ZX takes the input and becomes the substring for the INSTR command. Subroutine 200 then searches each of the Z array strings for ZX. If found, the program displays that Z array element. If not found, the program displays the "Not in List" message. I used variable V0 within this subroutine for speed.

The Record routine (lines 3000–3040) prompts for the new entry and receives the input directly into the Z array just beyond the end of the list. Then it increments the counter and returns to the menu. Phonfind stores the list on disk as a separate function to allow input of new entries or changes in one session, then store them all at once.

The Store routine (lines 4000–4080) writes the Z array back into the sequential file. It also checks each entry to make sure it starts with a number. If it doesn't, that entry is not stored. This keeps the file clean, and allows deletion of a record by changing it to a non-numeric string (see Change routine). Next time you run the program these records will be gone.

The Print routine (lines 5000–5050) allows a review of the list's contents. You can change it to print the list on your screen.

The Change or Delete routine (lines 6000–6050) prompts for the entry to be changed, uses the subroutine at line 200 to locate the entry, and then prompts for the new entry. If you want to delete an item use a blank or any non-numeric character as the new entry. The Store routine will delete it the next time the list is stored to disk.

Phonfind is not elaborate, but it saves me lots of time when the phone bill comes, and I no longer painstakingly log every call I make. As my list grows, I have to search for fewer and fewer numbers each month. By using the powerful INSTR command, I get a fast, simple program. By writing the program in sections, I have complete flexibility as a user. ■

Mr. Eldridge is a consultant with Robert Eldridge and Associates. His hobbies are racquet ball and computers.

Program continued

```
1010 GOSUB100
1020 ONINSTR("LRSPC",Y$)+1GOSUB1010,2000,3000,4000,5000,6000:GOT
O1000
2000 ' ---- Routine to search array Z for Number or Label
2010 INPUT"Enter Number or Label to Lookup";ZX
2020 GOSUB200
2030 RETURN
3000 ' ---- Routine to add new Name or Number to array z
3010 PRINT"Enter new Number and Label as one string"
3020 INPUTZ(KK+1)
3030 KK=KK+1
3040 RETURN
4000 ' ---- Routine to Store entire array Z on Disk
4010 OPEN"O",1,"NUMBER/SEQ.BOB"
4020 FORX=1TOKK
4029     '-- DON'T STORE ENTRIES WHICH DON'T START WITH A NUMBER
4030     IFVAL(Z(X))=V0THEN4060
4040     PRINT#1,Z(X)
4050    PRINT"*";
4060 NEXT
4070 CLOSE:PRINT:PRINT"LIST IS STORED"
4080 RETURN
5000 ' ---- Print Entire List on Line Printer
5010 LPRINTTAB(20);"PHONFIND LIST OF NUMBERS":LPRINT" "
5020 FORX=1TOKKSTEP2
5030 LPRINTTAB(5);Z(X);TAB(45);Z(X+1)
5040 NEXT
5050 RETURN
6000 ' ---- Routine to change or delete an entry
6010 INPUT"ENTER NUMBER OR LABEL AS NOW EXISTS";ZX
6020 GOSUB200
6030 PRINT"ENTER NEW STRING AS IT SHOULD BE"
6040 INPUT"    (TO DELETE, ENTER A BLANK)";Z(X)
6050 RETURN
```

See List of Advertisers on page 386

The rest of Programming Pitch I

Programming Pitch II

Merton L. Davis
3A Palmetto Arms
Camden, SC 29020

Oops. In Merton L. Davis's article "Programming Pitch last month (p. 142), we made several grievous errors.

First, a series of administrative boo-boos led to the deletion of the Assembly language listing. That listing is what you see below.

Second, the second Basic listing accompanying that article (Program Listing 2) belongs to another sound generation article submitted by Mr. Davis. That article will be published in a future issue.

80 Micro regrets the errors. ■

Program Listing

```
               00100 ;PIANO KEYBOARD AND MUSIC GENERATOR
               00110 ;PROGRAM ENTERED BY BASIC "MUSIC" DRIVER IN MAY ISSUE
               00111 ;OF 80 MICROCOMPUTING
               00112 ;PROGRAM BY M. L. DAVIS
               00113 ;             3A PALMETTO ARMS
               00114 ;             CAMDEN SC 29020
               00120 ;
0A9A           00130 RETURN  EQU     0A9AH
0A7F           00140 ENTER   EQU     0A7FH
260D           00150 VARPTR  EQU     260DH
               00160 ;
7BFE           00170         ORG     7BFEH   ;OR 0BBFEH OR 0FBFEH
7BFE CD7F0A    00180 KYBRD   CALL    ENTER   ;ARGUMENT IN HL
7C01 23        00190         INC     HL
7C02 5E        00200         LD      E,(HL)  ;TO POINT DE TO
7C03 23        00210         INC     HL      ;FIRST BYTE OF
7C04 56        00220         LD      D,(HL)  ;NOTE STRING.
7C05 EB        00230         EX      DE,HL   ;POINTER IN HL.
7C06 DD218A7C  00240         LD      IX,NOTES ;TABLE POINTER
7C0A 012800    00250         LD      BC,40   ;NO. BYTES NAT. TO SHARP
7C0D 117800    00260         LD      DE,120  ;NO. BYTES A TO B
7C10 7E        00270         LD      A,(HL)  ;FIRST BYTE IN A REG.
7C11 FE41      00280         CP      41H     ;ADD TO IX UNTIL
7C13 CA3B7C    00290         JP      Z,SHARP ;NOTE A TO G IS
7C16 DD19      00300         ADD     IX,DE   ;FOUND AND THEN
7C18 FE42      00310         CP      42H     ;PROCEED TO FIND
7C1A CA3B7C    00320         JP      Z,SHARP ;SECOND BYTE
7C1D DD19      00330         ADD     IX,DE   ;MATCH.
7C1F FE43      00340         CP      43H
7C21 CA3B7C    00350         JP      Z,SHARP
7C24 DD19      00360         ADD     IX,DE
7C26 FE44      00370         CP      44H
7C28 CA3B7C    00380         JP      Z,SHARP
7C2B DD19      00390         ADD     IX,DE
7C2D FE45      00400         CP      45H
7C2F CA3B7C    00410         JP      Z,SHARP
7C32 DD19      00420         ADD     IX,DE
7C34 FE46      00430         CP      46H
7C36 CA3B7C    00440         JP      Z,SHARP
7C39 DD19      00450         ADD     IX,DE
7C3B 23        00460 SHARP   INC     HL      ;POINTS TO 2ND BYTE
7C3C 7E        00470         LD      A,(HL)  ;2ND BYTE IN 'A'
7C3D FE4E      00480         CP      4EH     ;CONTINUE ADDITION
7C3F CA4B7C    00490         JP      Z,OCTAVE        ;UNTIL
7C42 DD09      00500         ADD     IX,BC   ;NAT. OR SHARP OR FLAT IS
7C44 FE53      00510         CP      53H     ;FOUND AND THEN
7C46 CA4B7C    00520         JP      Z,OCTAVE        ;PROCEED
7C49 DD09      00530         ADD     IX,BC   ;TO THIRD BYTE.
7C4B 010500    00540 OCTAVE  LD      BC,5    ;NOTE INTERVAL
7C4E 23        00550         INC     HL      ;POINTS TO 3RD BYTE
7C4F 7E        00560         LD      A,(HL)  ;3RD BYTE IN A REG.
7C50 FE30      00570         CP      30H
7C52 CA817C    00580         JP      Z,FOUND ;CONTINUE UNTIL
7C55 DD09      00590         ADD     IX,BC   ;OCTAVE MATCH IS
7C57 FE31      00600         CP      31H     ;FOUND.
7C59 CA817C    00610         JP      Z,FOUND
7C5C DD09      00620         ADD     IX,BC
7C5E FE32      00630         CP      32H
7C60 CA817C    00640         JP      Z,FOUND
7C63 DD09      00650         ADD     IX,BC
7C65 FE33      00660         CP      33H
7C67 CA817C    00670         JP      Z,FOUND
7C6A DD09      00680         ADD     IX,BC
7C6C FE34      00690         CP      34H
7C6E CA817C    00700         JP      Z,FOUND
7C71 DD09      00710         ADD     IX,BC
7C73 FE35      00720         CP      35H
7C75 CA817C    00730         JP      Z,FOUND
7C78 DD09      00740         ADD     IX,BC
7C7A FE36      00750         CP      36H
7C7C CA817C    00760         JP      Z,FOUND
7C7F DD09      00770         ADD     IX,BC
7C81 DD6604    00780 FOUND   LD      H,(IX+4) ;RETURN WITH NOTE
7C84 DD6E03    00790         LD      L,(IX+3) ;PERIOD IN HL.
7C87 C39A0A    00800         JP      RETURN
               00810 ;****TABLE OF NOTE DESIGNATION VS PERIOD****
7C8A 41        00820 NOTES   DEFM    'AN0'
7C8D 9207      00830         DEFW    1938
7C8F 41        00840         DEFM    'AN1'
7C92 C903      00850         DEFW    969
7C94 41        00860         DEFM    'AN2'
7C97 E401      00870         DEFW    484
7C99 41        00880         DEFM    'AN3'
7C9C F200      00890         DEFW    242
7C9E 41        00900         DEFM    'AN4'
7CA1 7900      00910         DEFW    121
7CA3 41        00920         DEFM    'AN5'
7CA6 3C00      00930         DEFW    60
7CA8 41        00940         DEFM    'AN6'
7CAB 1E00      00950         DEFW    30
7CAD 41        00960         DEFM    'AN7'
```

Program continues

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Program continued

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7CB0 0F00     00970     DEFW    15
7CB2 41       00980     DEFM    'AS0'
7CB5 2507     00990     DEFW    1829
7CB7 41       01000     DEFM    'AS1'
7CBA 9203     01010     DEFW    914
7CBC 41       01020     DEFM    'AS2'
7CBF C901     01030     DEFW    457
7CC1 41       01040     DEFM    'AS3'
7CC4 E400     01050     DEFW    228
7CC6 41       01060     DEFM    'AS4'
7CC9 7200     01070     DEFW    114
7CCB 41       01080     DEFM    'AS5'
7CCE 3900     01090     DEFW    57
7CD0 41       01100     DEFM    'AS6'
7CD3 1C00     01110     DEFW    28
7CD5 41       01120     DEFM    'AS7'
7CD8 0E00     01130     DEFW    14
7CDA 41       01140     DEFM    'AF0'
7CDD D007     01150     DEFW    2000
7CDF 41       01160     DEFM    'AF1'
7CE2 0204     01170     DEFW    1026
7CE4 41       01180     DEFM    'AF2'
7CE7 0102     01190     DEFW    513
7CE9 41       01200     DEFM    'AF3'
7CEC 0001     01210     DEFW    256
7CEE 41       01220     DEFM    'AF4'
7CF1 8000     01230     DEFW    128
7CF3 41       01240     DEFM    'AF5'
7CF6 4000     01250     DEFW    64
7CF8 41       01260     DEFM    'AF6'
7CFB 2000     01270     DEFW    32
7CFD 41       01280     DEFM    'AF7'
7D00 1000     01290     DEFW    16
7D02 42       01300     DEFM    'BN0'
7D05 BF06     01310     DEFW    1727
7D07 42       01320     DEFM    'BN1'
7D0A 5F03     01330     DEFW    863
7D0C 42       01340     DEFM    'BN2'
7D0F AF01     01350     DEFW    431
7D11 42       01360     DEFM    'BN3'
7D14 D700     01370     DEFW    215
7D16 42       01380     DEFM    'BN4'
7D19 6B00     01390     DEFW    107
7D1B 42       01400     DEFM    'BN5'
7D1E 3500     01410     DEFW    53
7D20 42       01420     DEFM    'BN6'
7D23 1A00     01430     DEFW    26
7D25 42       01440     DEFM    'BN7'
7D28 0D00     01450     DEFW    13
7D2A 42       01460     DEFM    'BS0'
7D2D 5E06     01470     DEFW    1630
7D2F 42       01480     DEFM    'BS1'
7D32 2F03     01490     DEFW    815
7D34 42       01500     DEFM    'BS2'
7D37 9701     01510     DEFW    407
7D39 42       01520     DEFM    'BS3'
7D3C CB00     01530     DEFW    203
7D3E 42       01540     DEFM    'BS4'
7D41 6500     01550     DEFW    101
7D43 42       01560     DEFM    'BS5'
7D46 3200     01570     DEFW    50
7D48 42       01580     DEFM    'BS6'
7D4B 1900     01590     DEFW    25
7D4D 42       01600     DEFM    'BS7'
7D50 0C00     01610     DEFW    12
7D52 42       01620     DEFM    'BF0'
7D55 2507     01630     DEFW    1829
7D57 42       01640     DEFM    'BF1'
7D5A 9203     01650     DEFW    914
7D5C 42       01660     DEFM    'BF2'
7D5F C901     01670     DEFW    457
7D61 42       01680     DEFM    'BF3'
7D64 E400     01690     DEFW    228
7D66 42       01700     DEFM    'BF4'
7D69 7200     01710     DEFW    114
7D6B 42       01720     DEFM    'BF5'
7D6E 3900     01730     DEFW    57
7D70 42       01740     DEFM    'BF6'
7D73 1C00     01750     DEFW    28
7D75 42       01760     DEFM    'BF7'
7D78 0E00     01770     DEFW    14
7D7A 43       01780     DEFM    'CN0'
7D7D 5E06     01790     DEFW    1630
7D7F 43       01800     DEFM    'CN1'
7D82 2F03     01810     DEFW    815
7D84 43       01820     DEFM    'CN2'
7D87 9701     01830     DEFW    407
7D89 43       01840     DEFM    'CN3'
7D8C CB00     01850     DEFW    203
7D8E 43       01860     DEFM    'CN4'
7D91 6500     01870     DEFW    101
7D93 43       01880     DEFM    'CN5'
7D96 3200     01890     DEFW    50
7D98 43       01900     DEFM    'CN6'
7D9B 1900     01910     DEFW    25
7D9D 43       01920     DEFM    'CN7'
7DA0 0C00     01930     DEFW    12
7DA2 43       01940     DEFM    'CS0'
7DA5 0206     01950     DEFW    1538
7DA7 43       01960     DEFM    'CS1'
7DAA 0103     01970     DEFW    769
7DAC 43       01980     DEFM    'CS2'
7DAF 8001     01990     DEFW    384
7DB1 43       02000     DEFM    'CS3'
7DB4 C000     02010     DEFW    192
7DB6 43       02020     DEFM    'CS4'
7DB9 6000     02030     DEFW    96
7DBB 43       02040     DEFM    'CS5'
7DBE 3000     02050     DEFW    48
7DC0 43       02060     DEFM    'CS6'
7DC3 1800     02070     DEFW    24
7DC5 43       02080     DEFM    'CS7'
7DC8 1E00     02090     DEFW    30
7DCA 43       02100     DEFM    'CF0'
7DCD BF06     02110     DEFW    1727
7DCF 43       02120     DEFM    'CF1'
7DD2 5F03     02130     DEFW    863
7DD4 43       02140     DEFM    'CF2'
7DD7 AF01     02150     DEFW    431
7DD9 43       02160     DEFM    'CF3'
7DDC D700     02170     DEFW    215
7DDE 43       02180     DEFM    'CF4'
7DE1 6B00     02190     DEFW    107
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7DE3 43       02200     DEFM    'CF5'
7DE6 3500     02210     DEFW    53
7DE8 43       02220     DEFM    'CF6'
7DEB 1A00     02230     DEFW    26
7DED 43       02240     DEFM    'CF7'
7DF0 0D00     02250     DEFW    13
7DF2 44       02260     DEFM    'DN0'
7DF5 AC05     02270     DEFW    1452
7DF7 44       02280     DEFM    'DN1'
7DFA D602     02290     DEFW    726
7DFC 44       02300     DEFM    'DN2'
7DFF 6B01     02310     DEFW    363
7E01 44       02320     DEFM    'DN3'
7E04 B500     02330     DEFW    181
7E06 44       02340     DEFM    'DN4'
7E09 5A00     02350     DEFW    90
7E0B 44       02360     DEFM    'DN5'
7E0E 2D00     02370     DEFW    45
7E10 44       02380     DEFM    'DN6'
7E13 1600     02390     DEFW    22
7E15 44       02400     DEFM    'DN7'
7E18 1E00     02410     DEFW    30
7E1A 44       02420     DEFM    'DS0'
7E1D 5A05     02430     DEFW    1370
7E1F 44       02440     DEFM    'DS1'
7E22 AD02     02450     DEFW    685
7E24 44       02460     DEFM    'DS2'
7E27 5601     02470     DEFW    342
7E29 44       02480     DEFM    'DS3'
7E2C AB00     02490     DEFW    171
7E2E 44       02500     DEFM    'DS4'
7E31 5500     02510     DEFW    85
7E33 44       02520     DEFM    'DS5'
7E36 2A00     02530     DEFW    42
7E38 44       02540     DEFM    'DS6'
7E3B 1500     02550     DEFW    21
7E3D 44       02560     DEFM    'DS7'
7E40 1E00     02570     DEFW    30
7E42 44       02580     DEFM    'DF0'
7E45 0206     02590     DEFW    1538
7E47 44       02600     DEFM    'DF1'
7E4A 0103     02610     DEFW    769
7E4C 44       02620     DEFM    'DF2'
7E4F 8001     02630     DEFW    384
7E51 44       02640     DEFM    'DF3'
7E54 C000     02650     DEFW    192
7E56 44       02660     DEFM    'DF4'
7E59 6000     02670     DEFW    96
7E5B 44       02680     DEFM    'DF5'
7E5E 3000     02690     DEFW    48
7E60 44       02700     DEFM    'DF6'
7E63 1800     02710     DEFW    24
7E65 44       02720     DEFM    'DF7'
7E68 1E00     02730     DEFW    30
7E6A 45       02740     DEFM    'EN0'
7E6D 0D05     02750     DEFW    1293
7E6F 45       02760     DEFM    'EN1'
7E72 8602     02770     DEFW    646
7E74 45       02780     DEFM    'EN2'
7E77 4301     02790     DEFW    323
7E79 45       02800     DEFM    'EN3'
7E7C A100     02810     DEFW    161
7E7E 45       02820     DEFM    'EN4'
7E81 5000     02830     DEFW    80
7E83 45       02840     DEFM    'EN5'
7E86 2800     02850     DEFW    40
7E88 45       02860     DEFM    'EN6'
7E8B 1400     02870     DEFW    20
7E8D 45       02880     DEFM    'EN7'
7E90 1E00     02890     DEFW    30
7E92 45       02900     DEFM    'ES0'
7E95 C504     02910     DEFW    1221
7E97 45       02920     DEFM    'ES1'
7E9A 6202     02930     DEFW    610
7E9C 45       02940     DEFM    'ES2'
7E9F 3101     02950     DEFW    305
7EA1 45       02960     DEFM    'ES3'
7EA4 9800     02970     DEFW    152
7EA6 45       02980     DEFM    'ES4'
7EA9 4C00     02990     DEFW    76
7EAB 45       03000     DEFM    'ES5'
7EAE 2600     03010     DEFW    38
7EB0 45       03020     DEFM    'ES6'
7EB3 1300     03030     DEFW    19
7EB5 45       03040     DEFM    'ES7'
7EB8 1E00     03050     DEFW    30
7EBA 45       03060     DEFM    'EF0'
7EBD 5A05     03070     DEFW    1370
7EBF 45       03080     DEFM    'EF1'
7EC2 AD02     03090     DEFW    685
7EC4 45       03100     DEFM    'EF2'
7EC7 5601     03110     DEFW    342
7EC9 45       03120     DEFM    'EF3'
7ECC AB00     03130     DEFW    171
7ECE 45       03140     DEFM    'EF4'
7ED1 5500     03150     DEFW    85
7ED3 45       03160     DEFM    'EF5'
7ED6 2A00     03170     DEFW    42
7ED8 45       03180     DEFM    'EF6'
7EDB 1500     03190     DEFW    21
7EDD 45       03200     DEFM    'EF7'
7EE0 1E00     03210     DEFW    30
7EE2 46       03220     DEFM    'FN0'
7EE5 C504     03230     DEFW    1221
7EE7 46       03240     DEFM    'FN1'
7EEA 6202     03250     DEFW    610
7EEC 46       03260     DEFM    'FN2'
7EEF 3101     03270     DEFW    305
7EF1 46       03280     DEFM    'FN3'
7EF4 9800     03290     DEFW    152
7EF6 46       03300     DEFM    'FN4'
7EF9 4C00     03310     DEFW    76
7EFB 46       03320     DEFM    'FN5'
7EFE 2600     03330     DEFW    38
7F00 46       03340     DEFM    'FN6'
7F03 1300     03350     DEFW    19
7F05 46       03360     DEFM    'FN7'
7F08 1E00     03370     DEFW    30
7F0A 46       03380     DEFM    'FS0'
7F0D 8004     03390     DEFW    1152
7F0F 46       03400     DEFM    'FS1'
7F12 4002     03410     DEFW    576
```

Program continues

Program continued

```
7F14 46            DEFM    'FS2'
7F17 2001          DEFW    288
7F19 46            DEFM    'FS3'
7F1C 9000          DEFW    144
7F1E 46            DEFM    'FS4'
7F21 4800          DEFW    72
7F23 46            DEFM    'FS5'
7F26 2400          DEFW    36
7F28 46            DEFM    'FS6'
7F2B 1200          DEFW    18
7F2D 46            DEFM    'FS7'
7F30 1E00          DEFW    30
7F32 46            DEFM    'FF0'
7F35 0D05          DEFW    1293
7F37 46            DEFM    'FF1'
7F3A 8602          DEFW    646
7F3C 46            DEFM    'FF2'
7F3F 4301          DEFW    323
7F41 46            DEFM    'FF3'
7F44 A100          DEFW    161
7F46 46            DEFM    'FF4'
7F49 5000          DEFW    80
7F4B 46            DEFM    'FF5'
7F4E 2800          DEFW    40
7F50 46            DEFM    'FF6'
7F53 1400          DEFW    20
7F55 46            DEFM    'FF7'
7F58 1E00          DEFW    30
7F5A 47            DEFM    'GN0'
7F5D 4004          DEFW    1088
7F5F 47            DEFM    'GN1'
7F62 2002          DEFW    544
7F64 47            DEFM    'GN2'
7F67 1001          DEFW    272
7F69 47            DEFM    'GN3'
7F6C 8800          DEFW    136
7F6E 47            DEFM    'GN4'
7F71 4400          DEFW    68
7F73 47            DEFM    'GN5'
7F76 2200          DEFW    34
7F78 47            DEFM    'GN6'
7F7B 1100          DEFW    17
7F7D 47            DEFM    'GN7'
7F80 1E00          DEFW    30
7F82 47            DEFM    'GS0'
7F85 0204          DEFW    1026
7F87 47            DEFM    'GS1'
7F8A 0102          DEFW    513
7F8C 47            DEFM    'GS2'
7F8F 0001          DEFW    256
7F91 47            DEFM    'GS3'
7F94 8000          DEFW    128
7F96 47            DEFM    'GS4'
7F99 4000          DEFW    64
7F9B 47            DEFM    'GS5'
7F9E 2000          DEFW    32
7FA0 47            DEFM    'GS6'
7FA3 1000          DEFW    16
7FA5 47            DEFM    'GS7'
7FA8 1E00          DEFW    30
7FAA 47            DEFM    'GF0'
7FAD 8004          DEFW    1152
7FAF 47            DEFM    'GF1'
7FB2 4002          DEFW    576
7FB4 47            DEFM    'GF2'
7FB7 2001          DEFW    288
7FB9 47            DEFM    'GF3'
7FBC 9000          DEFW    144
7FBE 47            DEFM    'GF4'
7FC1 4800          DEFW    72
7FC3 47            DEFM    'GF5'
7FC6 2400          DEFW    36
7FC8 47            DEFM    'GF6'
7FCB 1200          DEFW    18
7FCD 47            DEFM    'GF7'
7FD0 1E00          DEFW    30
            ;TONE GENERATOR FOR MUSIC
            ;***********************************************
7FD2 CD7F0A MUSIC  CALL    ENTER    ;PERIOD IN HL
7FD5 E5            PUSH    HL       ;SAVE IT
7FD6 21FE7F        LD      HL,DVAR  ;VARIABLE IN D REG.
7FD9 CD0D26        CALL    VARPTR   ;POINTER IN DE
7FDC EB            EX      DE,HL    ;NOW IN HL
7FDD 5E            LD      E,(HL)   ;LO BYTE IN E
7FDE 23            INC     HL       ;AND
7FDF 56            LD      D,(HL)   ;HI BYTE IN D
7FE0 E1            POP     HL       ;GET PERIOD
7FE1 0E01          LD      C,01     ;TO TOGGLE A
7FE3 1B            DEC     DE       ;TEST FOR REST
7FE4 7A            LD      A,D      ;GO IF VARIABLE IN
7FE5 B3            OR      E        ;D EQUALS 1
7FE6 13            INC     DE       ;RESTORE DECREMENT
7FE7 2806          JR      Z,DELAY  ;SKIP TONE
7FE9 3E03   TONE   LD      A,03     ;TOGGLED FROM 2 TO 1
7FEB A9            XOR     C        ;BY VALUE IN C
7FEC 4F            LD      C,A      ;SAVE TOGGLE
7FED D3FF          OUT     (0FFH),A ;VIBRATE
7FEF E5     DELAY  PUSH    HL       ;SAVE PERIOD
7FF0 2B            DEC     HL       ;DELAY FOR
7FF1 7C            LD      A,H      ;LENGTH OF
7FF2 B5            OR      L        ;PERIOD.
7FF3 20FB          JR      NZ,DELAY+1   ;ELSE
7FF5 E1            POP     HL       ;GET PERIOD
7FF6 1B            DEC     DE       ;AND CONTINUE TONE
7FF7 7A            LD      A,D      ;UNTIL END OF
7FF8 B3            OR      E        ;DURATION.
7FF9 20EE          JR      NZ,TONE  ;ELSE,
7FFB C39A0A        JP      RETURN   ;BACK TO BASIC
7FFE 44     DVAR   DEFM    'D'
7FFF 00            DEFB    0
7BFE               END     KYBRD
00000 TOTAL ERRORS
```

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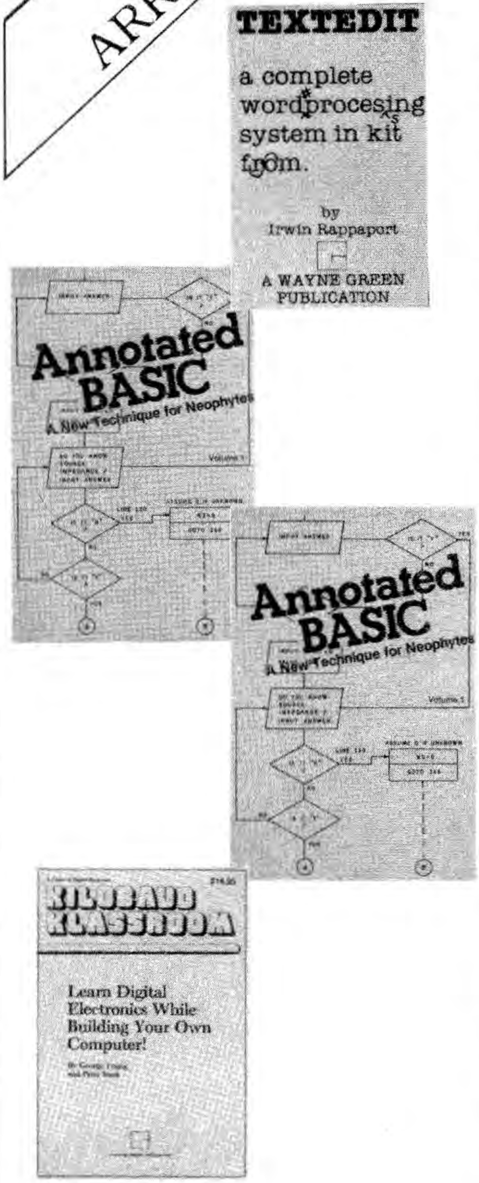

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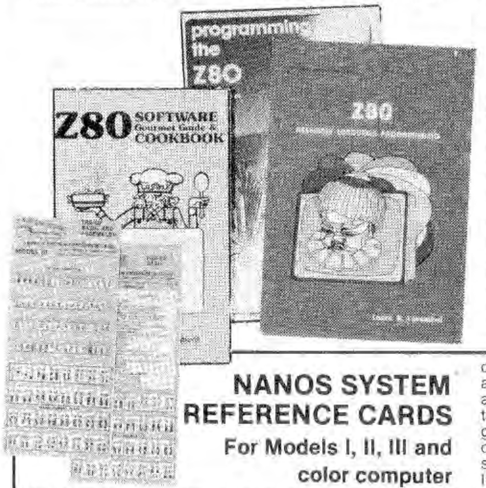

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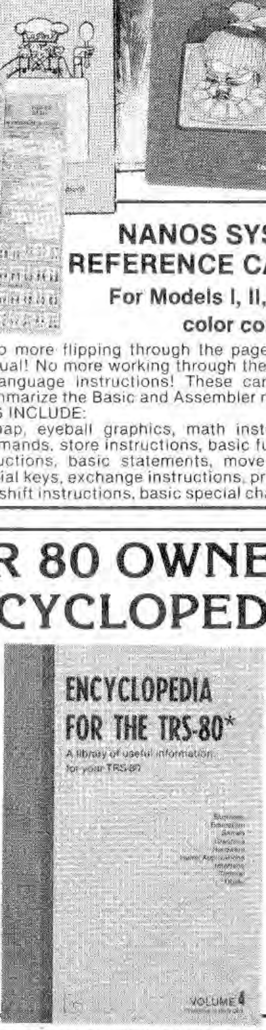

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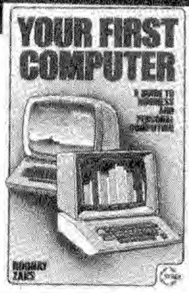

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Pin 10	Through 1MFD. Tantalum Capacitor to Pin 11(74121)
Pin 5	U-56 Pin 6
Pin 6	E-24 on Circuit Board
Pins 3,4,7	E-24 (Ground)

Pin 7	Data #3	Pin 17
Pin 8	Ground	Pin 35
Pin 9	Data #4	Pin 18
Pin 10	Ground	Pin 36
Pin 11	Data #5	Pin 8
Pin 12	Ground	Pin 27
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Pin 14	Ground	Pin 30
Pin 15	Data #7	Pin 13
Pin 16	Ground	Pin 31
Pin 17	NC	
Pin 18	NC	
Pin 19	NC	
Pin 20	Ground	Pin 21
Pin 21	Busy	Pin 2
Pin 22	NC	
Pin 23	Out of Paper	Pin 31 (or Ground)

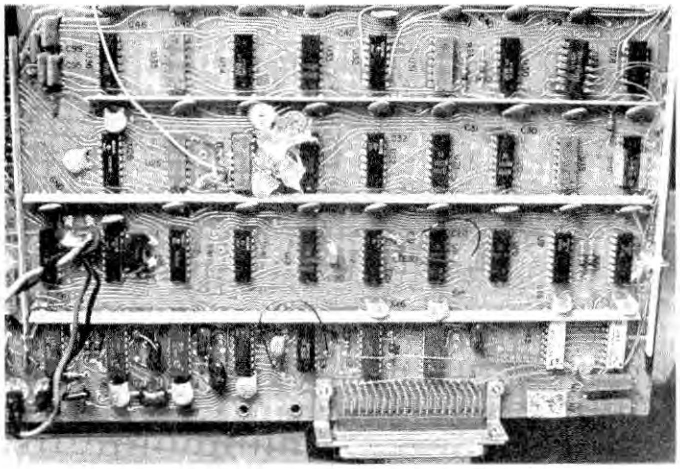

Photo 1

Most of the ground connections are elective with the exception of Pin 23: It must be grounded or the system will hang.

Adjust line feed spacing through the 2.2K Ohm pot while receiving data from the computer. Place the printer in the Remote mode. If after about 15 seconds the print wheel has not stopped, switch to the Local mode and output a test line to the printer. This dumps the 1K memory buffer that may have received extraneous characters when you turned the computer on. The printer has a sensor detecting data in memory, and automatically puts the printer on-line when data is received from the computer. See Fig. 1 and Photo 1 for location and wiring diagram.

Solve the second problem with a 7404/7414 inverter chip mounted on top of U-29 with the following pin connections.

7404/7414 Pin Out	Connect To:
Pin 1	Buss Connector Pin 19
Pin 2	U-18 Pin 3
Pin 3	R-5 Connection Nearest Buss (see Photo 1)
Pin 4	Buss Connector Pin 2
Pin 7	Soldered to U-29 Pin 7
Pin 14	Soldered to U-29 Pin 14

Connect the printer to the expansion interface parallel port through seven data lines, the data strobe, the busy signal and sufficient grounds to isolate the data lines.

Model 1 Expansion Interface	37 Pin Printer Buss	
Pin 1	Data Strobe	Pin 19
Pin 2	Ground	Pin 37
Pin 3	Data #1	Pin 15
Pin 4	Ground	Pin 33
Pin 5	Data #2	Pin 16
Pin 6	Ground	Pin 34

You can now output to the printer through all LPRINT and LLIST statements and any other parallel port statements. ■

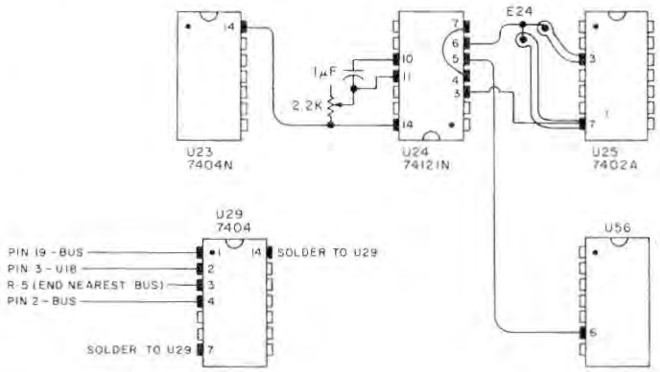

Fig. 1.

✓See List of Advertisers on page 386

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5 Megabyte Winchester Fixed Disk

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203505..........Model III Version $2795.00

10 Megabyte Winchester Fixed Disk

201510..........Model I Version $5395.00

203510..........Model III Version $5395.00

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MONEY DOS

an operating system for financial survival

by J.M. Keynes

Program Listing 1

```
10 CLEAR100
20 ONERRORGOTO1510
30 DEFDBLA-E,G-W:DEFINTF,X,Z
40 A1$="####,###.##"
50 A2$="###,###.##"
60 A3$="##.##"
70 A4$="##"
80 A5$="###,###.##-"
90 A6$="#####,###.##"
92 CLS:PRINT"EVALUATION OF RENTAL PROPERTY.":PRINT:PRINT
95 PRINT"NOTE: WHEN ASKED FOR A PERCENTAGE ENTER AS INTEGER NOT
DECIMAL.":PRINT:PRINT
100 PRINT"WHAT IS THE PURCHASE PRICE OF THE PROPERTY"
110 PRINT:INPUTG
120 IFX=4GOTO510
130 CLS:PRINT"WHAT IS THE VACANCY ALLOWANCE?  ENTER 15% AS 15 NO
T .15
140 INPUTVA
150 IFX=2GOTO510
160 CLS:PRINT"HOW MANY UNITS DOES THE PROPERTY HAVE":INPUTUN
170 CLS:PRINT"HOW MANY SQUARE FEET OF USABLE SPACE":INPUTSF
180 CLS:PRINT"YEARLY GROSS INCOME (ASSUMING 100% OCCUPANCY)
190 INPUTGI
200 IFX=1THEN510
210 CLS:PRINT"WHAT IS THE EXPECTED EXPENSE RATIO, THAT IS, THE"
220 CLS:INPUT"YEARLY EXPENSES DIVIDED BY GROSS INCOME, IN %";ER
230 IFX=3THEN510
240 CLS:INPUT"HOW MANY MORTGAGES WILL THERE BE, 1 OR 2";MN:CLS:I
FMN>2GOTO240
250 CLS:PRINT"FOR INTEREST ONLY OR BALLOON MORTGAGES,"
260 PRINT"MONTHS = 1000"
270 DEFINTI
280 MT=0
290 FORI=1TO2:AM(I)=0:T(I)=0:RT(I)=0:Y1(I)=0
300 CF(I)=0:PT(I)=0:NEXTI
310 FORI=1TOMN
320 PRINT:PRINT"FOR MORTGAGE NUMBER ";I;"GIVE THE FOLLOWING"
330 INPUT"TOTAL AMOUNT OF THE MORTGAGE";AM(I)
340 INPUT"THE TERM, IN YEARS";T(I):T(I)=T(I)*12
350 INPUT"THE INTEREST RATE, IN % ";RT(I)
360 MT=MT+AM(I)
370 NEXTI
380 IFX=5GOTO510
390 CLS:PRINT"DESCRIBE DEPRECIATION METHODS"
400 INPUT"ALLOCATION TO BUILDING IN % ";D1
410 INPUT"ALLOCATION TO PERSONAL PROPERTY IN %";D2
420 IFD1+D2>=100THENPRINT"TOO MUCH":FORF3=1TO1000:NEXTF3:GOTO400
430 PRINT"WHAT METHOD OF DEPRECIATION IS TO BE USED"
440 PRINT"FOR THE BUILDING.  INPUT SL, DDB, 125%, OR 150%"
450 INPUTDB$:IFY=10THEN800
460 INPUT"TERM OF BUILDING DEPRECIATION, IN YRS";YB
470 PRINT"WHAT METHOD OF DEPRECIATION IS TO BE USED"
480 PRINT"FOR PERSONAL PROPERTY.  INPUT SL, DDB, 125% OR 150%
490 INPUTDP$:IFY=11THENGOTO850
500 INPUT"TERM OF PERSONAL PROPERTY DEP. IN YRS";YP
510 CLS:PRINT@260,"I'M THINKING.......
520 VS=VA*GI/100
530 ER(1)=ER*(GI-VS)/100
540 OI=GI-VS-ER(1)
550 IFMN=0THEN730
560 DEFDBLI:M1=0:M2=0:PT(1)=0:PT(2)=0:IT(1)=0:IT(2)=0
570 FORX=1TOMN
580  IFT(X)=1000THENIT(X)=AM(X)*(RT(X)/100):GOTO700
```

Program Listing 1 Continues

"I'll buy the Empire State Building and the World Trade Center within 48 hours with no cash."

You have seen the ads by a multitude of these so-called multimillionaires who, for a consideration, will make you wealthy overnight by arranging your purchase of single or multi family real estate for no money down. They even suggest that you can do so with a credit rating worse than Chrysler's! Nice looking young men who are well dressed and well scrubbed, conducted free (?) seminars. They wouldn't think of putting a con on you! The super secret information they sell will allow you to purchase half the damn city for no money down. Why, in no time at all, you will go about fleecing all those unsuspecting sellers out of their property, and, in many cases, you will wind up with bundles of cash in your pocket along with that choice piece of real estate.

I recently went to one of these seminars. It was well attended. The average age of the potential pigeons was about 50. The pitch was excellent. . . . in fact, the jokes were identical to those I heard while attending a get-rich-quick commodity options seminar last year. The young man knew little of what owning rental property is really like, but he knew enough to sell his product to many that night. The price to become an instant real estate baron (or baroness) was, I think, $75.00. I find it admirable that these multi-millionaires are willing to share their secrets for such a paltry sum.

So much for "Rentalscam." Your computer will allow you to examine, quickly and accurately, the real potential of any rental property you may be considering. The program in Listing 1 deals with the real world. A few basic rules will enhance the value of the program.

KEYNES LAWS:

• *It's 3x the work you think it will be.* If you are buying less than about 10-15 units, plan on being your plumber, carpenter, and manager. If you are unwilling to work up a sweat, look for another investment. You can't afford manage-

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The Word Processor that re-wrote the book on Word Processing

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COMPARISON CHART	SUPER COLOR WRITER			THE COMPETITION		
System Size	4K	16K	32K	4K	16K	32K
TAPE: Text space	N/A	8K	24K	N/A	2K	18K
ROMPAK: Text space	2.5K	15K	31K	N/A	N/A	N/A
DISK: Text space	N/A	6.5K	22.5K	N/A	0.5K	16.5K
Right Justify		YES			NO	
Video Window		YES			NO	
Edit any ASCII File		YES			NO	

The figures speak for themselves and with professional features like PROGRAMMABLE function string commands to perform up to 28 commands automatically, PROGRAMMABLE text file chaining, PROGRAMMABLE column insert & delete, and right hand JUSTIFICATION with punctuation precedence, the choice is clear but there's still more!

The **Super "Color" Writer** takes full advantage of the new breed of "smart printers" with Control codes 1-31, 20 Programmable control codes 0-255 for special needs and built in Epson MX-80, Centronics 737, 739 and R.S. Line Printer IV, VII, VIII drivers.

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SUPER "COLOR" WRITER DISK

The Disk version of the **Super "Color" Writer** works with the TRS-80C Disk System and has all the features listed above plus many more! Use with up to four Disk Drives. Includes an extended HELP table you can access at any time. Call a directory, print FREE space, Kill disk files and SAVE and LOAD text files you've created all from the **Super "Color" Writer**. Print, merge or append any **Super "Color" Terminal** file, ASCII file, BASIC program or Editor/Assembler source listing stored on the Disk or tape. The **Super "Color" Writer Disk** version has additional formatting and print features for more control over your printer and PROGRAMMABLE chaining of disk files for "hands off" operation. Print an entire BOOK without ever touching a thing!

Includes comprehensive operators manual.

TAPE $49.95 ROM PAK $74.95 DISK $99.95

Manual only, $7.00 Refundable with purchase.

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Time Share, Smart Terminal, High-speed Data X'fer & Videotex

The **Super "Color" Terminal** turns the Color Computer into a Super-smart terminal with all the features of VIDEOTEX(TM) plus much more. COMMUNICATE with Dow Jones & Compuserve and with computers like the TRS-80(TM) MODEL I, II, III, APPLE etc., via moden or RS-232 direct! Save the data to tape or print it! Reduces ON—LINE cost to a minimum!

FEATURES

10 buffer size settings from 2-30K • Buffer full indicator • Lprints buffer contents • Full 128 ASCII keyboard • Compatible with **Super "Color" Writer** files • UPLOAD & DOWNLOAD ASCII files, Machine Language & Basic programs • Set RS-232 parameters • Duplex: Half/Full • Baud Rate: 110, 300, 600, 1200, 2400, 4800 • Word Lengths: 5, 6, 7 or 8 • Parity: Odd, Even or None • Stop Bits: 1-9 • Local linefeeds to screen • Tape save & load for ASCII files, Machine code & Basic programs • Unique clone feature for copying any tape.

Super "Color" Terminal Disk

The Disk version offers all the features listed above plus Host ability in full duplex • Lower case masking • 10 Keystroke Multiplier (MACRO) buffers on disk to perform repetitive log-on tasks and send short messages (up to 255 bytes) • Programmable prompts for send next line • Selectable character trapping • Set printer line length • Pagination • Linefeed with CR option • Printer Baud: 110, 300, 600, 1200 & 2400 • Documentation.

TAPE $39.95 ROM PAK $49.95 DISK $69.95

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16K RAM KIT $15.99

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MONEY DOS

Program Listing 1 Continued

```
590  I(X)=RT(X)/1200
600  T=(I(X)+1)[(-T(X)):T=1-T:MP(X)=I(X)*AM(X)/T
610  MP(X)=INT(MP(X)*100+.5)/100
620  IT(X)=0:PT(X)=0:RP=AM(X)
630  FORZ=1TO12
640   IM=INT(RP*I(X)*100+.5)/100
650   PM=MP(X)-IM
660   IT(X)=IT(X)+IM
670   PT(X)=PT(X)+PM
680   RP=RP-PM
690  NEXTZ
700  IT=IT+IT(X):PT=PT+PT(X)
710 NEXTX
720 M1=PT(1)+IT(1):M2=PT(2)+IT(2)
730 CF=OI-M1-M2
740 PP=PT(1)+PT(2)
750 AM=AM(1)+AM(2)
760 RN=CF+PP
770 EQ=G-AM
780 RT=RN/EQ*100
790 DP=0
800 IFDB$="DDB"THENDP=D1*G/YB/50:GOTO850
810 IFDB$="SL"THENDP=D1*G/YB/100:GOTO850
820 IFDB$="125%"THENDP=D1*G/YB*.0125:GOTO850
830 IFDB$="150%"THENDP=D1*G/YB*.015:GOTO850
840 PRINT:PRINT"ENTER PROPER DEPRECIATION METHOD":FORY=1TO1000:N
EXTY:Y=10:GOTO430
850 IFDP$="DDB"THENDP=DP+D2/YP/50:GOTO900
860 IFDP$="SL"THENDP=DP+D2*G/YP/100:GOTO900
870 IFDP$="125%"THENDP=DP+D2*G/YP*.0125:GOTO900
880 IFDP$="150%"THENDP=DP+D2*G/YP*.015:GOTO900
890 PRINT:PRINT"NEED METHOD FOR PERSONAL PROPERTY DEPRECIATION":
FORY=1TO1000:NEXTY:Y=11:GOTO470
900 TI=RN-DP
910 PU=G/UN
920 PF=G/SF
930 CR=OI/G*100
940 MR=G/(GI-VS)
950 '
960 CLS
970 PRINT"COMPUTED GROSS      ";:PRINTUSINGA1$;GI;
980 PRINTTAB(33)"MTG PMT YR1  #1          #2"
990 PRINT"VAC ALLOWANCE ";:PRINTUSINGA4$;VA;:PRINT" %  ";:PRINTU
SINGA2$;VS;
1000 PRINTTAB(33)"PRINCIPAL ";:PRINTUSINGA2$;PT(1);:PRINT" ";:PR
INTUSINGA2$;PT(2);
1010 PRINT"EXP. RATIO ";:PRINTUSINGA3$;ER;:PRINT" %";:PRINT" ";:
PRINTUSINGA1$;ER(1);
1020 PRINTTAB(33)"INTEREST  ";:PRINTUSINGA2$;IT(1);:PRINT" ";:PR
INTUSINGA2$;IT(2);
1030 PRINT"OPERATING INCOME   ";:PRINTUSINGA1$;OI;:PRINTTAB(33)"
TOTAL      ";:PRINTUSINGA2$;M1;:PRINT" ";:PRINTUSINGA2$;M2;
1040 FORX=0TO63:PRINT"+";:NEXT
1050 FORY=0TO11:SET(64,Y):NEXTY
1060 PRINT"CASH FLOW                ";:PRINTUSINGA5$;CF;:PRINT" ";:PR
INTTAB(33)"PURCHASE PRICE      ";:PRINTUSINGA6$;G;
1070 PRINT"PRIN. PAYMENT           ";:PRINTUSINGA5$;PP;
1080 PRINTTAB(33)"MORTGAGE TOTAL      ";:PRINTUSINGA6$;AM;
1090 PRINT"EQU RTN = ";:PRINTUSINGA3$;RT;:PRINT" %    ";:PRINTUSI
NGA5$;RN;
1100 PRINTTAB(33)"EQUITY              ";:PRINTUSINGA6$;EQ;
1110 PRINT"DEPRECIATION           ";:PRINTUSINGA5$;DP;
1120 PRINTTAB(33)"% RETURN ON INVESTED $  ";:PRINTUSINGA3$;CR;:P
RINT" %";
1130 PRINT"TAXABLE INCOME         ";:PRINTUSINGA5$;TI;
1140 PRINTTAB(33)"MULTIPLIER (X EARNINGS)   ";:PRINTUSINGA3$;MR;
1150 FORX=0TO63:PRINT"+";:NEXTX:FORY=15TO29:SET(64,Y):NEXTY
1160 PRINT"PRICE PER UNIT = ";:PRINTUSINGA1$;PU;
1170 PRINTTAB(33)"PRICE / SQ FT =        ";:PRINTUSINGA2$;PF;
1180 FORX=0TO63:PRINT"+";:NEXTX
1190 PRINT"DO YOU WISH TO  1 - SHOW SUMMARY  2 - CHANGE A VALUE
1200 PRINT"                3 - RERUN THE PROGRAM
1210 INPUT"ENTER THE NUMBER OF YOUR CHOICE: ";F
1220 IFF<>ABS(INT(F))ORF>4GOTO1210
1230 ONFGOTO1240,1380,10
1240 CLS:PRINT"PRICE";TAB(33)"";:PRINTUSINGA6$;G
1250 PRINT"GROSS INCOME";TAB(33)"";:PRINTUSINGA6$;GI
1260 PRINT:PRINT"DEPRECIATION";TAB(20)"% ALLOC.";TAB(30)"YEARS";
TAB(40)"TYPE
```

Program Listing 1 Continues

Program Listing 1 Continued

```
127Ø PRINT"BUILDING";TAB(2Ø)D1;TAB(3Ø)YB;TAB(4Ø)DB$
128Ø PRINT"PERSONAL PROP.";TAB(2Ø)D2;TAB(3Ø)YP;TAB(4Ø)DP$
129Ø IFMN=ØTHENPRINT:PRINT"THERE ARE NO MORTGAGES":GOTO133Ø
13ØØ PRINT:FORX1=1TOMN:PRINT"MTG. #";X1;"IS $";:PRINTUSINGA6$;AM
(X1);:PRINT" AT";RT(X1);"% ";:IFT(X1)=1ØØØTHENPRINT"FIRST YEAR I
NTEREST ONLY":GOTO132Ø
131Ø PRINT"OVER";T(X1);" MONTHS.
132Ø NEXTX1
133Ø PRINT:PRINT"THE BUILDING HAS"UN;"UNITS AND";SF;"SQUARE FEET
.
134Ø PRINT:PRINT"DO YOU WISH TO  1 - DISPLAY FIRST YEAR  2 - CHA
NGE
135Ø PRINT"A VALUE  3 - RERUN PROGRAM
136Ø INPUTX:X=ABS(INT(X)):ONXGOTO95Ø,138Ø,1Ø
137Ø CLS:GOTO134Ø
138Ø CLS
139Ø PRINT:PRINT"DO YOU WISH TO CHANGE:
14ØØ PRINT"     1 - COMPUTED GROSS INCOME
141Ø PRINT"     2 - VACANCY ALLOWANCE
142Ø PRINT"     3 - EXPENSE RATIO
143Ø PRINT"     4 - PURCHASE PRICE
144Ø PRINT"     5 - MORTGAGE INFORMATION
145Ø PRINT"     6 - DEPRECIATION INFORMATION
146Ø PRINT:PRINT"ENTER THE NUMBER OF YOUR CHOICE ";:INPUTX
147Ø IFX<>ABS(INT(X))ORF>6THEN146Ø
148Ø ONXGOTO18Ø,13Ø,21Ø,1ØØ,24Ø,39Ø
149Ø GOTO146Ø
15ØØ END
151Ø CLS:IFERR/2+1=11THENPRINT"A DIVIDE BY ZERO ERROR HAS OCCURR
ED.  THIS USUALLY"ELSE155Ø
152Ø PRINT"MEANS THAT A VALUE WAS NOT ENTERED PROPERLY.  iT
153Ø PRINT"MIGHT MEAN THAT THE ERROR OTHERWISE WAS COMPUTED.
154Ø INPUT"LET'S GO BACK AND TRY AGAIN.  PRESS ENTER WHEN READY"
;A$:GOTO1Ø
155Ø PRINT"AN ERROR HAS OCCURRED.  LET'S GO BACK AND TRY AGAIN.
156Ø INPUT"PRESS ENTER TO RERUN PROGRAM.";A$:GOTO1Ø
```

Program Listing 2

```
1Ø CLEAR1ØØØ : GOTO2Ø
2Ø CLS : CLEAR : LPRINTCHR$(3Ø)
3Ø U$="#.##" : T$="####.##" : S$="###.##" : V$="##.#" : X$="####
##.##" : Z$="######"
4Ø PRINT : PRINT : PRINT"YOU HAVE SIX OPTIONS...
5Ø PRINT : PRINT
6Ø REM USE DOWN ARROW TO ENTER THE FOLLOWING ON NEW LINES
7Ø PRINT"1. INVESTMENT ANALYSIS
2. COMMISSION SCHEDULE
3. COVERED OPTION WRITING
4. USER DETERMINED PRINTOUTS
5. COMPARE INTEREST RETURN ON COMMERCIAL PAPER VS. A CD
6. ACTUAL RETURN ON A DISCOUNTED BOND VS A CD OR TREASURY BOND.
8Ø PRINT
9Ø INPUTMU : IF MU=1  THEN 129Ø  ELSE  IF MU=2 THEN 119Ø  ELSE I
FMU=4 THEN 157Ø ELSE IFMU=5 THEN 194Ø ELSE IFMU=6 THEN 164Ø
1ØØ CLS : PRINT"COVERED OPTION WRITING ANALYSIS." : PRINT : PRIN
T : INPUT"NO. OF SHARES`1ØØ,2ØØ,3ØØ,5ØØ, OR 1ØØØ.";N: IF N<1ØØ T
HEN N=1ØØ
11Ø INPUT"STOCK PRICE (EXPRESSED AS IN DECIMAL).";S : E=S*N
12Ø INPUT"OPTION STRIKING PRICE";SP
13Ø INPUT"OPTION PRICE (EXPRESSED AS DECIMAL).";O : F=O*N
14Ø INPUT"DAYS TO EXPIRATION";D
15Ø INPUT"CURRENT MARGIN RATE";IR : IR=IR/1ØØ
16Ø INPUT"COMMISSION DISCOUNT";C : C=1-(C/1ØØ)
17Ø GOSUB 114Ø
18Ø INPUT"DIVIDENDS PER SHARE TO EXPIRATION";DD : DD=DD*N
19Ø PRINTDD
2ØØ CLS : PRINT : INPUT"FOR PRINTOUT=2";A4
21Ø IFA4=2 THEN LPRINT"COMPUTER STUDY OF A COVERED OPTION WRITE"
 : LPRINT"WITH THE FOLLOWING PARAMETERS : " : LPRINT
22Ø IFA4=2 THEN INPUT"ENTER STOCK SYMBOL AND OPTION DATA";W$ : L
PRINT" " : LPRINTW$
23Ø IFA4=2 THEN LPRINTN;" SHARES AT $";S;" PER SHARE." : LPRINT"
WRITE OPTION FOR $";O;" WITH A STRIKING PRICE OF ";SP : LPRINT
24Ø PRINTN;" SHARES AT $";S;" PER SHARE." : PRINT" WRITE OPTION
FOR $";O;" WITH STRIKING PRICE OF ";SP
```

Program Listing 2 Continues

✓See List of Advertisers on page 386

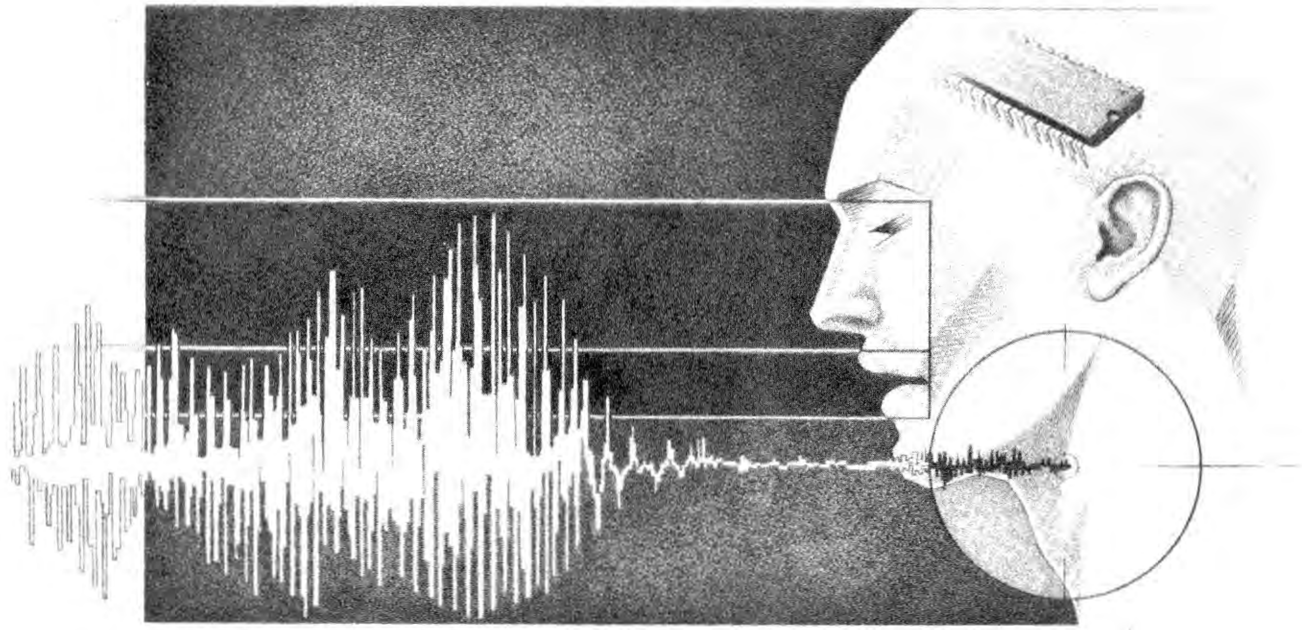
MONEY DOS

Program Listing 2 Continued

```
250 IFA4=2 THEN LPRINTD;" DAYS TO EXPIRATION.";" MARGIN RATE AT
";IR*100;"%" : LPRINT
260 PRINTD;" DAYS TO EXPIRATION.";" MARGIN RATE AT ";IR*100;"%
270 PRINT
280 GOSUB 510
290 CM=Z+OC
300 G=CM*C
310 I=E-F+G-DD
320 IFS<SP THEN 340 ELSE IFA4=2 THEN LPRINT"THE MAXIMUM RETURN W
ILL BE REALIZED PROVIDED THE STOCK" : LPRINT"REMAINS ABOVE ";SP;
".";" CASH INVESTMENT $";I : LPRINT"CASH RETURN","ACTUAL","ANNUA
LIZED","BREAK EVEN"
330 IFS>SP THEN PRINT"THE MAXIMUM RETURN WILL BE REALIZED PROVID
ED THE STOCK" : PRINT"REMAINS ABOVE ";SP;" CASH INVESTMENT $";I+
DD : PRINT"CASH RETURN","ACTUAL","ANNUALIZED","BREAK EVEN" : PP=
1 : GOTO 410
340 GR=E-I
350 J=GR/I*100
360 K=J/D*365
370 IFA4=2 THEN LPRINT"RETURN ON CASH INVESTMENT OF $";I+DD : LP
RINT"","ACTUAL %","ANNUALIZED %","BREAK EVEN" : LPRINT"UNCHANGED
",J,K
380 PRINT"RETURNS ON CASH INVESTMENT OF $";I+DD
390 PRINT"","ACTUAL %","ANNUALIZED %","BREAK EVEN
400 PRINT"UNCHANGED",J,K
410 S=SP : GOSUB 510
420 SO=SP*N
430 ER=SO-I-Z
440 II=I+Z
450 AA=ER/II*100
460 AB=AA/D*365
470 BE=I/N
480 IFA4=2 THEN LPRINT"EXERCISED",AA,AB,BE
490 PRINT"EXERCISED",AA,AB,BE
500 GOTO 880
510 IFS<=10 THEN  Z=33.92 : GOTO 830
520 IFS<11 THEN  Z=34 : GOTO 830
530 IFS<12  THEN  Z=36.25 : GOTO 830
540 IFS<13  THEN  Z=38 : GOTO 830
550 IFS<14 THEN Z=39.50 : GOTO 830
560 IFS<15 THEN Z=41.25 : GOTO 830
570 IFS<16 THEN Z=42.90 : GOTO 830
580 IFS<17 THEN Z=44.46 : GOTO 830
590 IFS<18 THEN Z=46.25 : GOTO 830
600 IFS<19 THEN Z=48.00 : GOTO 830
610 IFS<20 THEN Z=49.60 : GOTO 830
620 IFS<21 THEN Z=51.27 : GOTO 830
630 IFS<22 THEN Z=52.72 : GOTO 830
640 IFS<23 THEN Z=54.50 : GOTO 830
650 IFS<24 THEN Z=56.23 : GOTO 830
660 IFS<25 THEN Z=57.89 : GOTO 830
670 IFS<26 THEN Z=59.29 : GOTO 830
680 IFS<27 THEN Z=60.43 : GOTO 830
690 IFS<28 THEN Z=61.57 : GOTO 830
700 IFS<29 THEN Z=62.56 : GOTO 830
710 IFS<30 THEN Z=63.75 : GOTO 830
720 IFS<32 THEN Z=65.70 : GOTO 830
730 IFS<34 THEN Z=67.90 : GOTO 830
740 IFS<36 THEN Z=70.15 : GOTO 830
750 IFS<38 THEN Z=72.44 : GOTO 830
760 IFS<40 THEN Z=74.72 : GOTO 830
770 IFS<42 THEN Z=77.01 : GOTO 830
780 IFS<44 THEN Z=79.30 : GOTO 830
790 IFS<46 THEN Z=81.59 : GOTO 830
800 IFS<48 THEN Z=83.88 : GOTO 830
810 IFS<50 THEN Z=84.77 : GOTO 830
820 Z=88.52
830 IFN=200 THEN Z=Z*1.9
840 IFN=300 THEN Z=Z*2.7
850 IFN=500 THEN Z=Z*4.1
860 IFN=1000 THEN Z=Z*7
870 RETURN
880 REM
890 MR=E/2-F+G
900 BM=E-F+G-MR
910 IC=BM*IR/365*D
920 I=MR+IC-DD
930 GR=E-BM-I
940 J=GR/MR*100
```

Program Listing 2 Continues

"THE SPOKEN WORD"



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MONEY DOS

Program Listing 2 Continued

```
950 K=J/D*365
960 BB=(BM+I)/N
970 IFA4=2 THEN LPRINT"MARGIN RETURNS"
980 PRINT : PRINT"MARGIN RETURNS" : IFPP=1 THEN  1010
990 IFA4=2 THEN LPRINT"UNCHANGED",J,K
1000 PRINT"UNCHANGED",J,K
1010 S=SP : GOSUB 510
1020 SP=SP*N
1030 I=I+Z
1040 GR=SP-BM-I
1050 J=GR/MR*100
1060 K=J/D*365
1070 IFA4=2 THEN LPRINT"EXERCISED",J,K,BB
1080 PRINT"EXERCISED",J,K,BB
1090 RR=G+Z : FY=(K/100)+1 : TT=10000 : FORO=1TO5 : TT=TT*FY : N
EXTO
1100 IFA4=2 THEN LPRINT" " : LPRINT"MARGIN DEPOSIT $";: LPRINT U
SINGZ$;MR;: LPRINT"    $10,000. INVESTED FOR 5 YEARS" : LPRINT"AT
 ";K;"% WILL GROW TO $";TT : LPRINT : LPRINT : LPRINT : LPRINT
1110 PRINT : PRINT"MARGIN DEPOSIT $";: PRINT USINGZ$;MR;: PRINT"
    $10,000 INVESTED FOR 5 YEARS
1120 PRINT"AT ";K;"% WILL GROW TO $";TT;"
1130 INPUT"ADVANCE PAPER=2 RETURN TO MENU=1";IO : IFIO=2 THEN LP
RINT : GOTO1130 ELSE 20
1140 NO=N/100
1150 LL=NO*6
1160 IFF<=2500 THEN OX=(F*.013)+12+LL : OC=((OX*1.1)+1)*1.07 : R
ETURN
1170 OX=F*.009+22+LL : IFF<=5000 THEN OC=((OX*1.1)+1)*1.07 : RET
URN
1180 OC=((OX*1.15)+1)*1.07 : RETURN
1190 CLS : PRINT"COMMISSION,S FOR STOCKS (100,200,300,500, OR 10
00 SHARES)" : PRINT"OR OPTIONS SELLING FOR $1. OR MORE." :  : IN
PUT"NO. OF SHARES?";N
1200 INPUT"PRICE PER SHARE (DECIMAL).";S
1210 GOSUB 510
1220 INPUT"HOW MANY OPTION PRICES?";PR : FORI=1TOPR : PRINT"ENTE
R OPTION PRICE #";I;: INPUTFD(I) : F=FD(I)*N
1230 GOSUB 1140
1240 OC(I)=OC
1250 NEXTI
1260 PRINT"COMMISSION ON ";N;" SHARES AT $";S;" IS $";: PRINT US
INGX$;Z
1270 Y=N/100 : FORI=1TOPR : PRINT"COMMMISSION ON ";Y;" OPTIONS A
T ";FD(I);" IS $";: PRINT USINGS$;OC(I) : NEXT
1280 PRINT@970,"";:INPUT"RETURN TO MENU=1  MORE COMMISSIONS=2";B
S : IFBS=1 THEN  20  ELSE  1190
1290 CLS : PRINTCHR$(23)"WILL ROGERS ONCE SAID," : PRINT"OUR PRO
BLEM IS NOT IGNORANCE" : PRINT"IT'S ALL THE THINGS WE KNOW" : PR
INT"THAT AIN'T SO!
1300 PRINT : PRINT"WE ALL KNOW THAT A 10 YEAR TAX  EXEMPT BOND Y
IELDING 9% IS" : PRINT"A PRUDENT INVESTMENT,OR PERHAPS A 20 TREA
SURY BOND" : PRINT"YIELDING 11% ???
1310 PRINT : PRINT : PRINT"TO EXAMINE THE RESULTS OF THESE OR AN
Y OTHER INVESTMENT" : INPUT"PRESS 'ENTER'";PO
1320 CLS : PRINT"THIS PROGRAM WILL ALLOW YOU TO DETERMINE THE AC
TUAL" : PRINT"RESULTS OF YOUR INVESTMENT IN TERMS OF PURCHASING
POWER.
1330 PRINT : PRINT"FOR SIMPLICITY, WE SHALL ASSUME A GALLON OF G
AS NOW COSTS" : PRINT"$1.00 AND WILL INCREASE IN COST AT THE EST
IMATED RATE OF" : PRINT"INFLATION.
1340 PRINT : PRINT"IT IS FURTHER ASSUMED THAT YOUR YEARLY DIVIDE
NDS, INTEREST," : PRINT"ETC. IS RE-INVESTED AT THE RATE OF ORIGI
NAL INVESTMENT.
1350 PRINT : PRINT"NOTE :  AFTER EACH ENTRY, YOU MUST PRESS 'ENT
ER'
1360 PRINT
1370 INPUT"AMOUNT OF YOUR INVESTMENT IN $.";A
1380 INPUT"NUMBER OF YEARS?";Y
1390 INPUT"YEARLY RETURN EXPRESSED AS A % RATE.";R
1400 INPUT"YOUR INCOME TAX BRACKET (IN %)?";TB : T=(100-TB)/100
1410 RR=(R*T)/100+1
1420 INPUT"ESTIMATED INFLATION RATE IN %";B : BB=B/100+1
1430 C=R*T : Z=1 : Q=A
1440 FOR I=1TOY
1450 A=A*RR
1460 Z=Z*BB
1470 NEXT : I=I-1
1480 X=A/Z : W=X/Q : V=(1-W)*100
1490 CLS : FORF=1TO1000 : NEXT
```

Program Listing 2 Continues

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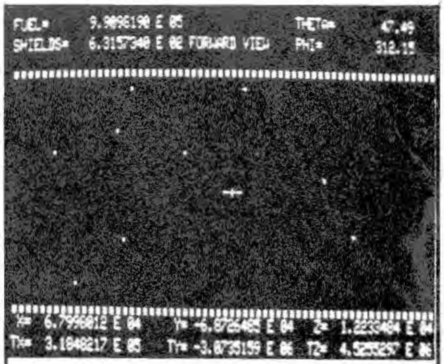

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MONEY DOS

Program Listing 2 Continued

```
1500 PRINT : PRINT"TODAY YOUR $";Q;" INVESTMENT BUYS ";Q;" GALLO
NS OF GAS.
1510 PRINT : FORF=1TO1000 : NEXT : PRINT"IN ";I;" YEARS YOUR INV
ESTMENT WILL HAVE GROWN TO $";: PRINT USINGX$;A
1520 PRINT : FORF=1TO1500 : NEXT : PRINT"IT SEEMS THAT YOU HAVE
DONE WELL UNTIL YOU BUY SOME GAS...." : FORF=1TO1500 : NEXT : PR
INT : PRINT"WHICH WILL BE $";: PRINT USINGS$;Z;: PRINT" PER GALL
ON.
1530 FORI=1TO1500 : NEXT : PRINT : PRINT"NOW YOU CAN BUY ONLY ";
: PRINT USINGZ$;X;: PRINT" GALLONS OF GAS.
1540 FORI=1TO1500 : NEXT : PRINT : PRINT"WHICH MEANS YOU WILL LO
SE ";: PRINT USINGV$;V;: PRINT" % OF YOUR PURCHASING POWER!
1550 TR=B/T : PRINT"YOU MUST INVEST YOUR MONEY AT ";: PRINT USIN
GV$;TR;: PRINT"% TO BREAK EVEN.
1560 PRINT : PRINT : INPUT"TO EXAMINE ANOTHER INVESTMENT, PRESS
'ENTER'. MENU=1";LL : IFLL=1 THEN 20 ELSE 1320
1570 CLS : PRINT"RETURN TO MENU BY PRESSING [   PRINT TEXT WITH A
 @
1580 E$=INKEY$ : IFE$="" THEN 1580 ELSE PRINTE$;
1590 IF E$="@" THEN LPRINT R$+"" : R$="" : PRINT : GOTO 1580
1600 IFE$="[" THEN R$="" : E$="" : GOTO20
1610 R$=R$+E$ : GOTO1580
1620 NEXTT
1630 PRINT"RETURN TO MENU, PRESS 'ENTER'";: INPUT : GOTO20
1640 CLS : PRINT"ACTUAL RETURN ON DISCOUNTED BONDS." : PRINT
1650 INPUT"IF BOND IS TAX FREE ENTER A  1";TF
1660 INPUT"TOTAL DOLLARS INVESTED";DI
1670 INPUT"BOND PRICE  (A BOND SELLING FOR $560 WOULD BE ENTERED
 AS 56 ";BP : BP=BP*10
1680 INPUT"MONTHS LEFT TO MATURITY";MA : ML=MA/12
1690 CG=1000-BP
1700 XX=DI/BP
1710 INPUT"COUPON RATE";CP : CP=CP*10*ML
1720 INPUT"TAXPAYERS BRACKET";TP : TB=(100-TP)/100 : TX=TP
1730 INPUT"RISK FREE CD INTEREST RATE";IJ : II=(IJ/100)*ML : PRI
NTII
1740 I1=.5*ML
1750 CLS : PRINT"RESULTS OF A BOND PURCHASED AT $";BP;" DUE IN "
;MA;" MONTHS
1760 PRINT"FOR A TAXPAYER IN THE ";TP;"% BRACKET VS A CD AT ";IJ
;"%
1770 PRINT : PRINT"THE BOND","GROSS RETURN","AFTER TAX RETURN"
1780 AT=CP*TB : IFTF=1,AT=CP
1790 PRINT"INTEREST",CP,AT
1800 TP=TP/100
1810 NN=CG*.4 : NM=NN*TP : NG=CG-NM
1820 PRINT"CAP. GAIN",CG,NG
1830 TN=NG+AT
1840 PRINT"TOTAL NET",,TN
1850 R1=BP*II : R2=R1*TB
1860 PRINT
1870 PRINT"CD AT ";IJ;"% RETURNS  $";R1;" GROSS OR $";R2;" NET!
1880 DA=TN-R2 : PR=(DA/R2)*100
1890 PRINT"EACH BOND WILL YIELD $";DA;" MORE THAN THE CD." : PRI
NT"OR ";PR;"% GREATER RETURN
1900 TC=(100-TX)/100 : X1=TN/MA*12 : X2=X1/TC : X3=X2/BP
1910 PRINT"NET RETURN FOR ONE IN ";TX;"% BRACKET = CD AT ";: PRI
NT USINGS$;X3*100;: PRINT"%
1920 IFDI>1 THEN DX=DA*XX : PRINT"$";DI;" INVESTED IN BONDS YIEL
DS $";DX;" MORE AFTER TAXES." : PRINT
1930 INPUT"MORE=2  MENU=1";MJ : IFMJ=2 THEN 1640 ELSE 10
1940 CLS : PRINT : PRINT : PRINT"THIS ALLOWS YOU TO DETERMINE TH
E ADVANTAGE OF A SHORT TERM
1950 PRINT"INVESTMENT IN COMMERCIAL PAPER VS. A CD." : PRINT
1960 INPUT"PRINTOUT=2";PO : CLS : INPUT"AMOUNT";M1
1970 INPUT"NUMBER OF DAYS";M2
1980 INPUT"INTEREST RATE";M4 : M3=M4/100
1990 INPUT"YIELD ADVANTAGE OVER MONEYMARKET FUNDS IN %";MM : MM=
MM/100
2000 MA=M1*MM/365*M2
2010 Q1=M1*M3/365 : Q2=Q1*M2 : CLS : PRINT : PRINT
2020 PRINT"$"; M1;" INVESTED FOR ";M2;" DAYS @ ";M4;"% RETURNS "
;: PRINT USINGT$;Q2
2030 IFPO=2 THEN LPRINT"$";M1;" INVESTED FOR ";M2;"DAYS & ";M4;"
% RETURNS";: LPRINT USINGT$;Q2
2040 PRINT"DAILY INTEREST RETURN = $";: PRINT USINGX$;Q1
2050 IFPO=2LPRINT"DAILY INTEREST RETURN = $";: LPRINT USINGX$;Q1

2060 Z1=Q1/M4 : PRINT"AN ADDITIONAL 1 PERCENT/DAY ON $ ";M1;"=$"
;: PRINT USINGS$;Z1
```

Program Listing 2 Continues

Program Listing 2 Continued

```
2070 I1=Z1/8 : PRINT"1/8 OF A POINT = $";: PRINT USINGU$;I1;: PR
INT" PER DAY
2080 PRINT : PRINT"CURRENT ADVANTAGE OVER MONEYMARKET FUNDS FOR
PERIOD=$";: PRINT USINGX$;MA
2090 IFPO=2LPRINT"MONEYMARKET FUNDS NOW YIELD ";Y1;"%";" YOUR CO
MMERCIAL PAPER YIELDS ";M3 : LPRINT"THE YIELD ADVANTAGE AMOUNTS
TO $";: LPRINT USINGX$;MA
2100 IFPO=2LPRINTCHR$(31) : LPRINT" " : LPRINT"                CO
NGRATULATIONS !
2110  PRINT@970,"";:INPUT"MORE=2 RETURN TO MENU=1";O9 : IFO9=1 T
HEN 20 ELSE 1960
```

ment if you are to prosper.

● *If the broker says there is no vacancy problem . . . figure 10%.*

Even the most desirable rental units experience at least a 5% loss from maximum gross income due to such unavoidable things as repainting, recarpeting, and other periodic maintenance. The average property will likely experience about 12%.

● *Buy with nothing down and become a slumlord.*

The properties which can be purchased for small down payments usually rent to people who are at the low end of the pecking order, hence the landlord must face such additional expenses as unpaid damage, getting court orders to evict people who refuse to move, renting to stockbrokers, bad checks, ad nauseum. Many excellent deals can be had from sellers who went in with no real idea of the work and problems involved. Think about it . . . if these units were so profitable, why is the seller so eager to accommodate you?

● *They can take everything but your wife (lamentably).*

Before you sign up for a big mortgage, check the law in your state and you may find that you are liable for the mortgage. e.g. You default and the mortgage holder forecloses. Then he sells at public auction. If the price does not pay him in full, he may be able to obtain a deficiency judgement and seize and attach your other assets . . . which could include your computer toys as well as less valuable items such as your bank account, car, or ski boat.

● *Rent furnished, or, "Last night they left . . . with your couch."*

Furnished property will likely show a better current return than one unfurnished. This is somewhat of an illusion as the furniture must be replaced about every 3–5 years while the unfurnished unit requires no such periodic expenditure. Unfurnished units attract, generally speaking, a more stable class of tenant. You need not worry about this group disappearing in the middle of the night.

● *Disaster will strike at the least propitious time.*

Twenty five years ago I bought five units. I didn't mind spending my weekends painting, fixing, and trying to collect the rent from 200 lb. gorillas in a surly mood. Then, one night at about 2AM my phone rang. "My toilet won't flush," said Mrs. Brooks. "Oh S---," said I. "That is exactly what I intend to do as soon as you fix it, Mr. Keynes." Mind you, I'm not suggesting that rental property is bad, only that it "ain't no bed of roses." In fact, I did parlay my five units into 50 units in ten years, and, it was all worth it. (GASP)

The program in Program Listing 1 does not weight the expenses based on the age of the building. The older the structure, the more likelyhood of unanticipated expenses. Another factor which will help determine the worth to you is your tax bracket. The higher your tax bracket, the more valuable the depreciation becomes. When you apply the program to the property you are considering, you may find that the chicken pie is in fact . . . uh . . . chicken feathers.

When you invest your money in a small number of rental units you are *not* an investor. It is a business venture wherein you are an active, hard working partner. Compare this with the returns available from risk free investments (currently about 14% from AAA rated tax free bonds) before you decide. P.S. My business is managing about $200 million in the stock and bond markets. If you want to risk some money, take a look at First Executive Life traded on the over the counter market (FEXC). According to *Forbes Magazine* of January 4th, FEXC ranked #1 in performance over the last five years. As this is written FEXC is at 7½. They have reinvented life insurance and are saving people millions in premiums. They recently signed an agreement with a major brokerage firm to handle their product. A good product handled by a firm with an enormous affluent client base has *interesting* possibilities. ■

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- ____ 4. Popular Computing
- ____ 5. Creative Computing
- ____ 6. 80 U.S.

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- ☐ 3. $2,001—$3,000
- ☐ 4. $3,001—$4,000
- ☐ 5. Over $4,000

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- ☐ 2. No

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- ☐ 2. No
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- ☐ 3. $251—$500
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80 CALENDAR

June

1-2 The Yankee Group, Cambridge, MA. **The Second Phase of Office Automation**, New York, NY.

1-4 Management Science America Inc., Atlanta, GA. **Payroll-Personnel Conference**, Hilton Hotel, Atlanta, GA.

4-6 San Diego Computer Society, **Ham-Comp 82**, Town and Country Convention Center, San Diego, CA.

5 North Area Repeater Association Inc., St. Paul, MN. **Amateur Fair: A Swapfest and Exposition of Personal Computer and Communication Equipment**, Minnesota State Fairgrounds.

6-8 North Carolina State University. **Sixth Annual Conference on Computers and the Humanities**, Raleigh, NC.

7-10 American Federation of Information Processing Societies Inc., Arlington, VA. **1982 National Computer Conference**, Astrohall, Houston, TX.

7-9 Technical Education Research Centers, Cambridge, MA. **Microcomputers in Education Workshops**, Taft School, Watertown, CT.

7-11 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Design/Structured Program Design**, Washington, DC.

7-11 MUMPS User's Group, Washington, DC. **11th Annual Conference**, Hilton Hotel, Denver, CO.

8-11 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Requirements Definition**, San Francisco, CA.

10-11 A/E Systems Report, Newington, CT. **Third International Conference on Automation and Reprographics in Design Firms**, Expocenter, Chicago, IL.

13-17 National Computer Graphics Association, Washington, DC. **Third Annual Conference and Exposition**, The Anaheim Convention Center, Anaheim, CA.

14-16 VR Information Services, Austin, TX. **19th Design Automation Conference**, Caesars Palace, Las Vegas, NV.

15-16 The Yankee Group, Cambridge, MA. **The Second Phase of Office Automation**, Palo Alto, CA.

15-18 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Design**, Boston, MA.

15-18 Integrated Computer Systems, Santa Monica, CA. **Computer Graphics course**, Washington, DC.

15-18 Integrated Computer Systems, Santa Monica, CA. **Distributed Processing, Mini and Microcomputer Implementations**, Washington, DC.

18-20 Midwest Affiliation of Computer Clubs and Franklin University, Columbus, OH. **Computerfest**, Phillips Hall, Franklin University, Columbus.

21-25 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Design/Structured Program Design**, St. Paul, MN.

22-25 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Systems Design/Structured Program Design**, Dallas, TX.

22-25 Integrated Computer Systems, Santa Monica, CA. **Computer Graphics course**, San Diego, CA.

28-30 The Interface Group, Framingham, MA. **COMDEX/SPRING '82**, Atlantic City Convention Hall, Atlantic City, NJ.

28-30 Online Conferences Ltd., London, England. **Videotex '82**, Hilton Hotel, New York, NY.

28-3 Ken Orr and Associates Inc., Topeka, KS. **Course on On-Line/Real-Time Systems Design**, Chicago, IL.

29-2 Ken Orr and Associates Inc., Topeka, KS. **Course on Structured Data Base Design**, Denver, CO.

29-2 Integrated Computer Systems, Santa Monica, CA. **Computer Graphics course**, Boston, MA.

29-2 Integrated Computer Systems, Santa Monica, CA. **Hands-On Pascal Workshop**, Boston, MA.

July

13-16 Integrated Computer Systems, Santa Monica, CA. **Distributed Processing, Mini and Microcomputer Implementations**, Boston, MA.

13-16 Integrated Computer Systems, Santa Monica, CA. **Hands-On Pascal Workshop**, San Diego, MA.

20-23 Integrated Computer Systems, Santa Monica, CA. **Distributed Processing, Mini and Microcomputer Implementations**, San Diego, CA.

21-23 University of Oregon, College of Education. **The Computer: Extension of the Human Mind**, Hilton Hotel, Eugene, OR.

August

1-4 Nevada-Reno Division of Continuing Education and Washoe County School District. **Microcomputer Applications in Education**, Cloud's Cal-Neva, Lake Tahoe, NV.

Coming Next Month

Games, games and for good measure, a few more games. Our third annual August games issue has more aliens, mazes, puzzles, challenges and adventures than our first two collections combined.

Remember Star Trek 4.0 in last August's issue? Well, *80 Micro*'s resident wampeter, Jake Commander, is flowcharting again. Star Trek 4.5? That's doubtful, but whatever he turns out promises to be exciting. Also worth waiting for is Kalvos Gesamte's game debut. A game by Kalvos Gesamte? Yep, that's what he said at first. If nothing else, it promises to be very interesting. And that's just for starters. We'd love to tell you more, but there's not enough room in this little box. ■

80 NEWS

Edited by John P. Mello Jr.

Micros and mainframes wed in ivy

Kerry Leichtman
and Jake Commander
80 Micro staff

Sometime next fall Dartmouth College, in Hanover, NH, will go on line with a new concept in computer time-sharing systems. The system is called Avatar, which is, loosely, an acronym for "A Physical Realization of a Conceptional Idea." So what's in a name? More importantly, Avatar weds the ease of working with a microcomputer to the storage, versatility and computing power of mainframes.

Briefly, when the system is up and running, an authorized user will be able to sit down at a micro terminal and work on it and a mainframe at the same time. The user benefits from the best aspects of micros and macros without suffering the drawbacks of either.

The principal drawback of the mainframe is its cost of on-line time, while the main drawback of the micro is its comparatively primitive operating systems and limited storage capacity. Using the Avatar system, a person can edit a file of a million bytes or so on a micro terminal of only 32K. Like an invisible force, Avatar constantly supplies the micro with whatever file portion is desired by the user—automatically. As Avatar scrolls one section out and another in, it saves and stores the new version while the operator is working on the next section. In effect, the micro user has continuous access to the full one-million byte file without having to break the file into, say, 20 separate floppy disks.

The Avatar project's general is William

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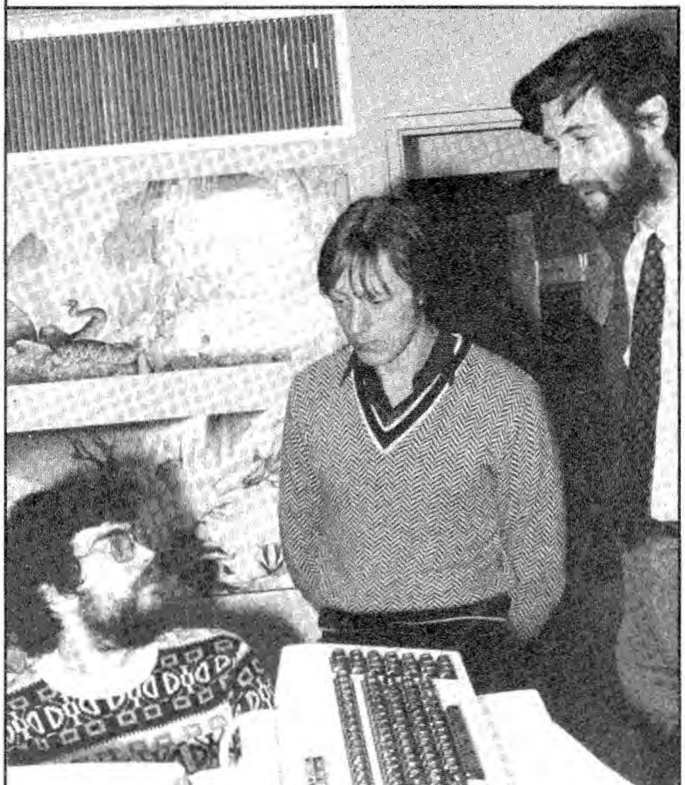

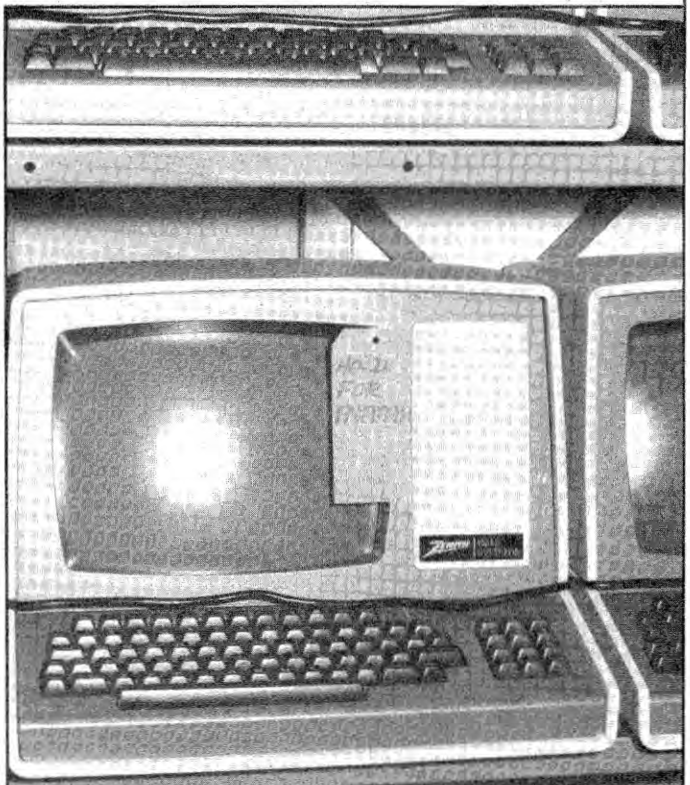

Jake Commander (center), *80 Micro* technical consultant, and William Arms (right) watch students demonstrate Avatar's micro to mainframe capabilities. In photo on right, Zenith Z-19s are waiting to come on line with Avatar.

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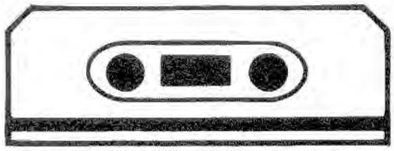

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LOAD 80 cassettes for BACK ISSUES of 80 Micro now available

In the April, 1981 issue of 80 Micro we introduced LOAD 80 to save you the time and trouble of typing our programs yourself. LOAD 80 cassette tapes contain dumps of the major program listings in 80 Micro.

If you have not yet ordered any LOAD 80 tapes and wish you had, don't worry. We are now offering a "back issue" cassette program. You can order any LOAD 80 cassette from April, 1981 to date for $9.97. Back issues of 80 Micro are also available with the LOAD 80 cassettes for $3.50. With the complete documentation found in the companion magazine issue, you should have no difficulty loading any of 80's major programs.

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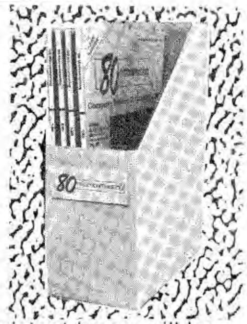

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DARTMOUTH *continued*

Arms, Dartmouth's director of computing services. Arms's background is in mainframes, but as micro technology became more capable, he became interested in fusing the two technologies together. "There is a great tendency," he told *80 Micro* during a recent visit, "to think of micros and time-sharing systems as rivals. This should not be the case."

Another example of Avatar at work: A class of 30 students is using a particular program to calculate findings in an engineering project. They are working individually on sections of the project, but will pool their results into a final solution. Suppose one of the students finds a modification to one of the programs the class is using. Using micros, the students would have to make 30 individual copies of their modified programs for the class. Using Avatar, they only need to store the new program into the mainframe and instantly the entire class has access to the newer, better program.

There are three main components to Avatar. First is the terminal. Avatar will use Zenith Z-19 dumb terminals. The second component, the micro, will not have a keyboard or CRT display. It will be no more than a box containing 32K RAM, 24K ROM and the various electrical circuitry. Twenty-four K is a lot of ROM. Most of it is for editing purposes.

Next is the mainframe. Dartmouth's Kiewit Computation Center houses many large macro systems. The Avatar system user will have access to them all.

When using the Z-19 as a microcomputer, the keyboard will send its input to the box, which will in turn send its output to the Z-19's CRT. When using the Z-19 with the mainframes, files will be dumped into the micro which will then send them along to the terminal. The difference between the speeds of displaying information from the macro or the micro to the Z-19 is no more than a quick blip on the screen.

In developing Avatar, Arms was attempting to accomplish many individual goals. "When developing a network, high speed, low cost and reliability are the things you always look for." The wedding of macro and micro has distinct advantages over using one exclusive of the other. "It doesn't matter if the CPU is miles away, or right in front of you. But it can be advantageous having a CPU in your terminal," Arms said.

The program's cost effectiveness comes into play when you compare the actual time spent on line. Using another hypothetical example: suppose that when an engineering student was modifying his program it took three hours. Using the current type of time-sharing system that on-line time would have cost him x dollars per hour, or 3x. Working on that same program modification under the Avatar system, he would be able to greatly reduce that on-line charge.

He would need the same three hours to work on the program, but of those three hours maybe only 10 minutes would be spent accessing the mainframes. The rest of the time would be time spent on the Z-19 accessed to the micro. The student would be working on the files stored in the mainframe but on the micro. Every time he called for a program section out of the micro's 32K range, Avatar would exchange that 32K for another. The transaction would not even take one second. But in that time, Avatar will have taken the edited 32K, saved and stored it, and supplied the student with another 32K of program.

Arms and his colleagues are mainframe people who, in the past, cast only a sideways glance at the emergence of the microcomputer: first a toy, later an interesting development, and finally a tool to make their megabyte world accessible to many, many others. They are more than optimistic about Avatar's revolutionary time sharing concept. "We combined micros to mainframes to provide a good service at a moderate price," Arms explained. And it seems they have done just that. ■

High Court dodges v-games question

It looks like the nation's highest court is not yet ready to wade into the controversy over government regulation of video game rooms.

The U.S. Supreme Court has returned to lower court a case involving an arcade ordinance in Mesquite, TX, a suburban Dallas community of 67,000 inhabitants. Included in the city law governing coin-operated amusement establishments are provisions requiring youths under 17 to be accompanied by an adult when playing video games in an arcade (*80 Micro* news, Jan. 1982).

The High Court's decision to return the case to the U.S. Court of Appeals for the Fifth Circuit located in New Orleans pleased neither side in the dispute.

"We were disappointed that the court did not address the merits of the age restriction issue," said Don Sampen, an attorney with the Chicago law firm representing Aladdin's Castle Inc., operator of a chain of some 250 game rooms across the country and a subsidiary of pinball giant Bally Manufacturing Corporation. He told *80 Micro* he felt confident Aladdin would prevail, as it did the first time, in the appeals court.

Elland Archer, city attorney for Mesquite, said of the court's dodging the age requirement issue: "We would have been much more pleased to have an outright decision on that one. I really felt it was a question that they could consider, but they had some question about it."

In the court's 7-2 decision, it said it failed to understand if the lower court's opinion rested on state or federal law. If the basis of the appeal court's decision was state law, the justices opined, they lacked jurisdiction to review it. But if it rested on federal law, then the High Court would have to take a closer look at it.

"There was no question in my mind," Archer said in a phone interview, "that it was decided solely on federal law. [The appeals court] simply mentioned the state constitution in passing."

Ironically, that was also the opinion of the two justices dissenting with the majority decision written by Justice John Stevens.

"[T]here is no reason in this case to suspect," Justice Byron White dissented, "that the Fifth Circuit's standard for evaluating Appellee's Due Process and Equal Protection claims under the Texas Constitution differed in any respect from federal constitutional standards."

The appeals court's mention of Texas cases, Justice Lewis Powell argued in his dissent, does not suggest "an adequate and independent state ground for overruling the Mesquite ordinance."

He added: "[T]he inclusion of three cursory state-law citations in a full discussion of federal law by a federal court is neither a reference to nor an adoption of an *independent* state ground.

"The Court's view allows federal courts overruling state statutes to avoid appellate review here simply by adding citations to state cases when applying federal law."

Mesquite's lawyer Archer maintained now that the appeals court knows the score, it will do what it has to to make its earlier decision stand. "My personal opinion," he said, "is they'll say that they did rule on some independent state ground so they won't get reversed by the Supreme Court. That's what I'd do if I were a judge."

✓See List of Advertisers on page 386

Computer theft bill filed in Mass.

Proposal would make breaking into computer files illegal

by Steven Frann
80 Micro Staff

Will Massachusetts become the 13th state to adopt legislation providing for the prosecution of computer related crime?

In March the Massachusetts Legislature's Committee on Criminal Justice heard testimony at the State House in Boston on a bill sponsored by Rep. Kenneth M. Lemanski (D-Chicopee) that would make it illegal for someone "to gain, or attempt to gain, access to any information of any kind within a computer to which such access is unauthorized, by any means, electronic or otherwise, from any location." Violators of the proposed law would be "punished by imprisonment in the state prison for not more than five years, and by a fine of not more than $10,000."

Lemanski, speaking from a prepared statement, said: "Many cases relating to computer abuse have been lost because many states including our own support the rule that electromagnetic impulses are not property. House Bill 5562 will eliminate this problem entirely by circumventing the question of property and instead focusing on the actual attempt to gain unauthorized entry to the system in question. Currently it is highly debatable whether or not a crime is being committed.

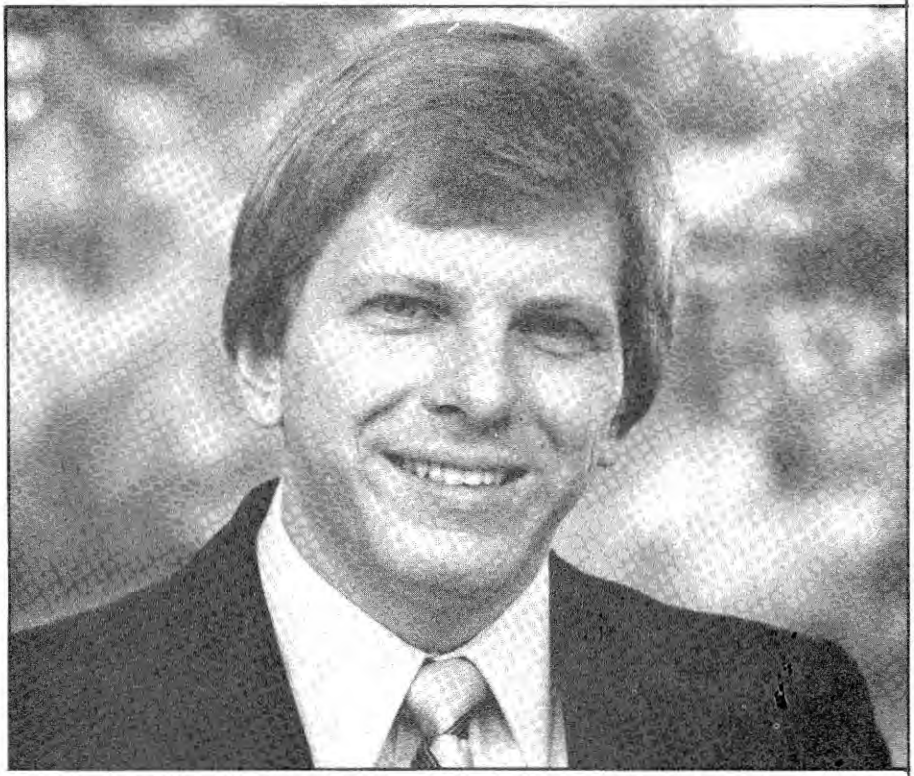
"H5562 is purposely flexible. H5562 will give prosecutors the base they desperately need in tracking down on what can be potentially devastating abuses."

Using phone lines to unlawfully gain access to information stored in computers would be illegal under this bill. "Many computer crimes are difficult to prosecute since the criminal was on the system rather than actually being physically present at the site of the computer," Lemanski said.

He noted legislation relating to computer crime is currently before the U.S. Congress.

Representative W. Paul White (D-Boston), House Chairman of the Committee, asked Lemanski, "Is it possible under present law for a District Attorney to prosecute this type of crime?"

"They can prosecute under a general class of action, not specifically as a computer crime. We hope to establish a separate crime for computer theft which would point out the problems that the computer industry not only in Massachusetts but across the country faces," Lemanski answered.



Rep. Lemanski: Many states have lost computer crime cases because electromagnetic impulses are not recognized as property.

Following Lemanski's testimony, Joseph A. Federici and James W. Stace, both of the Data Processing Management Association (DPMA), a group with 29,000 members in computer-related fields worldwide and with international headquarters in Park Ridge, IL, appeared before the committee in support of the bill. Frederici, vice president of government and business relations of the DPMA and also Customer Service Manager of Bay State Abrasives of Westboro, MA, explained the DPMA's position on the issue saying, "It is our intent to come up with a computer crime bill that will be a model for all states to follow."

The DPMA is currently studying the computer crime bills adopted in Arizona, California, Colorado, Florida, Georgia, Illinois, Michigan, Montana, New Mexico, North Carolina, Rhode Island and Utah and the bills pending in Massachusetts, Hawaii, Missouri and Pennsylvania. When they complete their study they will draw up a model bill for presentation to state legislatures where a computer crime bill has not yet been adopted.

Stace, who is international director for the Boston Chapter of the DPMA and who also works for the Commercial Union Assurance Companies located in Boston, said "There is a definite need for passage of the bill."

In an interview after the hearing, Tom Nichols, an aide to Lemanski, echoed the legislator's testimony: "We are intentionally keeping the law vague so that it will be refined by judicial review. It is best to give the prosecutors some statute to which they can resort. As it stands now they have to resort to trespassing or larceny. This law would make the simple act of accessing a computer and breaking into files illegal. To a jury that's not confusing. It's not 'Is it property?' or 'What's the nature of electromagnetic impulses?' It's 'Did he or did he not break into the file?' That's a much simpler question."

Lemanski anticipates a favorable report from the committee. ■

✓See List of Advertisers on page 386

Greats of Grand Old Game play ball in microcomputer

It's being billed as "The Greatest Baseball Game Never Played."

On July 14, the greatest American League stars of all time will be pitted against the greatest players from the National League in a computer all-star game to be aired on a national network of more than 200 radio stations including some in Canada.

The program for the game is written in Apple Pascal and will cook in an Apple III microcomputer with 128K of memory, a floppy disk drive and a Profile 5 megabyte hard disk drive.

The game is the brainchild of BFV&L Promotions Inc. of St. Louis. Vice President Don Weber told *80 Micro*, "This is an entertainment piece for the radio audience to depict as accurately as possible what would have transpired had these players played each other."

Baseball fans chose the rosters for the all-time all-star teams through ballots published in *The Sporting News* this spring. Editors at that national weekly based in St. Louis chose the players appearing on the ballot—for each league 10 outfielders, 10 pitchers, and five candidates for each of the other positions—but there was also room for write-ins.

"There were a number of obvious choices," observed SN's Circulation Director Donald Barrows, "but it was difficult limiting the ballot to 10. After you pick Babe Ruth and a couple of more, you can debate what the American League outfield will be."

Barrows added the game will be on a batter-by-batter basis rather than pitch-by-pitch. "The geometric multiplication of the problem would become too great," he said. "And who's to say what Cy Young would have thrown Ted Williams. You're really in a speculative mode there."

However, after the computer determines the outcome of a pitcher-batter confrontation, a pitch-by-pitch version of it will be scripted for the game's play-by-play commentator, Jack Buck, the voice of the St. Louis Cardinals. "Jack Buck will know that Ty Cobb got a single off Koufax," Barrows explained. "He will script Koufax's pitching to Cobb in the way that he probably would have pitched to him. The input for that will be supplied by our editors."

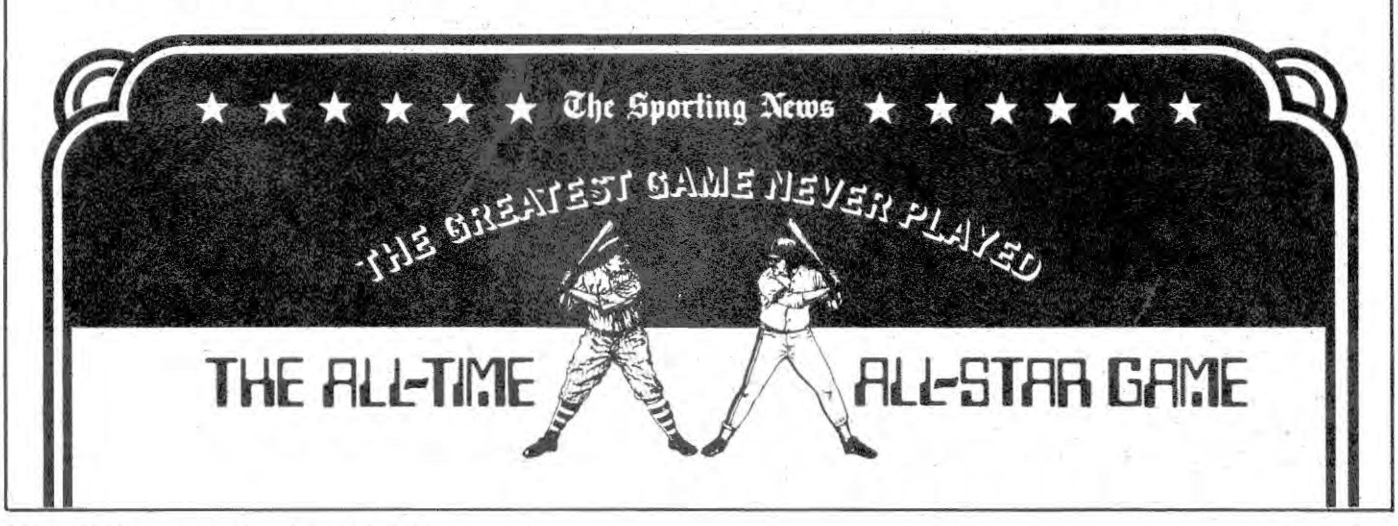
Weber said it was difficult establishing statistics for some aspects of the game. Game developers failed to establish fielding statistics for many players, he noted, so an error factor was developed based on a general standard.

Other statistics in the game are guesswork, Barrows noted: "If you try to make a decision, for example, of what percentage of the time Ty Cobb hit to left field, center field and right field, it's difficult. We've got some of that in the program, but for much of it we had to call on the expertise of our editors—God knows a couple of them are old enough to say they saw Cobb play—and come up with statistics that are perhaps not verifiable. They are subjective, but subjective from the best experts we can get."

Although the computer run of the game will take place early this month, Weber explained, the outcome of the game will be "one of the best kept secrets since who shot J.R." The Midwest promotions man added: "We have developed a format for maintaining the secrecy of the outcome of the game. Even the people doing the technical and broadcast work will not know the actual outcome. Although there will be one real game off the computer, we will dummy in other innings so they won't know which seventh, eighth and ninth innings are the legitimate ones."

Asked if the organizers of the game intend to market it commercially, Weber said: "The possibility is there. It would take some refining and graphics."■

Lindsey Nelson will join Jack Buck when present and past stars clash in all-time, all-star simulation.



Game boom spins off book boom

Authors with varied backgrounds write game books fast

by John P. Mello Jr.
80 Micro News Editor

There's big money being made in video games—$6 billion in 1981 alone. The money being made is not only from making the games and machines to play them on, but in writing about the games and how to win them.

Since December, publishers have been churning out video game books as fast as they can whip their authors to write them. At least eight books have appeared on the market this year and the promise of a blockbuster—like Ken Uston's *Mastering Pac Man* which has sold more than a million and half copies—has spurred publishers to pressure their video writers to pump out more of the genre.

"I've had to meet excruciating deadlines," said Craig Kubey, author of *Scoring Big at Pac Man: How to Munch the Monsters* rushed into print by Warner Books in January and *The Winners Book of Video Games* issued by Warner in April.

Kubey told *80 Micro* he was finishing *Winners* last November when Warner decided to market the book's Pac Man chapters separately. Gathering some additional material, he wrote the Pac Man book in three days.

The 32-year-old lawyer and former member of Nader's Raiders said *Winners* has been a very demanding project. "It hasn't been a matter of me calling my own shots and saying, well, I think it will take me two months to do this working 40 hours a week. It's been, sorry, you've got to do this in 12 days because of our scheduling."

Several times, Kubey said, he had to put in 100-hour weeks and all-nighters to meet deadlines. Four times he had to travel from his home in Davis, CA, to San Francisco—a trip of several hundred miles—to use an air express service that worked on Sundays. "I had to get all the photographs and all the illustrations for the book," he observed, "in 48 hours, though I'm neither a photographer nor artist."

Kubey said he got the idea for *Winners* on his 31st birthday, July 4, 1980. His mother and 18-year-old brother drove to Davis to visit him. During the ride, his brother, with pen and notebook in hand, wrote "The Almost Complete Book of Asteroids" and gave it to Kubey as a birthday present. The older brother added to the joke by creating a professional-looking cover with transfer lettering and writing a two-page apocryphal description of its author.

Later, another visiting relative, his sister from Los Angeles, saw the book and suggested he do it for real. He decided to take his sister's suggestion to heart. At the time, Kubey was working at a "menial" job as night librarian at the University of California-Davis. "I was interested in video and in writing," he said, "but most of all, I was desperate not to reject what everyone else would consider a foolish suggestion."

Kubey began contacting agents and eventually, one took an interest in his idea. When the agent approached Warner Books with the proposal, there was instant enthusiasm for it.

Michael Blanchet got the idea for *How to Beat the Video Games* while walking through a book store. The 22-year-old tournament winning game player had a part-time job at the time in an arcade in Morristown, NJ. "There were books on Bridge and card game strategies," he remembered, "but I thought, no one ever plays those games anymore. They're all in the arcade spending their money. So why not a book on video games?"

While he was writing the book, he competed in a video games tournament at the Willowbrook Mall in Wayne, NJ. He won the "Battle Zone" competition, scoring 73,000 points in three minutes. His exploits at the competition were included in the Sunday magazine of *The New York Times*. An enterprising agent saw the story and approached Blanchet about writing a video games book, unaware he and the youth were on the same pulse train.

After the agent sold the book to Simon & Shuster's Fireside Division, the ambitious Blanchet suggested he start writing a twice-weekly syndicated newspaper column on video games. The Tribune Company Syndicate Inc. of New York City liked the idea and gave Blanchet the go ahead. Now 90 newspapers carry the column.

The Garden State youth was introduced to computers and video games by his father, who taught computer science in grades 9-12 in the Madison, NJ, burrough school system. During the summer months, Blanchet's father brought the school system's Hewlett-Packard system home, set it up in his son's room and taught him Basic. Soon Blanchet was programming his own computer games. "At that time, you didn't have a CRT," he recalled. "You only had a printer. Every time a situation changed, you had to reprint the whole screen. It took up rolls of paper."

Blanchet has always loved pinball and was pumping $20 a week into the machines when he found a new love—coin-operated video games. "I'd go to 24-hour diners, bars, wherever I could find a game—at the time, Space Invaders," he remembered. "Wherever there was a game to play, I'd either drive or get myself there somehow to play it."

He set a goal of 10,000 points for himself. He scored 12,000. "On the grand scale, that's nothing. But it was enough for me. I was happy at that point."

I will never claim to you that I am a great player," Arnie Katz said, "But you don't have to be Kareem Abdul Jabbar to coach Kareem Abdul Jabbar. What I'm very good at is analyzing the games and coming up with strategies."

Katz, editor and publisher of *Electronic Games* and that magazine's executive editor, William Kunkle, have co-authored *The Player's Guide to Atari VCS Home Video Games* published by Dell. Katz, 35, said his and Kunkle's book grew out of their work at their magazine, a 250,000-circulation monthly founded in October 1981. The magazine—which covers hand-held, table-top, programmable, computer and arcade games—is slanted toward news, reviews and strategy, Katz explained. "It was only natural to take that concept and turn it into a book. There's no one writing about electronic games as frequently and steadily as Bill Kunkle and I. For us, the book was really an extension of our overall involvment with this exciting new hobby."

He said he and Kunkle's interest in video games goes back quite a few years: "We were among the first to purchase the Odyssey and Atari when they first came out. Bill owns one of the first Odyssey units that came out in '72. It had overlays that fit over the tv screen."

But, Katz said, he and Kunkle—who both write a column called "Arcade Alley" for Video magazine—had another reason for writing their book: "We were unpleas-

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WRITERS*continued*

antly surprised by the quality of the first few books that came out on the subject. We felt there should be something authoritative, well-written and well-researched. It was obvious that if that was going to happen, it would have to be us, since we have the deepest experience as well as the journalistic credentials."

Attorney Kubey seemed to share Katz's view on some of the video books on the market. He maintained the authors of one Pac Man book only covered action to the "ninth key." "That's like writing a book about the American automobile industry and not mentioning General Motors," he said.

He claimed the authors tried to get insights into the game by talking to players, but the players they talked to were "mediocre." The best player they interviewed had a score of 115,000, he noted. "With a score like that, you don't even get into the more sophisticated modes of the game." He added his top players had scores exceeding two million.

"I don't want to knock the competition because it sounds bad," observed Katz of *Electronic Games,* "but I think it's very obvious to anybody that reads the books that many of the people attempting to do them are not writers and are not familiar with the games." Katz, a professional writer and editor for 12 years, and Kunkle, a writer on pop subjects for six years, took four months to research and write their book. "We didn't want to do a quickie book," Katz said. "We took our time. We researched thoroughly even though we played every game hundreds of times. I must say the people at Dell understood right from the first the difference between a quick book and a good book."

Asked why he and Kunkle aimed their books at Atari, Katz observed: "Most of the books that have come out have concentrated on the coin-ops. While we think the commercial arcades are very important, they're hardly the whole story. There are now approximately 6,000 American households with Atari systems and we felt it was a better idea—rather than being the 10th coin-op book—to be the first book to really treat a major home system."

He said he prefers home games to arcade games: "I like to stretch out and take my time and play without a lot of distractions, at least the kind you get in an arcade. At home, no one is standing in line behind you. I enjoy the arcades. I'm not knocking them. But I enjoy being able to sit there and play and play and play without worrying about monopolizing the machine."

Asked what game systems he owned, Katz responded, "You name it." He also owns several microcomputers including a TRS-80 Color Computer, although he doesn't consider TRS-80s very good game computers.

Author Ken Uston also owns a squadron of microcomputers and game machines. After his *Mastering Pac Man* became a runaway best seller his publisher, New American Library, asked him to do a book on video games. The result was *Score: How to Beat the Top Video Games,* which climbed onto the Walden and Dalton chains of book stores bestseller lists within three weeks after release.

His publisher didn't want the former director of operations research for the Southern New England Telephone Company to stop there. It asked him to write a book on home video games. He bought five game units including Atari, Intellivision and Odyssey, and the 181 games made for them. "It must have cost me 10 grand to buy all that stuff," he said.

Prior to his video game work, Uston, a Harvard Business School graduate and former vice president of a San Francisco stock company, wrote three books on blackjack. He's what's known as a "counter." His methods once won him $27,000 in 45 minutes. They've also got him banned from playing blackjack in many casinos all over the world. And they've enabled him to retire at 37 years old.

"I've always been interested in video games," he said. "I started playing the original Breakout and Odyssey back in '78. I bought a Space Invaders for my house in Newport Beach in 1979. I still have the damn thing. It cost me $3,000. I became totally hooked on it. My roommates and I used to play it three or four hours a day."

He also became hooked on Pac Man last May while playing the game in a bar. "I began to do all this research," he noted, "not to write a book, but because I was interested in the game. I probably played 2,000 games, probably put $500 in the machine. I began making diagrams and finally I got the key to the game which is how to solve the ninth key, which means you can

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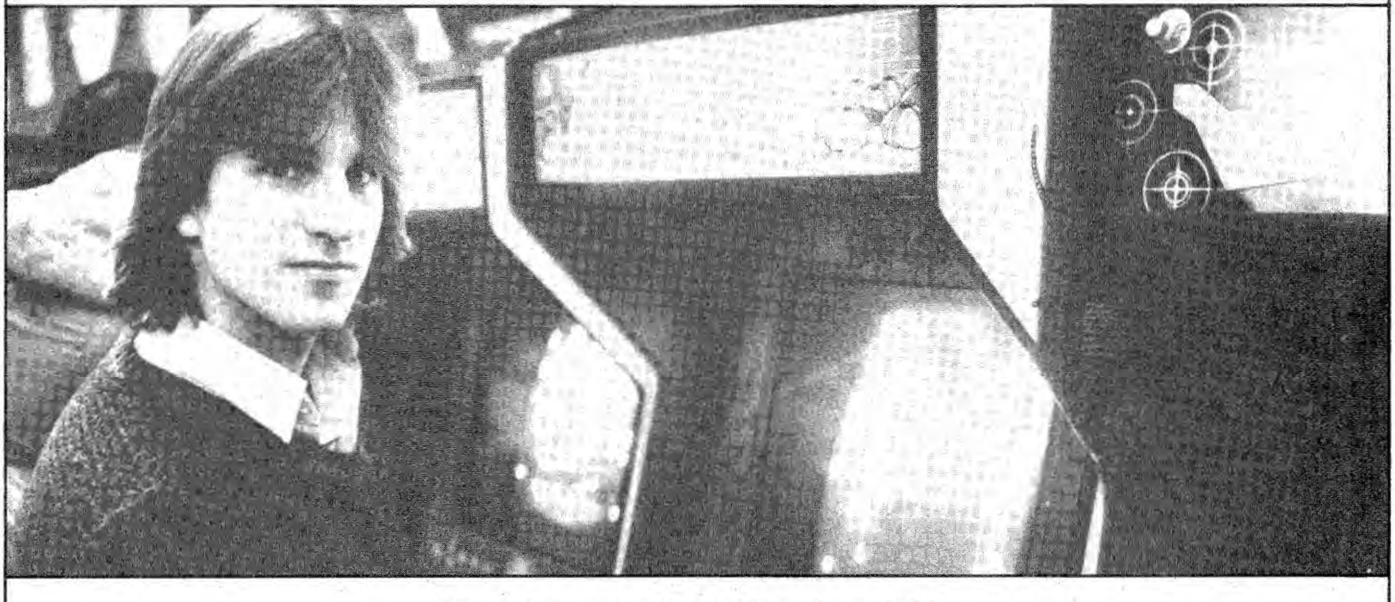

Blanchet: Some parents would have banned Elvis.

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WRITERS*continued*

play the game from now until August if you want.

"Then someone said to me, 'Kenny, Pac Man is really big,' and they showed me the best seller list and Rubic's Cube was on there. Well, I said to myself, what the hell? So I sat down and wrote the damn book in four days and came out with a $20,000 advance. It was just a total fluke.

"I'm a very fast writer and I'm very intense," Uston explained. "When I wrote the video games book, I just closeted myself for six weeks. I totally immerse myself in the subject. I find I do a far more thorough job that way. That's how I do it. I work seven days a week, 16 to 17 hours a day.

"I have not done any of my books on a word processor," he added. "To date, I have done them strictly by using dozens of bottles of Liquid Paper."

However, his next book—*Ken Uston's Guide to Home Computers*—will be written on word processors for the 10 or 12 popular computers he's bought to research the book.

Six people worked on *Consumer Guide* magazine's *How to Win at Pac Man,* according to managing editor Matthew White. He said the magazine's staff got interested in doing the book because they were having a lot of fun playing the game outside of work.

Although the legwork for the book was done over a period of five months, he explained, the "mechanics" of writing the piece published by Pocket Books took one month.

White, who has been interested in video games since Space Invaders but wasn't fanatical about them until Pac Man, said about the book:

"We were trying to come up with a single pattern method that would be simple. But the problems we were having with a single pattern was you always had to make exceptions here and there depending on what screen you were playing. So instead of doing one single pattern through the whole thing, we gave three really nice patterns that would work on the two different types of machines."

Patterns, tips, esoterica—that's what the authors of these video game books say they're offering their readers.

"This book can offer readers a hell of a lot," White said. "It's a way to approach the game right at the beginning. When this book came out, it was surprising how many people didn't know you could play patterns with the machine."

Attorney Kubey said the books offer players a better way to learn the games than through trial and error: "Learning through trial and error is a useful way, but a much more efficient way is to learn from the trial and errors of others, from the critical analysis of others, and from the programmers of the games.

"I have also picked up strategies that are unlikely to be figured out by anyone himself," he added. "My hottest tip is the best player of Defender I've ever heard of starts the game by annihilating nine of his own 10 guys. This is not the kind of stuff you're going to come up with yourself because on its face it seems illogical. It's like telling someone to start baseball by striking out or running to third base."

"The games are fun on their own hook," editor Katz observed, "but obviously it's more fun if you play better. We've tested our hints on some pretty veteran players and they all seem to do better after they read the articles."

Uston the gambler said: "The books allow people to learn how to play the game much, much quicker. They're able to get more fun out of the games because they know certain secrets. Most people don't have the patience or the quarters to work these things out."

"No one putting out a video game book is offering a solution," columnist Blanchet contended. "They're only offering a better way. That's the American way. People get frustrated and they want to know the answer."

If there's a way to raise the hackles of a video games writer, it's mentioning the growing controversy over government regulation of who plays in the arcades.

"It's getting a lot of attention because it's making money and it's all over the place." Blanchet said. "It's something physical. How many parents are going to band together and say, let's drive drugs from our town. They just can't do it. Video games are something concrete. They're something they can fight legally. I think it's just a scapegoat."

He added: "There is always something the older generation would call worthless activity that kids engage in. If you think back to the 50s and 60s, it was Elvis Presley. Elvis Presley was going to be the downfall of American youth. I'm sure if parents could, they would have outlawed him. They would have banned him from the United States."

Kubey sees parents' efforts to control the playing of arcade games as "well-intentioned but misguided." He observed, "People should understand that video games are not against the public interest but in the public interest.

"They're a great break," he continued. "Most people on their jobs or at school have only a short time to take a break from whatever is grinding them down in life. They have maybe 10 or 15 minutes. If they could rocket to Yosemite and commune with nature, they would, but they can't. In 10 or 15 minutes, you can get away from it all by playing video."

Katz maintained most arcade owners try to be a positive force in the community. He added: "The very, very small number of people who are vocally damning electronic gaming are the type of people that would be up in arms about any new development, with anything that's a little unusual that they aren't experienced with. There's always people that will react to any innovation in such a way it seems they feel personally threatened. Not only do they want to avoid the games, they want everyone else to avoid them, too."

"We feel," he added, "and many psychiatrists agree, that home games are a force to keep the family together because they provide something everyone can enjoy."

Uston said in arcades, as in anything else, there's good and bad: "I've played in some arcades in Manhattan that I wouldn't want to go in myself, let alone let kids in there. They're just full of people who look like pimps and hookers and drug dealers. On the other hand, I was in one in Minneapolis that was great — no drinking, no swearing, no food. It was real clean, nice and wholesome."

He noted arcade games could be detrimental to youngsters: "If they get addicted to them and they start spending money on them they can't afford or start getting into gambling, it could be very bad for them.

"I've got a lot of money, so if I put 500 bucks into a machine, it's not going to hurt me. Some of these kids put $20 in a machine. . . that might be their school lunch money for a month.

"I don't see anything bad for me except the little knob on my finger from playing Pac Man."

He said the games are outlawed in the Philippines. "The president down there," he explained, "feels that kids get addicted, and it's really bad, kids stealing money from their mother's purse to play the games."

But it was White that pointed out what may be the real value of the games and books in the long run: "They're what's getting kids and even adults involved in computers. They stop the imposing aspects of computers. They take out some of the mystery. And they show how easy these things are to use."■

PULSE TRAIN

Hardware costs will dip in '82

A new wave of competition in the small-business computer market will exert severe pressure to reduce the cost of hardware, predicted Abraham Ostrovsky, vice president of the Savin Corporation.

In a statement, Ostrovsky maintained that IBM's growing involvement in the market and the expected entry of the Japanese will exert strong pressure to cut prices.

Only suppliers with very large volumes will be able to remain competitive, the Savin executive contended, so it becomes more advantageous for all but the very largest to purchase the hardware rather than manufacture it.

He noted that of the 150 or 200 companies now marketing computer systems to small businesses, "A majority are manufacturing their own equipment. Those that can't get volumes high enough to compete with the likes of IBM and the Japanese are going to be caught in a serious crunch before the middle of this decade."

Last hurrah for mainframes

Like a politician who's lost his handshake, mainframes will be seeing their "last hurrah" by 1990.

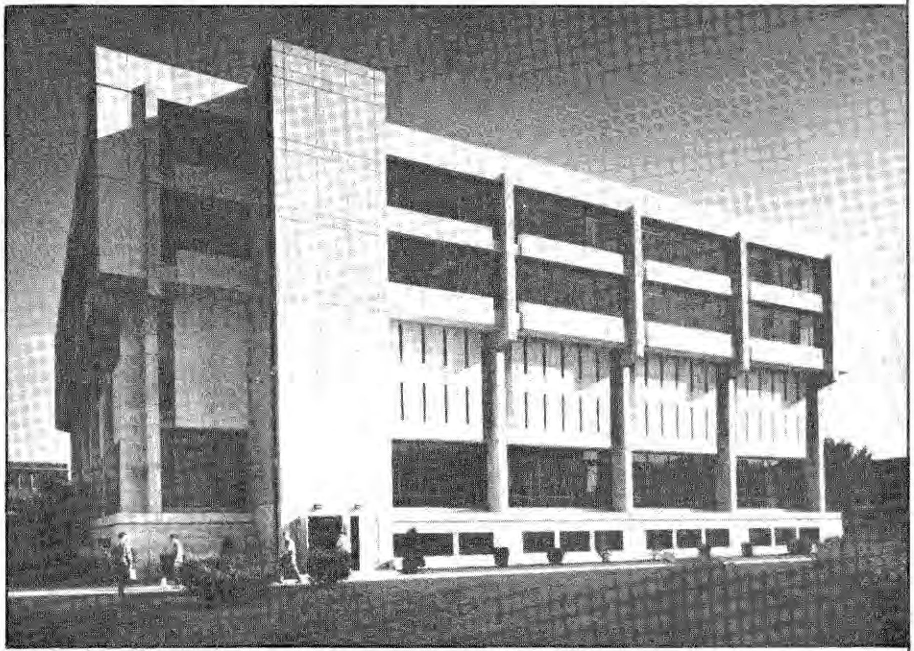
That's the contention of *Datamation* magazine. "Large mainframes," the magazine said in a statement, "will be pushed aside by microcomputers with expanded memory capacity."

It maintained that in eight years mainframes will have become "a mere bit player on the data processing scene."

Hardware degree

A college degree emphasizing computer hardware will be offered by the Wentworth Institute of Technology in Boston. With the start of the program this fall, Wentworth becomes one of the few college-level technical schools in the nation to offer a two-year-degree, hardware-oriented curriculum.

Students completing the curriculum will be awarded an Associate in Engineering degree. Courses in the program include: electric circuit theory, electronic drafting, digital electronics, computer science, Assembly language and microprogramming, electronic shop, introduction to microcomputers, microcomputer systems, solid state devices and applications, computer laboratory, measurements and instrumentation, data communications, computer architecture, operating systems, and programming applications.



Students seeking a college degree in hardware at the Wentworth Institute of Technology will be often seeing the inside of this building, Beatty Hall, the location of the school's computer center.

Making the office of the future a reality

If the office of the future is to become a reality, software must be easily altered by users, according to Seymour Rubinstein, president of Micropro International Corporation.

Speaking at a word-processing conference held in Florida late last year, Rubenstein noted "canned" software will never satisfy all the needs of the many large and small businesses buying small computers.

He observed: "Even if a product seems satisfactory at first, the good feeling will vanish as users realize there are many things it can't accomplish. The only answer is to integrate the entire office environment—not just combining words and numbers in one program, but by taking the unified approach with a family of programs."

Only the experienced need apply

The job market for entry-level programmers appears to be tightening up, according to the Boston *Globe*.

The newspaper said there are reports of fewer job openings for this year's college graduates holding degrees in computer science.

The hardest hit, it noted, will be the scores of adults switching careers into data processing. Many companies have implemented hiring freezes on entry-level positions. One career counselor told the *Globe* he is beginning to see a potential oversupply of programmers looking for first jobs.

Entry-level people, the journal noted, won't be the only ones feeling the job pinch. New graduates with Masters of Business Administration degrees and mid- and upper-level data-processing managers in the $40,000 salary range are also finding fewer openings.

The counselor added, "The market is strongest for people with two-to-four years' experience in Fortran, Assembler and Cobol, who have design capabilities and who have worked extensively in applications processing."

Reaching the peak in the valley

When it comes to business, nothing is a sure thing. But the closest thing to it can be found in the Silicon Valley, a 30-mile strip of industry at the base of San Francisco Bay.

The New York *Times* reported a 20-year study of business start-ups conducted by the University of Santa Clara shows starting a high-technology company in the valley may be as near a sure thing as the free market system can achieve.

Valley companies, the newspaper said, are so successful because of the complex network of universities, support companies, consultants, scientists, managers and investors the area has developed over the last 30 years to cradle new companies until they are ready to stand on their own.

According to the study, the average manufacturing company stands a 75 percent chance of surviving its first two years in business, but in the valley, companies stand a 95 percent chance of surviving their first six years.

HP in micro scramble

The flying boxcar of personal computers has been released by the Hewlett-Packard Company. Some observers contend the Palo Alto, CA, firm is releasing a biplane in the jet age.

Called the HP-87, this new microcomputer has the largest memory capacity of any personal computer on the market today. Although the base model has 32K RAM, the micro can be upgraded to 544K. Its closest competition in the memory department is the TRS-80 16, which can be upgraded to 512K.

However, the new micro has an eight-bit microprocessor, a dubious feature, according to its critics, in light of the new generation of personal micros with 16- and 32-bit microprocessors.

The move by Hewlett-Packard appears to have surprised at least one executive at Radio Shack. Jon Shirley, vice president for merchandising at Tandy, when asked about the HP-87 was quoted in *The Wall Street Journal* as saying: "I'm surprised. An eight-bit machine becomes an inefficient machine as it addresses larger and larger memory."

But another analyst quoted by the newspaper maintained the added speed in the Tandy and IBM computers is not an advantage yet because most software on the market is written for eight-bit machines.

According to the *Journal*, Hewlett-Packard is positioning its new micro to compete with the Apple III and IBM Personal Computer. Prices for the HP-87 range from $3,995 for 32K and one disk drive to $7,995 for 544K and two drives. An Apple III with 128K and a monitor sells for about $3,800; a TRS-80 16 with 128K and a disk drive for $4,999.

The *Journal* also said Hewlett-Packard is expected to have Computerland stores stock and sell the HP-87.

For $495, a plug-in CP/M module can be bought for the HP-87, allowing it to use some 3,000 programs.

It also has a built-in, nine-inch monitor—better than the HP-85 released last year but smaller than the Apple's.

The HP-85 generated $130 million in revenue for Hewlett-Packard last year.

Increased memory in the new HP micro allows it to tackle a variety of complex scientific problems, including financial forecasting with as many as 200 line items, or linear programming by engineers, physicists, or chemists incorporating as many as 80 simultaneous equations and 200 variables, the *Journal* reported.

Atari hustles Coleco out of Centuri pact

When you're number one and you're

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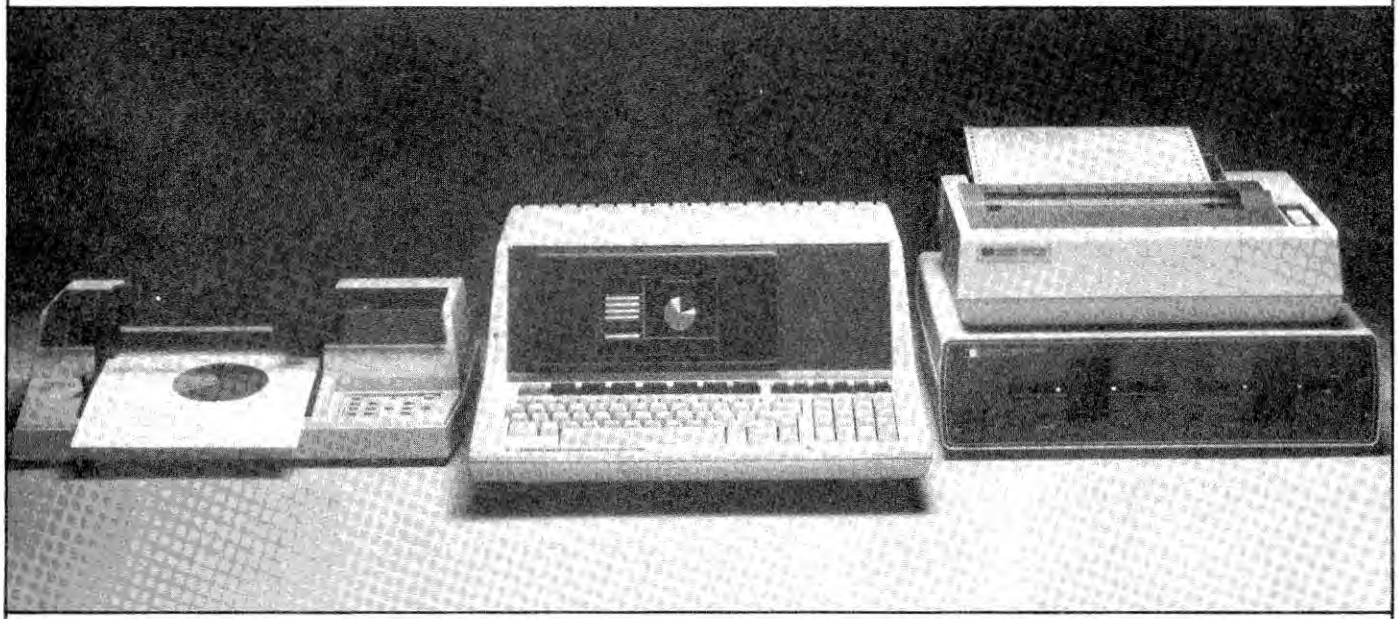

HP-87: the flying boxcar of personal computers.

PULSE TRAIN *continued*

Atari you never stop trying harder. Coleco Industries Inc. found that out the hard way.

For more than three months, Coleco—with an eye toward cutting into Atari's 75 percent stake in the $1.2 billion video game market—has been flashing a new video game player and boasting about having exclusive rights to sell arcade games by Centuri Inc., producers of Phoenix, Challenger and Vanguard.

But, according to *The Wall Street Journal*, Coleco never had a contract with the arcade game concern, so Coleco executives were red faced when Atari announced it had signed a four-year agreement with Centuri for exclusive rights to its existing games and any games it develops in the future.

The *Journal* reported the Atari-Centuri agreement took many Wall Street analysts by surprise. At the New York Stock Exchange on the day of the Atari-Centuri announcement, stock of Warner Communications, Atari's parent company, closed at $60.125 a share, up 37.5 cents. Coleco Industries closed at $9.875, down 62.5 cents.

Since the Consumer Electronics Show in Las Vegas in January, Coleco had been exhibiting a new game machine to compete with Atari and Mattel. As part of its presentation, Coleco showed sample cartridges with Centuri's games. It was showing the cartridges, the *Journal* reported, at the Toy Fair in New York City on the day Atari and Centuri announced their deal.

Pocket socket lets you plug into information

Telecomputer: the data equivalent to the telephone.

A pocket-sized microcomputer allowing easy access to larger computers via the telephone has been developed by a Cambridge, MA, couple known for inventing the electronic game Merlin.

Robert O. and Holly Thomis Doyle's 7.25 by 3.25 inch Telecomputer has been hailed as the most user-friendly device of its kind to date, according to a report in *The Wall Street Journal*.

Except for a code word to turn it on, the Telecomputer requires no special knowledge to use. The system prompts a user through a sequence of instructions in plain English. If the operator gets stuck, there are keys like "Don't Know," "Help," and "Go Back."

Most users accessing data in larger computers have to work through a six or eight step "log on" process before they begin receiving information. The Doyle's device stores those procedures in memory. Once the user establishes his identity via a code number, Telecomputer handles the entire connection operation.

Robert Doyle, 45, who has a Ph.D. in astrophysics from Harvard University, told the Boston *Globe* he and his wife see their micro as the data equivalent of the telephone.

The Telecomputer—which has a 16-character single line display and tiny typewriter keyboard—plugs directly into a modular wall plug for a telephone. The energy to run the system comes from the telephone connection, although the power to turn it on comes from a PolaPulse battery, the same type used in Polaroid cameras. Unlike other terminal devices, the Doyle's micro does not need an acoustic coupler. It also has a built-in modem.

For phones without a modular plug, a device to clamp onto the handset is available. The Doyle's company—IXO Industries Inc. of Culver City, CA—told the *Journal* it also expects to market a printer and RF modulator to enable Telecomputer to use a tv as a display device.

According to the *Globe*, IXO is being capitalized at close to $8 million by the Doyles, founder of IXO Jeffrey Rochlis and Boston and New York venture capitalists like Ampersand Inc., the Palmer Organization, and New Court Securities, and corporate investors like General Instrument Corp. and Control Data.

The *Globe* added this year the Doyles expect to sell 40,000 of the devices, which will be manufactured in Hong Kong and Taiwan.

Not in the computer but in jail

A woman in Seattle, WA, spent 46 days in jail without a hearing because authorities failed to enter her name in a court computer system.

According to an Associated Press report, Catherine Elizabeth Parrett, 33, described as being mentally ill, was

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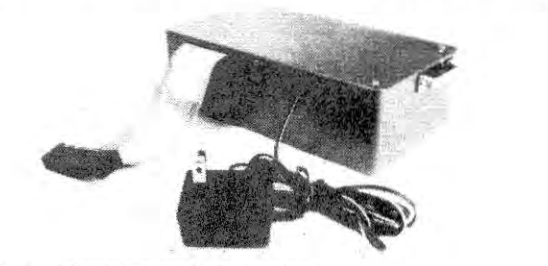

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PULSE TRAIN *continued*

arrested for allegedly shoplifting $50 worth of cosmetics from a supermarket.

After the procedural error was discovered, the case against Parrett was dismissed by Municipal Court Judge Stephen R. Schaefer.

Dynabyte's cutting pieces

A 23 percent price reduction on its Winchester disk-based multi-user computer systems has been announced by Dynabyte Business Computers of Milpitas, CA.

Dynabyte Vice President of Marketing Mike Seashols added in a statement, prices on single-user disk-based systems have been reduced by as much as 17 percent.

Actual reductions, he explained, will depend on product configuration, but overall the average reduction will be 16 percent.

Seashols said an increase in manufacturing volume coupled with decreases in the price of memory and storage media have spurred the price cuts.

In 1980, he noted, users were paying $14,000 for a configuration similar to Dynabyte's 5710 currently selling for $8,995. He went on to observe that a year ago Dynabyte was selling a 64K memory board for $1,795. Today, that board is selling for $595.

IBM trust case: dropped but not ended

The U.S. Justice Department dropped its 13-year anti-trust action against International Business Machines January 8, but controversy continues to boil over the case and the computer firm's business practices.

It is believed by business analysts the end of the case will hold major significance in the computer market for years to come. They feel dropping the case ensures IBM will continue to dominate the market, setting the pace for new products and prices.

Since the federal agency decided to drop its anti-trust lawsuit, there have been these developments:

- In testimony before a congressional subcommittee, the former chief of special litigation in justice rapped the agency for dropping the case.
- The presiding judge in the case called for an investigation into a possible conflict of interest by the assistant attorney general responsible for terminating the action.
- The executive commission of the European Common Market held hearings on alleged monopolistic practices by IBM in Europe.

Lewis Bernstein, who supervised the IBM case for more than a decade, told members of the House subcommittee on monopolies that dropping the action violated the public interest.

Lawyers for IBM contended the case lacked merit. William Baxter, the assistant attorney general who decided to drop the case, told the House panel the action rested on shaky factual and legal grounds.

Bernstein explained the government maintained IBM smothered competition by the subtle timing of new products, their pricing and their design. While an individual business move might not be illegal in itself, he said, a pattern of such conduct illustrated an intent to monopolize.

Baxter, a Reagan appointee, was later criticized by U.S. District Court Judge David N. Edelstein for failing to reveal he had represented IBM while practicing law in California. The judge called for investigations into the matter by Congress, the Office of Government Ethics and the Justice Department. Baxter characterized the legal work he did for IBM five years ago as "extremely limited" and "essentially irrelevant" to his conduct of the government's case.

Some of the same competitors of IBM backing the anti-trust action in the United States are involved with a similar case before the Common Market's executive commission. The commission has charged IBM—which did $9.9 billion in European business last year—has made it impossible for Old World customers to use other companies' software with IBM computers and refused to provide software for non-IBM computers.

According to *The Wall Street Journal*, however, the commission is not expected to move swiftly on the case. The newspaper said the decision could come near the end of this year or the beginning of next year. Should the commission find IBM guilty, the firm could be fined and ordered to alter its existing practices. But if IBM appealed the commission's decision, the case could drag on for another three years.

Towel, not hat, in 256K ring

Some American semiconductor chip manufacturers appear to be conceding the 256K dynamic RAM market to the Japanese, according to a report in *The New York Times*.

There is widespread feeling, the *Times* said, that the Japanese will dominate the dynamic RAM business in the next two decades.

The newspaper noted U.S. manufacturers' dismay is motivated by the stunning victory the Japanese have won in the 64K RAM market. There American companies braced themselves to compete with Japan, but that nation's manufacturers captured 70 percent of the market anyway.

A tree grows in the data base

Search trees and key words should be used when designing ways to access data bases.

In a statement released by the Institute for Perception Research and Philips Research Laboratories, the research groups said many people have difficulty getting the information they want from a data base.

"A comparison of the use of a search tree with the use of key words shows key words lead to the desired goal slightly faster, but half the people involved in the experiments nevertheless preferred to use a search tree," the researchers said.

"This means," they added, "that data bases should preferably be accessible by both search methods; and these should be made as simple as possible."

The study conducted by the groups located in the Netherlands involved male and female subjects 21 to 58 years old. Occupations varied from scientific researcher to waitress. The subjects were asked to search for 10 tv programs, five with the search tree method and five with key words.

"Many of the subjects," the statement said, "could not remember the choices they had already made, so that pointless repetitions occurred if a program could not be found straight away."

It added: "It was also found that subjects often overlooked parts of the text on a page. A good page layout is therefore very important." ■

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✓See List of Advertisers on page 386

FEEDBACK LOOP

by Terry Kepner

"Most programmers use machine language for graphics and high speed action."

Send any questions or problems dealing with any area of TRS-80 microcomputers to Feedback Loop, 80 Micro, *80 Pine Street, Peterborough, NH 03458.*

I am about to convert from cassette to a disk drive system for my TRS-80. Can I use my tape programs with a disk system?

E.H.
New Haven, CT

There are two approaches to using tape programs on a disk-based computer system. The first is to ignore disk drives by turning on your system in Level II mode. This means you will not be able to use your disk drives for program and data storage.

The second approach, which lets you use tape-based programs with your disk drives, is more complex and depends on the program you are using.

Games and simple applications programs should be easy to use on a disk system if they are written in Basic. But watch out if they have PEEK or POKE commands. These could complicate, or make impossible, running the program in Disk Basic. First disable the disk-clock feature, then load the programs into Disk Basic using the command CLOAD. Once the program is in memory, save it to disk. Programs that write and read data on tape will require alterations. You will have to add CMD"T" before each write or read statement. This will allow the programs to properly store and read tape data. To get the programs to store data on disk requires rewriting the tape I/O routines into disk I/O routines—not an easy task.

Machine-language programs can be a real problem. Many use special loader routines to prevent piracy. Some programs can be saved on disk using the TRSDOS program Tape Disk. Others can be saved to disk, but using them will lock-up or reset the computer. It is impossible to predict which machine-language programs can be put on disk and which ones cannot.

I have designed a few good software packages. I am sure people would purchase these packages. Is it a good idea to start my own software business?

G.H.
Chapel Hill, NC

That depends upon your goals. If you are looking at the business as an additional income and your packages are fairly inexpensive to produce (that is, they will not cost you an arm and a leg to pay for the initial production run of the documentation and disks or cassettes) then you might be able to start a company. I know of two software companies that started with less than $400 and are now each pulling over $10,000 a year. If you mean as a full-time business, then you should talk with financial experts who understand mail order businesses and the problems of getting started and staying in business.

For more information on the computer software market and how to break into it, I suggest you read these three books:

How to Sell Microcomputer Software
$18.50
The 1982 Software Writer's Market
$28.50
Free-Lance Software Marketing
$30

All are available from Kern Publications, P.O. Box 1029, Duxbury, MA 02332, (617) 934-0445.

Where can I buy used equipment?

P.T.
Chicago, IL

There are several places to check. One is the local Want-Ads book. These are distributed and sold in many states. In the Massachusetts booklet, which is printed monthly, there are 15–20 ads per month on used TRS-80's, Apples, PETs and other computers. Look under the headings for computers and office equipment.

Another source, if you live near a big city, is the classified ads section of the Sunday paper.

If you know of any local computer clubs, attend their meetings and ask around. Someone there might want to upgrade to a larger machine, or know someone who wants to sell his computer.

Some computer magazines have a classified ad section for their readers. There are even publications that specialize in used hardware. They are:

Computer Hotline—Box 1373, Ft. Dodge, IA 50501
Computer Shopper—P.O. Box F, Titusville, FL 32780
Computer Trader—1704 Sam Drive, Birmingham, AL 35235

Every time I key a long program into my computer the power fails and there goes all my work. Is there any way to prevent program loss if power fails?

B.L.
Hollywood, FL

Yes, but how much it will cost you is determined by how you define "power failure." If you mean the computer itself loses power, take it to a repair shop immediately. If you mean every time the furnace motor turns on there is a short brown-out (the lights dim, but do not go out), you need surge protection. They cost anywhere from $50 to several hundred dollars (the cost is linked to the quality and power rating of the device). Radio Shack sells a small plug-in powerstrip for $49. Many companies manufacture these devices; some are *80 Micro* advertisers.

If you mean the power goes off completely (the building lights actually go out, leaving you in the dark), you need a battery backup power supply. They start at several hundred dollars and go up to a thousand.

For more information contact:

Sun Research Inc., Box 210, Old Bay Rd., New Durham, NH 03855 (603) 859-7110
Goulde Inc., P.O. Box 43140, St. Paul, MN 55164 (612) 452-1500 or (612) 681-5450.

Of course, the simplest and cheapest way to keep from losing your entire program is to save it frequently. Then when the power goes and your program vanishes, you will have a backup copy. Your only loss will be the work done since the last backup save.

I decided to try designing my own computer game. After hours of programming I *was ready to play my first game—what a disappointment! It just did not have the impact of those purchased off the shelf. What happened? Is the TRS-80 incapable of such things?*

P.W.
Boise, ID

I am not exactly sure what you mean by "off the shelf." If you are comparing your TRS-80 with the games made for the Atari Game Machines, Intellivision or any of the other color graphic games, then no, the TRS-80 cannot compete with them (except the Color Computer). If you mean the computer games made for the TRS-80, I don't understand your question. If the games you find impressive can be purchased off the shelf for your computer, then of course the computer is capable of being impressive.

Because of the design of the Models I, II and III, you cannot have fine-line or color graphics on them without hardware modifications. But, with creative programming practices, you can achieve some very nice graphic effects. Few programmers have mastered the methods used by Leo Christopherson in his programs *Dancing Demon* and *Voyage of the Valkyrie.* Both are masterpieces of animation, the likes of which I have not seen matched on any other computer system. Most programmers use machine language for graphics and high speed action; bypassing Basic and its speed killing line-by-line interpreter.

The Color Computer is capable of matching the other color graphics computers in fine detail and color, but requires programming skill to do so. I have seen a finely written Basic program on the Color Computer outperform a poorly written machine-language program.

What happened to the Model I? All of a sudden they're not selling it. And does that mean Radio Shack will not service the one I have? Will a day come when I cannot buy programs and peripherals for my Model I?

D.T.
New Caanan, CT

That is an involved story. The TRS-80 Model I was originally introduced by Radio Shack in 1977 as an experimental machine, one that only the hardcore computer/electronics hobbyist would want. Radio Shack did not expect to sell more than 1000 of them the first year. Boy, did they underestimate the market. The first thousand were sold in a month, and Tandy spent the next two years catching up. Because the Model I was an experimental

FEEDBACK LOOP

machine, no one considered the implications of hundreds of thousands of these things scattered about.

One of the unforeseen implications is the severe RFI (Radio Frequency Interference) put out by the little machine. This RFI affects any tv, and many AM/FM radios within 100 feet or more of the TRS-80, making them incapable of receiving a clean signal. If the computer owner lives in an apartment building, every time he plays with his computer no one in the building can watch tv without seeing the interference (usually video snow).

With only a thousand TRS-80s on the market, the RFI was insignificant. But with hundreds of thousands sold, the RFI became a problem affecting over a million people. The FCC became interested in the Model I and its RFI. To make a long story short, Tandy was prohibited from the manufacturing of the Model I as of January 1, 1981, and from selling the Model I after July 1, 1982. Tandy was not the only computer company affected; Apple, PET and others must comply with the RFI standards set by the FCC.

"The FCC became interested in the Model I and its RFI."

The FCC, recognizing that there were hundreds of thousands of computers in private hands before their ruling took place, did not place any restrictions upon the support of these devices by the manufacturers.

Even so, some day you will be unable to buy programs and peripherals for your Model I, just as you cannot buy accessories for the player pianos of the 1800's. The FCC decided it is okay for a manufacturer to make peripherals for computers manufactured and sold before the deadline if these conditions are met: the peripherals do not violate the FCC RFI regulations, and do not cause the computer to radiate more RFI than before the peripherals were connected.

Radio Shack recently stopped production of the Model I Expansion Interface because of very slow sales. The Expansion Interface is now classified by Radio Shack as SOWG or Sold Out When Gone (from warehouse). If you want an Expansion Interface, you'd better hurry.

Whenever my local Radio Shack store sales staff cannot answer my questions they tell me to call customer assistance at Tandy. The number is toll-free, but I'm placed on a continuous, unending hold. How am I to get my questions answered?

R.P.
Shelton, CT

Everyone with a question about their TRS-80, or Radio Shack software, is told to call Tandy Computer Customer Service (1-800-433-5641 outside Texas, or 1-800-772-5973 in Texas). Since Tandy has sold around 500,000 computers and at least double that number of programs, an awful lot of people call those numbers. While Tandy does have a large staff manning the telephones, it takes time to check out each customer's question. This usually means you have to wait.

There is no shortcut or quicker way to get their attention. If you don't want to wait on the telephone ask the Tandy operator to have a technician call you back. As soon as someone is available you will be called.

I've been this route many times myself. Sometimes you get a call back in just half an hour, other times you may not be called until the next day.

I have a Model III and am forever reading ads in computer magazines for software and equipment. Some of these products are selling at attractive prices, but I'm not comfortable spending $50 to $100 for something I haven't seen—or for that matter don't know its quality. Is buying through the mail safe?

B.J.
Houston, TX

When you order something through the mail, you always take a risk. Whether or not the item is actually going to perform as promised is a bit of a gamble.

There is no way to guarantee the reliability of any one firm. Try to find someone who has the product, or has dealt with the firm selling it. Or check back issues of magazines for a review of the product. You can call the firm, if they list a phone number, and ask questions. Most companies will do their best to give you the right information. If they don't, they'll either lose the sale, or end up with a dissatisfied customer spreading bad news about their company.

There are some points to consider before ordering anything through the mail. First, merchandise paid for with a personal check will usually not be shipped until after the check clears the banks, about two weeks. Second, most computer software cannot be returned for a refund, although most companies will replace a defective disk or tape. The reason for the refund refusal is because of people who ordered programs, copied them, returned the original programs and then demanded their money back. Third, it takes time for the post office, or UPS to deliver merchandise. Allow the order about four to six weeks for delivery (one week for your order to get to the firm, one week for them to process it and two weeks for UPS to deliver the package. If it's paid for with a personal check, add two weeks for the check to clear).

I recently purchased the advanced statistical analysis program from Radio Shack. I have taken a few statistics courses, but some terms used in the program are unfamiliar to me. I called Radio Shack but they tell me they assumed the purchaser would know how to use the program. Where do I go from here?

A.D.
Smithville, NY

Unfortunately, you have joined the ranks of many others who have purchased that product. The best suggestion I have is for you to call a nearby college and ask for help from their mathematics department. You might be able to get someone to help you through the documentation. If you will need assistance in learning how to use the program, ask the math department to recommend a student who might be willing to help you out. This will probably cost you some money.

Several of my friends own Model I, Level II TRS-80s. They frequently have to replace their power supplies. What goes here?

A.C.
Murry Hill, NJ

I'm not sure. I've been using the same power supply on my TRS-80 for several years without any problems.

There could be many different reasons why your friends are having these problems, most of which have to do with overloading the power supplies by either hooking up too many modifications or by overheating the unit. If the power supplies are inside the Expansion Interface or in an enclosed space, the temperature build-up inside the black boxes may be responsible for their failures.

In either event, the internal fuse inside the Radio Shack power supplies should

FEEDBACK LOOP

be checked. If this fuse is blown the power supply will stop working. If the power supply has the catalog number 400007 on the bottom, you can remove the rubber feet and unscrew the four bolts holding the unit together. With the unit disassembled you can unsolder the old fuse and replace it with a new one (make sure you use one of the same power rating). If the catalog number is 4000004, forget it. The only way to open it is to saw it apart with a hacksaw.

"Sometimes things go right, as in the case of the Model 16."

I feel as if I'm getting the runaround. I recently received an ad for Westlaw software, sold at Radio Shack stores. As the ad suggested, I contacted my local Radio Shack store for more information. I had to show the salesman the ad. He had no idea what I was talking about—he didn't even have one in stock! Why advertise something you don't have?

B.H.
Denver, CO

The explanation for this rather odd way of doing business lies with the logistics of advertising.

The mail advertisements that Radio Shack sends out are designed months in advance by a department in the advertising division of Tandy. Because their average lead time is six months they have to make some rather hairy guesses as to when products will finish testing and start production. More often than not these guesses are reasonably accurate, but sometimes they miss by a mile.

The product advertising sent to the stores is prepared by a different department, which also tries to estimate when things will be ready. Sometimes these departments get seriously out of sync; the Westlaw products are one example. The store advertising was delayed, perhaps because the printing was done incorrectly, or some facts were wrong, or someone fell asleep at his desk. Whatever the reason, the bulk mail package was ready before the store information package.

Sometimes things go right, as in the case of the Model 16. The company stores had the information a week or so after press product announcements were made.

As to why the stores don't stock the merchandise advertised, you will have to consider the economics of marketing. Tandy has 8,000 stores, and to send one program to every store would cost thousands of dollars. When the package sells for several hundred dollars each the cost becomes prohibitive. So Tandy usually sends programs out on an "as-needed" basis, or to the stores with a high enough sales rate to justify the expense.

I want to buy a printer for my TRS-80 but need help. Printer prices at Radio Shack seem high compared to those offered at privately owned computer stores or through the mail. Can I use any printer with my TRS-80? What is the best printer to buy for home use?

B.A.
San Diego, CA

Which printer to buy and who to buy it from are questions most computer owners face at one time or another. What kind of printer you can use depends upon how you use your computer. Printers are divided into two main catagories: parallel and serial. The TRS-80 is designed to operate primarily with parallel printers using the Centronics Parallel Printer Port standard. Any printer using the Centronics standard can be used with TRS-80s. Make sure the printer manufacturer says the printer will operate with the TRS-80 before you buy it.

Any serial printer can be used with a TRS-80 if the computer is equipped with an RS-232 port and a program to control it.

The main difference between these two printers is their operating speed. In most cases parallel printers are faster, since the TRS-80 can deliver the data to the printer as fast as the printer can accept and print it. Serial printers are slower because the data must be translated to serial mode by the computer, transmitted to the printer and then translated back into normal mode by the printer before being printed.

As to which printer is best for home use, that's a question you will have to answer yourself. The primary points you need to consider are: price (what you can afford), printer speed (how fast you need the information printed), warranty (what recourse you have should the device need repair or cleaning. Is there a repair center near you?); ribbon replacement (how much and how easily available); and print quality (dot matrix or letter quality).

Before you give up on Radio Shack

printers, consider this: while the list price of Radio Shack printers is high, there are many dealer franchise stores (some advertise in this magazine) who sell these printers at substantially discounted prices. And Radio Shack's 8,000 stores make it easy for you to find an authorized repair center should you have problems with the unit.

I have been reading about home computers for years. I buy computer magazines but do not own a computer because they are so expensive. I am sure the price of home computers will quickly follow the price of radios—straight down. When will I know when it hits bottom?

G.C.
Woodhaven, NY

I'm afraid you are not going to see the prices drop much more than they have already. The bottom line on pricing is determined by how much hardware there is in the computer. It's no accident that the computers without video monitors (the Color Computer and Pocket Computer) are several hundred dollars cheaper than those that include their own monitors (Models II, III and 16). The more hardware put in, the higher the price. Most of this hardware is already at a state-of-the-art position. Standard keyboards are produced by the millions. Their price has not appreciably declined in the last 10 years. The same goes for the plastic cases and the epoxy circuit boards. The only way you can cut the price is to make smaller packages and use less materials.

If you check the magazine ads you will see computers for under $100, but you will also see a marked difference between these machines and their higher priced counterparts.

The same is true of radios. You can buy small hand-held units very cheaply. They contain only a few commonly manufactured general purpose parts. Or you can spend hundreds of dollars and buy a good quality stereo unit made of better parts.

So I don't think prices are going to decline much. Smaller units will be sold cheaper, but the large units will stay fairly even in price. This doesn't mean the larger units won't improve, it just means their price will remain the same; just like the full-size color tvs (remote control, 21-inch screen, built-in clock, automatic fine tuning) selling today for a thousand dollars, while the original color tvs sold for the same price and gave you far less in picture quality, sound and control. ■

Copernica Mathematica

by Bruce Douglass

"Scientists and mathematicians will welcome the precision of muMATH..."

Scientists and mathematicians will welcome the precision of muMATH, a symbolic mathematics package for microcomputers. Originally written by David Stoutmeyer and Albert Rich of The Soft Warehouse in Honolulu, it is now marketed by Microsoft. Microsoft has released two versions of this program for the TRS-80; one costs $75 and the other $250. While it is not my purpose to comprehensively review the product, I will mention program aspects I consider good, and others I consider bad.

muMATH is written in muSIMP, a high-level language very similar to the RLISP language. RLISP and muSIMP are both based on LISP, but offer a syntax that is less intimidating and more familiar to most microcomputer users than is traditional LISP.

When you buy the muMATH package, you receive the muSIMP programming language as well. The trouble is, no text on programming in either muSIMP or RLISP exists. Microsoft sells a programming manual to muMATH with the more expensive version—it does have some programming examples, but is not a complete text. This is indeed unfortunate, since the muSIMP programming language offers some capabilities inconvenient in the more traditional programming languages (Basic, Fortran and Pascal).

What It Can Do

muMATH performs essentially infinite precision mathematics by avoiding the floating point approximations used by more conventional languages. muMATH works with rational numbers—ask it to add 1/3 and 1/4, and it will answer 7/12. Basic, on the other hand, will tell you 0.583333. As you can see, muMATH's answer is exact and Basic's is an approximation.

How about expanding the binomial $(2X - Y)\uparrow 3$? Basic could only find it if you specify numerical values for X and Y. muMATH can expand it symbolically to $8*X\uparrow 3 - 8*X\uparrow 2*Y - 2*X*Y\uparrow 2 - Y\uparrow 3$. Or suppose you wanted to substitute $(Z\uparrow(1/3)) - 4*SIN(T))$ for Y in this expansion. It would be simple:

```
A: (2*X - Y)↑3 ;
EVSUB (A,X,(Z↑(1/3)) - 4*SIN(T))) ;
```

The power of muMATH doesn't stop here. It knows about imaginary and complex numbers, trigonometry, calculus, and (if you have the more expensive version from Microsoft) vectors and matrices.

muMATH can perform symbolic mathematics in trigonometry and calculus. I can never remember all those silly rules for angle reduction with the trigonometric functions. Well, muMATH can find them for me. The same goes for derivatives and integrals—sure, I can do them or I can look them up, but who needs to? That's a technician's job. Just as calculators and computers free me from adding and subtracting with a pencil and paper, muMATH frees me from the simpler forms of symbolic manipulation.

For a simple example, what is SIN(2*A + B)? muMATH tells me it is $2*COS(X)\uparrow 2*SIN(Y) + 2*COS(X)*COS(Y)*SIN(X) - SIN(Y)$. Or, what was the integral of $SIN(X)\uparrow 3*SIN(N*X)$ again? muMATH will tell me $3*SIN(X - X*N)/(8 - 8*N) - 3*SIN(X - X*N)/(8 + 8*N) - SIN(3*X - X*N)/24 - 8*N) + SIN(3*X + X*N)/(24 + 8*N)$, which can be reduced by the limit package if you have the more expensive version.

Some Programming Aids

One of muMATH's major faults is that after programming there is no convenient way to get these muMATH programs to disk—they must be typed in every time. Well, you have two ways to get around this.

Program Listing 1. Unparse

```
FUNCTION DISPFUN (F#U#N#, LEX1),
  NEWLINE(), NEWLINE(),
     UNPARSE(Ø, FALSE, LIST(GETD(F#U#N#))),
     PRINT(""),
ENDFUN $
F#U#N#: ""$
FUNCTION PRTARGS(INDENT, LEX1),
     SPACES(1),
     WHEN EMPTY(LEX1), PRINT("()") EXIT,
     WHEN ATOM(LEX1),
          QUOTEPRINT(LEX1) EXIT,
     WHEN DPAIR(LEX1),
          PRINTDPAIR(LEX1) EXIT
     PRINT(LPAR),
     LOOP
          UNPARSE(INDENT, FALSE, LIST(FIRST(LEX1))),
          WHEN EMPTY(LEX1:REST(LEX1)) EXIT
          PRINT(COMMA), SPACES(1),
     ENDLOOP,
     PRINT(RPAR),
ENDFUN $
PROPERTY UNPARSE, ', FUNCTION(INDENT,LEX1),
     PRINT(''),
     PRTARGS(INDENT, FIRST(LEX1)),
     TRUE,
ENDFUN $
PROPERTY UNPARSE, NOT, FUNCTION(INDENT, LEX1),
     PRINT('NOT), SPACES(1),
     UNPARSE(INDENT, FALSE, LEX1),
     TRUE
ENDFUN $
PROPERTY UNPARSE, FUNCTION, FUNCTION(INDENT, LEX1),
     PRINT('FUNCTION), SPACES(1), PRINT(F#U#N#), F#U#N#: "",
     PRTARGS(INDENT, FIRST(LEX1)),
     UNPARSE(INDENT+2, TRUE, REST(LEX1)),
     PRNTLINE(INDENT), PRINT('ENDFUN),
ENDFUN $
PROPERTY UNPARSE, SUBROUTINE, FUNCTION(INDENT, LEX1),
     PRINT('SUBROUTINE), SPACES(1), PRINT(F#U#N#),
     F#U#N#: "",
     PRTARGS(INDENT, FIRST(LEX1)),
     UNPARSE(INDENT+2, TRUE, REST(LEX1)),
     PRNTLINE(INDENT), PRINT('ENDSUB),
ENDFUN $
PROPERTY UNPARSE, LOOP, FUNCTION(INDENT, LEX1),
```

Program Listing 1 Continues

• You can use a text editor to write the programs to disk in ASCII format, or

• You can use the program Unparse (see Listing 1). This program first appeared in *The Soft Warehouse Newsletter #2;* they kindly gave permission to present it here. I recommend that you use some sort of text editor to enter the functions in the Unparse package.

A discussion of how the Unparse package functions is beyond the scope of this article. It is, however, very easy to use. To save a function and its property list to a disk file just enter:

```
WRITEFILE(filename,ext,drive#,
    function1,function2,...);
```

DISPFUN(fun) displays the muSIMP language version of "fun." This is an extremely handy feature.

Currently, if you make a mistake entering a function, you must retype it. This is a bit of a pain. However, you may use The Alternate Source's KBE as a full screen editor while typing functions within the muSIMP environment. If you do this, you must use the 48K version of KBE and the 32K version of muMATH (muMATH has no respect for the MEMTOP pointer adjusted by KBE).

Another thing muMATH lacks is a floating point package. muMATH is exact. If you ask Basic or Fortran to evaluate ⅓ it will tell you 0.333333. muMATH would just answer ⅓. Exact numerical representation is extremely powerful and useful, but for some purposes floating point is really what we want. Presented in Program Listing 2 is a floating point package from *The Soft Warehouse Newsletter #5.* This package is easy to use and allows you to define your precision.

Point is the control variable for the floating point function. If it is zero or negative, muMATH will print its results in its normal rational arithmetic format. If Point is a positive integer, the output will be formatted to contain that number of digits to the right of the decimal point. Be careful when using floating point input of numbers. It doesn't work correctly if the first digit to the right of the decimal is a zero—3.08 will be read as 3.8. Enter floating point numbers as rational fractions (for example, enter 3.08 as 308/100).

The two packages above add considerable power to the muMATH system. If you have functions other muMATH users would appreciate, send them along and I'll mention them in this column. If you are interested in muMATH, you can subscribe to the newsletter above for $5 (US). Published three times per year, it is available from:

Program Listing 1 Continued

```
        PRINTLINE('LOOP), SPACES(INDENT+2),
        UNPARSE(INDENT+2, FALSE, LEX1),
        PRNTLINE(INDENT), PRINT('ENDLOOP),
   ENDFUN $
   FUNCTION UNPARSE(INDENT, EOL, LEX1, LEX2),
        WHEN EMPTY(LEX1) EXIT,
        LEX2:FIRST(LEX1),
        WHEN DPAIR(LEX2),
             PRINTDPAIR(LEX2) EXIT,
        WHEN ATOM(LEX2),
             BLOCK
                  WHEN EOL,
                       PRNTLINE(INDENT) EXIT,
             ENDBLOCK,
        QUOTEPRINT(LEX2) EXIT,
        BLOCK
             WHEN EOL, PRNTLINE(INDENT) EXIT,
        ENDBLOCK,
        WHEN ATOM(FIRST(LEX2)),
             UNPARSEFUN(INDENT,LEX2),
             UNPARSE(INDENT, TRUE, REST(LEX1)) EXIT,
        WHEN ATOM(FIRST(FIRST(LEX2))),
             UNPARSEWHEN(INDENT, LEX2),
             UNPARSE(INDENT, TRUE, REST(LEX1)) EXIT,
        UNPARSEBLOCK(INDENT, LEX2),
        UNPARSE(INDENT, TRUE, REST(LEX1)),
   ENDFUN $
   FUNCTION UNPARSEFUN(INDENT, LEX1, LEX2),
        LEX2:FIRST(LEX1),
        WHEN INTEGER(LEX2), PRINT(''),
             PRTARGS(INDENT, LEX1) EXIT,
        WHEN APPLY(GET(UNPARSE, LEX2), LIST(INDENT,REST(LEX1))) EXIT,
        WHEN GET('LBP, LEX2),
             WHEN EMPTY(RREST(LEX1)),
                  PRINT(LEX2),
                  SPACES(1),
                  UNPARSE(INDENT, FALSE, REST(LEX1)) EXIT,
             UNPARSE(INDENT, FALSE, LIST(SECOND(LEX1))),
             SPACES(1), PRINT(LEX2), SPACES(1),
             UNPARSE(INDENT, FALSE, RREST(LEX1)) EXIT,
        PRINT(LEX2),
        PRTARGS(INDENT, REST(LEX1)),
   ENDFUN $

  FUNCTION  UNPARSEWHEN (INDENT, LEX1),
        PRINT ('WHEN), SPACES(1),
        UNPARSE (INDENT+2, FALSE, LEX1),
        SPACES(1),  PRINT('EXIT),
  ENDFUN $

   FUNCTION UNPARSEBLOCK(INDENT, LEX1),
        PRINTLINE('BLOCK), SPACES(INDENT+2),
        UNPARSE(INDENT+2, FALSE, LEX1),
        PRNTLINE(INDENT),
        PRINT('ENDBLOCK),
   ENDFUN $
   FUNCTION DPAIR(LEX1),
        WHEN ATOM(LEX1), FALSE EXIT,
        WHEN EMPTY(REST(LEX1)), FALSE EXIT,
        ATOM(FIRST(LEX1)) AND ATOM(REST(LEX1)),
   ENDFUN $
   FUNCTION PRINTDPAIR(LEX1),
        PRINT(LPAR), QUOTEPRINT(FIRST (LEX1)),
        PRINT(". "),
        QUOTEPRINT(REST(LEX1)),
        PRINT(RPAR),
   ENDFUN $
   FUNCTION PRNTLINE(INDENT),
        PRINTLINE(COMMA), SPACES(INDENT),
   ENDFUN $
   MOVD(PRINT, QUOTEPRINT) $
   FUNCTION QUOTEPRINT(EX1, EX2, LEX1, LEX2),
        WHEN INTEGER(EX1), PRINT(EX1) EXIT,
        WHEN LENGTH(EX1)=0, PRINT("""""") EXIT,
        LEX1:EXPLODE(EX1),
        BLOCK
             WHEN DIGIT(FIRST(LEX2)),
                  EX2:TRUE EXIT,
             LEX2:LEX1,
             LOOP
                  WHEN WILDCHAR(FIRST(LEX2)),
                       EX2: TRUE EXIT,
                  LEX2:REST(LEX2),
                  WHEN EMPTY(LEX2) EXIT,
             ENDLOOP,
        ENDBLOCK,
        WHEN NOT EX2, PRINT(EX1) EXIT,
        PRINT(""""),
        LOOP
             BLOCK
                  WHEN PRINT(FIRST(LEX1))="""",
                       PRINT("""") EXIT,
             ENDBLOCK,
             LEX1:REST(LEX1),
             WHEN EMPTY(LEX1) EXIT,
        ENDLOOP,
        PRINT(""""),
   ENDFUN $
```

Program Listing 1 Continues

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Calculating in muMATH

Aside from its use in programming, muMATH can be used in a calculator mode. But you've never seen a calculator like this!

Let's examine exactly what a symbolic math package is. How would you expand the expression (X + Y)↑2? Well, you would perform it something like this:

```
              X + Y
  times       X + Y              (multiply)
              -----
             X*Y + Y*Y
   X*X +      X*Y                (add partial products)
  -----------------------
   X*X + 2*X*Y + Y*Y   (final result)
```

This is the same result muMATH gives. Try that in Basic, Fortran or even Pascal—they can perform arithmetic only on numbers, not on variables. When Basic tries to evaluate (X + Y)↑2, it looks up and substitutes the value for X, then it substitutes the value for Y, adds them and finally squares this sum. You end up with a single number rather than an algebraic expression.

muMATH, then, allows you to mathematically manipulate symbols rather than just numbers. So your TRS-80 moves from a number-cruncher to a super symbol cruncher!

Let's look at muMATH's syntax. First, the colon serves as the assignment operator. You can assign expressions as well as numbers to variables. For example,

TEMPCEL : 5/9*(TEMPFAR – 32);

assigns the expression 5/9*(TEMPFAR – 132) to the variable TEMPCEL. Answering the @ prompt with TEMPCEL; results in this expression. You may assign TEMPFAR a value (such as zero) by the line:

TEMPFAR : 0;

Now entering TEMPCEL; results in – 160/9. The semicolon is the end-of-statement marker used by muMATH.

Let's consider some functions in muMATH:

- A factors function that gets all multiplicative factors of a given number
- A function plotter
- A cubic equation solver
- A Taylor series generator that allows you to specify the desired accuracy (to be used with the floating point package)

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Program Listing 1 Continued

```
 FUNCTION WILDCHAR(EX1),
      MEMBER(EX1, LIST('" ", '!, '"""", '$, '"%", '&, '', LPAR, RPAR, '*, '+,
COMMA, '-, '., '/, ':, ';, '<, '>, '=, '?, '[)),
 ENDFUN $
 FUNCTION DIGIT(EX1),
      MEMBER(EX1, '("0", "1", "2", "3", "4", "5", "6", "7", "8", "9"))
 ENDFUN $
 SUBROUTINE WRITEFILE LEX1
      WRITEFILE1(FIRST(LEX1), REST(LEX1)),
 ENDSUB $
 FUNCTION WRITEFILE1(LEX1, LEX2),
      WRS(FIRST(LEX1), SECOND(LEX1), THIRD(LEX1)),
      LOOP
           WHEN EMPTY(LEX2) EXIT,
           PRINTFUN(FIRST(LEX2)),
           PRINTVAL(FIRST(LEX2)),
           PRINTPROPS(FIRST(LEX2)),
           LEX2:REST(LEX2),
      ENDLOOP,
      NEWLINE(), NEWLINE(),
      PRINT("RDS () $"),
      WRS(),
      FIRST(LEX1),
 ENDFUN $
 FUNCTION PRINTFUN(EX1),
      WHEN ATOM(GETD(EX1)) EXIT,
      DISPFUN(EX1),
      PRINT('$),
 ENDFUN $
 FUNCTION PRINTVAL(EX1),
      WHEN FIRST(EX1)=EX1 EXIT,
      NEWLINE(), NEWLINE(),
      QUOTEPRINT(EX1), PRINT(" : "),
      UNPARSE(2, FALSE, LIST(FIRST(EX1))),
      PRINTLINE('$),
 ENDFUN $
 FUNCTION PRINTPROPS(LEX1, LEX2),
      WHEN ATOM(LEX2:REST(LEX1)) EXIT,
      LOOP
           WHEN EMPTY(LEX2) EXIT,
           NEWLINE(), NEWLINE(),
           PRINT('PROPERTY),
           SPACES(1), QUOTEPRINT(LEX1),
           PRINT(", "), PRINT(FIRST(FIRST(LEX2))),
           UNPARSE(2, TRUE, LIST(REST(FIRST(LEX2)))),
           PRINTLINE('$),
           LEX2:REST(LEX2),
      ENDLOOP
 ENDFUN $

STOP () $
RDS () $
```

Program Listing 2. Float

```
%                                                        %
%  float/mu package from The Soft Warehouse Newsletter  %
%  from issue number 5 page 6 - original version faulty %
%  changed by Bruce Powel Douglass so that it would run %
%                presented by permission of              %
%                    The Soft Warehouse                  %
%                       Honolulu, HI                     %
%                                                        %
POINT: FALSE $
PUTD('PRTMATH2, GETD('PRTMATH)) $
%                                                        %
%              now redefine the PRTMATH driver           %
%                                                        %
FUNCTION PRTMATH1 (EX1, RBP, LBP, PRTSPACE,
   % LOCAL: % EX2, EX3),
  WHEN NUMBER(EX1) AND (POSITIVE(POINT) OR ZERO(POINT)      ),
    EX2: DEN(EX1),
    EX1: NUM(EX1),
    PRTSPACE: FALSE,
   BLOCK
     WHEN NEGATIVE (EX1),
        BLOCK
           WHEN LBP > 130,
              PRTSPACE: TRUE,
              PRINT (LPAR) EXIT,
        ENDBLOCK,
        PRINT('-),
        EX1: -EX1 EXIT,
    ENDBLOCK,
    EX1: DIVIDE(EX1,EX2)
   PRINT(FIRST (EX1)),
   PRINT('.)
   EX3: POINT,
   LOOP
      WHEN ZERO(EX3) EXIT,
      WHEN ZERO(SECOND (EX1)) EXIT,
```

Program Listing 2 Continues

• A simple hex-to-decimal number converter function

Factors (see Listing 3) is a simple program. First, the text between percent marks is a comment, ignored by muMATH. The Function line tells muMATH that we are defining a function called Factors and we are using the variables N,A,B. We are only passing one parameter to Factors (N), but by defining the rest in the Function line, we ensure that they are locally rather than globally bound. Even though we used A and B in our function, the values of A and B outside the function will remain unchanged. If we used them without defining them, the values of A and B would be different after exiting the function than they were before entering the function.

The conditional statement in muMATH is When. The line:

```
WHEN N = 2 OR N = 3, TRUE EXIT
```

means that if N equals two or three, muMATH returns a logical True and exits the function. The first function used is Primes, which determines whether a number is prime. It is called by Factors, which is the second function.

Primes then goes on to see if the parameter is an integer or even. If it is not an integer or if it is even, then it must not be prime, so we exit with a logical False.

We then define a loop which divides all numbers between three and SQR(N) into our test number. If any of these returns an integer, the number must not be a prime.

The program flow of Factors is simple enough. First, we define local variables. Then we test to see if the argument is an integer. If not, we exit. Then, we test our number to see if it is a prime. If it is a prime, we know all the factors, so we list them: one and N.

If not a trivial case, we must loop through a block to make a list of all the prime numbers that evenly divide our argument. This function is a good simple example of the use of the Block... Endblock construct. If you exit from a loop, then you also exit the function. With the Block construct, you can exit the loop and remain within the function.

Next Factors sets up a number D = N/B. We can then easily test to see if it is an integer. If B is not prime or if D is not an integer (B doesn't go into N evenly) we don't need to keep it as a factor. We can throw the value of B away and exit the block (program flow transfers to the line following Endblock).

If B passes these two initial tests, the list of prime factors is increased by adding B to the list (ANS) with ANS: ADJOIN(B,ANS). Then, knowing that B goes into B at least once, we wish to know how many times it goes in. For example, if we enter FACTOR(8), the routine produces the list (2,2,2). The inner loop continues until N/B is a non-integer. The value for N is decreased by letting N:N/B each time, so we don't count each factor more than once.

When B finally ceases to divide N evenly, we exit the loop (and block) and increase the value of B until B is greater than half of the initial value of N. ANS is printed because it is the last expression before the exit from the function.

Function Plotter

The PLOT/MU package contains several functions (see Listing 4). The first, called BOX( ), requires no parameters. It merely clears the screen and draws a frame around it.

The next function, Plot, makes several calls elsewhere. MAX(X,Y) returns the greater of two numbers, INT(X) finds the integer portion of a rational number, FLASH(X,Y) flashes a graphics point on and off, and W#SCAN waits until a key is pressed.

This last function demonstrates the use of the PUTD function to link machine language routines with muMATH. In the TRS-80 Model I, a ROM call at 0049H (73 decimal) checks the keyboard and waits until a key is pressed. By using the PUTD function, we can assign the function W#SCAN to be a call to that address. Do be careful with ROM calls, however. If one of the many exits to Disk Basic is taken, muMATH will die a miserable death.

To plot a function, enter PLOT(fun,var, low,high). Fun is the function to be plotted; var is the variable in fun; and low and high are the extreme X values to be shown on the plot. Plot uses the entire video screen and auto-scaling for the Y-axis. While this is a bit slow, it presents an attractive graph.

Plot scales the X-axis to 126 equally-spaced intervals and checks the value of the function at these points. It then determines the low and high values for the Y-axis. The Y-axis is then scaled by the formula PLOTTEDY = (46-1)/(HIGHY-LOWY)*functiony + LOWY so the lowest value of Y will be at y equals one and the highest value at y equals 46, fitting nicely on the screen. This amount is subtracted from 47 to invert the screen, making it more easily readable.

While Plot checks the function for high and low values, it stores all the calculated function values in LISTY. These same values will be needed later to scale and plot on the screen.

Then we reverse the list (since we want it to be a queue rather than a stack of values), take the values out of the list one at a time, and plot them. The x value is incremented by one each time, so that the X value does not need to be scaled.

Rather than have the exit to command mode destroy the carefully drawn screen, the W#SCAN function waits until a key is pressed. An alternative method would be Loop followed by Endloop. Since there is no When statement, there is no way out of the loop. Holding down the clear key also allows you to exit the loop.

There is one thing to remember, though.

Program Listing 2 Continued

```
      EX1: DIVIDE (TIMES (SECOND (EX1), RADIX()), EX2),
      EX3: DIFFERENCE (EX3, 1),
      PRTDIG (FIRST(EX1)),
   ENDLOOP,
   WHEN PRTSPACE, PRINT (RPAR) EXIT EXIT,
 PRTMATH2 (EX1, RBP, LBP, PRTSPACE)
 ENDFUN $
%                                                       %
%                                                       %
FUNCTION PRTMATH (W,X,Y,Z)
  WHEN NUMBER(W), PRTMATH1 (W,X,Y,Z), "" EXIT,
PRTMATH2 (W,X,Y,Z), ""
ENDFUN $
%                                                       %
%                                                       %
FUNCTION PRTDIG (EX1),
  WHEN LENGTH (EX1) EQ 1, PRINT (EX1), EXIT,
  PRINT (SECOND (EXPLODE (EX1))),
ENDFUN $
%                                                     %
%  this FLOAT function for inputting floating numbers %
%  doesn't work correctly - 3.01 is read as 3.1       %
%                                                     %
FUNCTION FLOAT(EX1, EX2)
  EX1 + EX2/RADIX()[LENGTH (EX2)
  ENDFUN $
PROPERTY LBP, ".", 190 $
PROPERTY INFIX, ., COND  (
  WHEN INTEGER (EX1) AND INTEGER(SCAN)
     FLOAT(EX1, SCAN, SCAN()) EXIT
  WHEN SYNTAX() EXIT ) $
%                                                   %
%  this logapx(x) function finds an approximation   %
%  to  LN(x) using N terms of a series expansion    %
%  best to use with the floating point package      %
%                                                   %
FUNCTION LOGAPX (X, N, Z, TOTAL, CTR),
  TOTAL: CTR: 0,
  Z: (X-1)/(X+1),
  X: Z[2,
  LOOP
     TOTAL: TOTAL + Z/(2*CTR+1),
     WHEN CTR=N, 2*TOTAL EXIT,
     Z: Z*X,
     CTR: CTR+1,
  ENDLOOP,
ENDFUN $
%                                                   %
%      The last two lines must be included for      %
%      muMATH to properly finish the reading in     %
%              the text file from disk              %
%                                                   %
 STOP () $
 RDS () $
```

```
% routine to calculate multiplicative factors %
 FUNCTION PRIME (N,A,B)
    WHEN N=2 OR N=3, TRUE EXIT,
    WHEN INTEGER(N)=FALSE OR INTEGER(N/2), FALSE EXIT,
    A:3 B:N[(1/2) % B=SQR(N) %
    LOOP
       WHEN INTEGER(N/A), FALSE EXIT
       WHEN A>B, TRUE EXIT,
       A:A+2,
    ENDLOOP
ENDFUN $
%                                                        %
%               now the main function                    %
%                                                        %
FUNCTION FACTORS(N,J,ANS,B,D),
  WHEN INTEGER(N)=FALSE, FALSE EXIT,
  WHEN PRIME(N), ANS:LIST(1,N) EXIT,
  J:N, ANS:LIST(), B:2,
  LOOP
    D:N/B
    BLOCK
      WHEN INTEGER(D)=FALSE OR PRIME(B)=FALSE, EXIT
      WHEN INTEGER(D/B), N:D
        LOOP
          ANS:ADJOIN(B,ANS)
          WHEN INTEGER(N/B)=FALSE, EXIT,
          N:N/B,
        ENDLOOP EXIT,
    ANS:ADJOIN(B,ANS),
    ENDBLOCK
    B=B+1
    WHEN B>J/2, ANS EXIT
  ENDLOOP
ENDFUN $
```

Program Listing 3. Factors

Program Listing 4. Function Plotter

```
%       ---___---___---___---___---___---___---___---      %
%              FUNCTION PLOTTER FOR MUMATH                 %
%              but first, we need BOX to set               %
%                  up the screen for us                    %
%       ---___---___---___---___---___---___---___---      %
FUNCTION BOX (XHIGH, A)
  CLS(),
  A:0,
```

Program Listing 4 Continues

Program Listing 4 Continued

```
    BLOCK
      WHEN A>XHIGH, EXIT
      LOOP
        SET(A,0), SET(A,47)
        A:A+1,
        WHEN A>XHIGH, EXIT
      ENDLOOP
    ENDBLOCK
    A:0,
    BLOCK
      WHEN A>47, TRUE EXIT,
      LOOP
        WHEN A>47, TRUE EXIT,
        SET(0,A), SET(XHIGH,A)
        A:A+1,
      ENDLOOP
    ENDBLOCK
ENDFUN $                 % END_BOX %
%      ---___---___---___---___---___---___---          %
DOT:'. $
%      ---___---___---___---___---___---___---          %
%           this portion is the main program            %
%           this function may run out of vector         %
%           space on complex functions, if this         %
%              happens, use PLOT#1() below              %
%           If you don't want to use auto scaling       %
%           for the Y axis, the use PLOT#2() below      %
%      ---___---___---___---___---___---___---          %
%                                                       %
FUNCTION PLOT(EXPR, X, LOW, HIGH, YLIST, ZINT
         INCX, INCY, A, B, Y, SLOPEY, INTERY, Q)
  WHEN (LOW=HIGH) OR
       (NUMBER(HIGH)=FALSE) OR (NUMBER(LOW)=FALSE),
           PRINT("ERROR IN LIMITS!") EXIT,
  CLS(), PRINT("THINKING"), YLIST: LIST(),
  INCX: (HIGH-LOW)/100, ZINT:0
  %                                  %
  % NOW FIND SCALING FACTOR FOR Y-AXIS %
  %                                  %
  UPY: EVSUB(EXPR,X,HIGH), LOWY: EVSUB(EXPR,X,LOW),
  WHEN (NUMBER(UPY)=FALSE) OR (NUMBER(LOWY)=FALSE),
           PRINT("ONLY UNIVARIATE FUNCTIONS!")  EXIT,
  A: LOW,
  LOOP
    BLOCK
       WHEN INTEGER(ZINT/10), PRTMATH(ZINT) EXIT,
       PRINT(DOT),
    ENDBLOCK
    ZINT: ZINT+1
    B: EVSUB(EXPR,X,A),
    YLIST:ADJOIN(B,YLIST)  % save the generated points %
    UPY: MAX(UPY,B),
    LOWY: MIN(LOWY,B),
    A: A+INCX
    WHEN A>HIGH  EXIT,
  ENDLOOP
  A: LOW, Q: 1, YLIST:REVERSE(YLIST),
  WHEN LOWY=UPY, PRINT("CHOOSE DIFFERENT X-LIMITS"), EXIT
  SLOPE: 45/(UPY-LOWY)
  INTER: 1-SLOPE*LOWY
%      ---___---___---___---___---___---___---          %
%        ok, now that we have the scaling               %
%        factors, let's plot the function               %
%      ---___---___---___---___---___---___---          %
  BOX(100),         % SET UP SCREEN %
  LOOP
      WHEN Q>100, EXIT
      Y: 47 - INT(FIRST(YLIST)*SLOPE + INTER)
      YLIST:REST(YLIST)
      SET(Q,Y)
      Q: Q + 1,
  ENDLOOP
%                    now keep looping                   %
%                until any key is pressed               %
%             (see definition by PUTD below)            %
%          (another way to do the loop would be:        %
%                         LOOP                          %
%                         ENDLOOP                       %
%          in which case the only way out is to         %
%                use the <CLEAR> key to exit)           %
%                                                       %
  W#SCAN (),
ENDFUN $                 % END_PLOT %
%                                                       %
%             PLOT#1() is just like PLOT() except       %
%         that it doesn't store all the numbers, so     %
%         you won't have so much tendency to run        %
%            out of vector space due to storage         %
%                                                       %
FUNCTION PLOT#1(EXPR, X, LOW, HIGH, ZINT,
         INCX, INCY, A, B, Y, SLOPEY, INTERY, Q)
  WHEN (LOW=HIGH) OR
       (NUMBER(HIGH)=FALSE) OR (NUMBER(LOW)=FALSE),
           PRINT("ERROR IN LIMITS!") EXIT,
  CLS(), PRINT("THINKING"),
  INCX: (HIGH-LOW)/126, ZINT:0
  UPY: EVSUB(EXPR,X,HIGH), LOWY: EVSUB(EXPR,X,LOW),
  WHEN (NUMBER(UPY)=FALSE) OR (NUMBER(LOWY)=FALSE),
```

Program Listing 4 Continues

muMATH had better be able to evaluate the function before you use Plot. Therefore, you cannot graph SIN(X). You can graph a truncated Taylor series such as X − X↑3/3! + X↑5/5! − X↑7/7!, and it will look reasonably good.

The Cubic equation solver shows a rather simple example of recursion (see Listing 5). The expression it expects to see is of the form:

z*y↑3 + p*y↑2 + q*y + r

If z is not one or zero, Cubic calls itself after dividing the expression by z. Cubic finds all real or imaginary roots of the cubic polynomial even if they are in terms of some other variable.

The Taylor series generator (see Listing 6) is another interesting problem. The muMATH manual comes with a Taylor series generator, and we can use this to generate approximations. However, since muMATH normally operates in rational arithmetic, this is not very useful in certain applications. Suppose we want the value for SIN(X) to 10 decimal places. A fraction like 10949857676909686874786/8686771236548962210121 44775 is not particularly helpful. But now we have a floating point function for it!

You can use the other Taylor series generator easily to evaluate, say, SIN(19.5) radians by entering the line:

EVSUB(TAYLOR(SIN(X),X,0,10),X,19.5);

You are requesting a Taylor series with a certain number of terms calculated, rather than one calculated to a given accuracy. These are not the same things. Even if the Taylor series of a function converges, it may converge rapidly or slowly. The FLTTAY function presented here allows you to specify the accuracy desired in terms of significant digits rather than in terms of the number of arithmetic terms evaluated.

The difficult part of writing this program was finding the proper exiting condition. The most obvious approach would be to compare two consecutive terms, see if the terms are still getting smaller (test for convergence), and compare the size of the term with the accuracy criterion to see if it is less. There is a problem with this.

For illustration, let's look at the MacLaurian series for SIN(X). It looks like:

SIN(X) = X − X↑3/3! + X↑5/5! − X↑7/7 + . . .

This is a Taylor series, but it happens that every other term is zero. If we compare two consecutive terms the series will pre-

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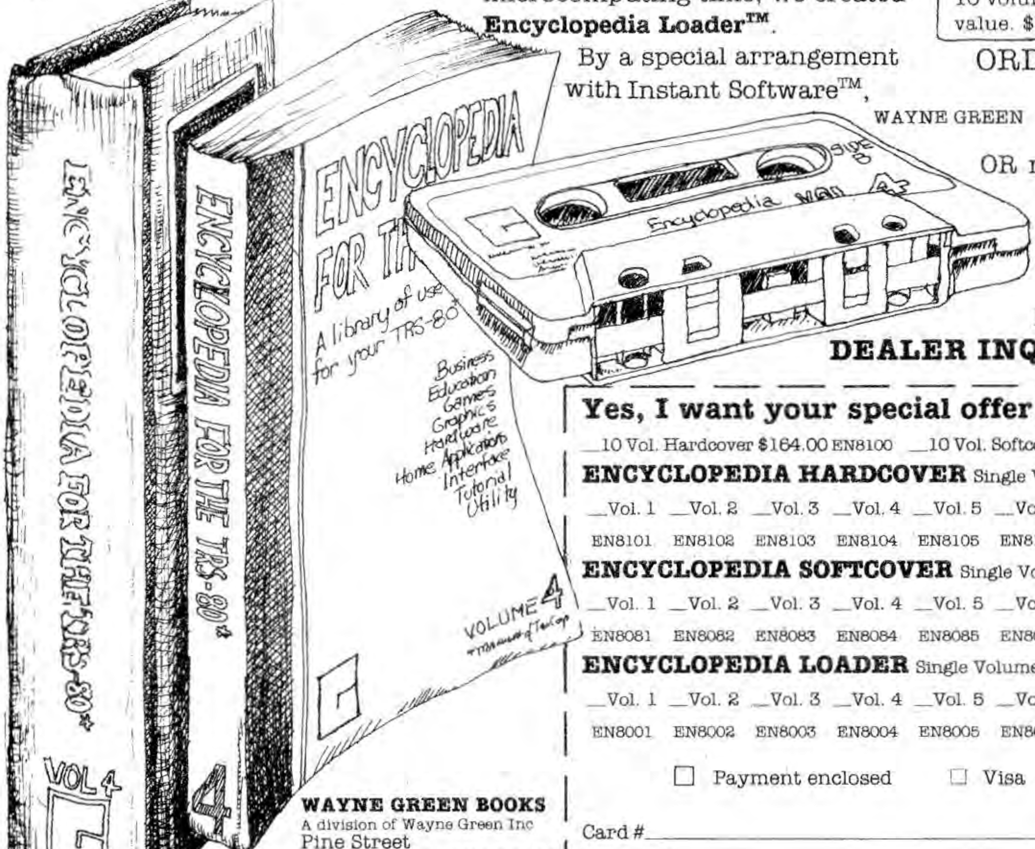

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Program Listing 4 Continued

```
        PRINT("ONLY UNIVARIATE FUNCTIONS!")  EXIT,
A: LOW,
LOOP
  BLOCK
     WHEN INTEGER(ZINT/10), PRTMATH(ZINT) EXIT,
     PRINT(DOT),
  ENDBLOCK
  ZINT: ZINT+1
  B: EVSUB(EXPR,X,A),
  UPY: MAX(UPY,B),
  LOWY: MIN(LOWY,B),
  A: A+INCX
  WHEN A>HIGH  EXIT,
ENDLOOP
  A: LOW, Q: 1,
  WHEN LOWY=UPY, PRINT("CHOOSE DIFFERENT X-LIMITS"), EXIT
  SLOPE: 45/(UPY-LOWY)
  INTER: 1-SLOPE*LOWY
  BOX(126),          % SET UP SCREEN %
  LOOP
      WHEN Q>126, EXIT
      Y: 47 - INT(EVSUB(EXPR,X,A)*SLOPE + INTER)
      SET(Q,Y)
      Q: Q + 1, A: A+INCX
  ENDLOOP
  W#SCAN (),
ENDFUN $               % END_PLOT#1 %
%                                                      %
%      PLOT#2 is different in that you must            %
%      enter the limits for X and Y, rather            %
%      than have auto Y-scaling. The calling           %
%                 sequence is:                         %
%    PLOT#2(expr, X, X_low, X_high, Y_low, Y_high)     %
%                                                      %
%                                                      %
FUNCTION PLOT#2(EXPR, X, LOW, HIGH, LOWY, UPY,
       INCX, A, B, Y, SLOPEY, INTERY, Q)
  WHEN (LOW=HIGH) OR (LOWY=UPY) OR
       (NUMBER(HIGH)=FALSE) OR (NUMBER(LOW)=FALSE) OR
       (NUMBER(LOWY)=FALSE) OR (NUMBER(UPY)=FALSE),
          PRINT("ERROR IN LIMITS!") EXIT,
  INCX: (HIGH-LOW)/126,
  A: LOW, Q: 1,
  WHEN LOWY=UPY, PRINT("CHOOSE DIFFERENT X-LIMITS"), EXIT
  SLOPE: 45/(UPY-LOWY)
  INTER: 1-SLOPE*LOWY
  BOX(126),          % SET UP SCREEN %
  LOOP
      WHEN Q>126, EXIT
      Y: 47 - INT(EVSUB(EXPR,X,A)*SLOPE + INTER)
      SET(Q,Y)
      Q: Q + 1, A: A+INCX
  ENDLOOP
  W#SCAN (),
ENDFUN $               % END_PLOT#2 %
%      ------------------------------------------      %
%     define a function to find the maximum of         %
%                  two arguments                       %
%      ------------------------------------------      %
%                                                      %
FUNCTION MAX(X,Y)
  WHEN MIN(X,Y)=Y, X EXIT
  Y
ENDFUN $                  % END_MAX %
%                                                      %
%      ------------------------------------------      %
%     define a function to find the integer Part       %
%              of a rational number                    %
%      ------------------------------------------      %
%                                                      %
FUNCTION INT(X)
   QUOTIENT(NUM(X),DEN(X))
ENDFUN $                   % END_INT %
%                                                      %
%      ------------------------------------------      %
%      define the TRS-80 ROM call at 0049H to be       %
%     W#SCAN (); it waits until a key is pressed       %
%      ------------------------------------------      %
%                                                      %
PUTD ('W#SCAN, 73) $
%                                                      %
%      ------------------------------------------      %
%               CALLING SEQUENCE:                      %
%      ------------------------------------------      %
%           PLOT(fun, var, low, high)                  %
%      ------------------------------------------      %
%                     where:                           %
%         fun = function to be plotted                 %
%        var = variable in the function                %
%     low & high are limits of the function            %
%      ------------------------------------------      %
%     now, enter the end-of-file information           %
%      ------------------------------------------      %
%                                                      %
STOP () $
RDS () $
```

```
%                                                      %
%       CUBIC solves cubic equations of the form       %
%             y[3 + p*y[2 + q*y + r = 0                %
%                                                      %
FUNCTION CUBIC(EXPR,Y,X,A,B,A1,B1,P,Q,Z)
    R: EVSUB(EXPR,Y,0),
    Q: EVSUB(DIF(EXPR,Y),Y,0),
    P: EVSUB(DIF(DIF(EXPR,Y),Y),Y,0),
    Z: DIF(DIF(DIF(EXPR,Y),Y),Y)
    WHEN (NOT (Z=1)) AND (NOT (ZERO(Z))),
         CUBIC(EXPR/Z,Y) EXIT
    A: (3*Q-P[2)/3     B: (2*P[3-9*P*Q+27*R)/27
    A1: CUB(-B/2+SQR(B[2/4+A[3/27))
    B1: CUB(-B/2-SQR(B[2/4+A[3/27))
    PRINT("ROOT 1 =") PRTMATH(A1+B1), NEWLINE(),
    PRINT("ROOT 2 =")
         PRTMATH(-(A1+B1)/2+(A1-B1)/2*SQR(-3)), NEWLINE(),
    PRINT("ROOT 3 =")
         PRTMATH(-(A1+B1)/2-(A1-B1)/2*SQR(-3)), NEWLINE(),
ENDFUN $
%                                                      %
%       SQR finds the square root in muMATH form       %
%                                                      %
FUNCTION SQR(X),
  X[(1/2)
ENDFUN $
%                                                      %
%       CUB finds the cube root in muMATH form         %
%                                                      %
FUNCTION CUB(X)
  X[(1/3)
ENDFUN $
%                                                      %
%                                                      %
STOP() $
RDS() $
```

Program Listing 5. Cubic Equation Solver

Program Listing 6. Taylor Series Generator

```
%     floating point Taylor series function            %
%     you must enter the expression and the            %
%     accuracy desired in number of digits             %
%                  written by                          %
%            Bruce Powel Douglass                      %
%                                                      %
%      NOTE: FLOAT/MU PACKAGE IS REQUIRED              %
%            The function must be one for              %
%            which muMATH knows the value              %
%                  at the point A                      %
%                                                      %
FUNCTION FLTTAY (EXPR, X, A, ACC, VAL, NUM, I, D
       DONE, RES1, RES, POINT, NUMNUM, DENNUM, DOT)
  POINT: ACC, DOT: '., DONE:FALSE,
  ACC: 1/RADIX()[ACC              % accuracy of result %
  NUMNUM:DENNUM:30,
  RES: 0, D:I: 1, RES1: -(RADIX()[10),
  PRINT("I'M THINKING  ")
  LOOP
    PRINT(DOT)
    RES: RES + EVSUB(EXPR,X,A) * D
%                                                      %
%        now, test every so often, to see if           %
%        the series is converging or has met           %
%            the convergence criterion                 %
%                                                      %
    BLOCK
       WHEN I<3 EXIT
       WHEN INTEGER(I/4), RES1: RES, EXIT
       WHEN INTEGER(I/2),
         WHEN ABS(RES-RES1) < ACC, NEWLINE(),
            PRINT("ACCURACY REQUIRED "), PRTMATH(I),
            PRINT("ITERATIONS"), NEWLINE(),
            PRINT("ANSWER IS "), PRTMATH(RES),
            DONE: TRUE, EXIT,
         PRINT("ITERATION #"), PRINT(I)
         PRINT(", CURRENT VALUE IS "),
         PRTMATH(RES), NEWLINE(), EXIT
    ENDBLOCK
    WHEN DONE, NEWLINE(), PRTMATH(RES), "" EXIT
%                                                      %
%        now, if, after 500 terms, we haven't          %
%       gotten there, then we probably never will      %
%                                                      %
    WHEN I>500,
       NEWLINE(),
       PRINT("DID NOT CONVERGE"), NEWLINE(),
       PRINT("VALUE IS "), PRTMATH(RES), NEWLINE(),
       PRINT("NUMBER OF ITERATIONS "), I EXIT,
```

Program Listing 6 Continues

Program Listing 6 Continued

```
    EXPR: DIF(EXPR,X)
    I: I + 1
    D: D * EVSUB((X-A)/(I-1), X, VAL)
  ENDLOOP
ENDFUN $            % END_FLOATTAY %
%                                                          %
%               CALLING SEQUENCE:                          %
%    FLTTAY(fun, var, exp pt, #_of_digits, eval pt         %
% where function = the function to be evaluated            %
%       accuracy = the number of digits desired            %
%       variable = the variable of the function            %
%       expansion point = the point of expansion           %
%       evaluation point = the point of evaluation         %
%               of the Taylor Series                       %
% for example:   FLTTAY(SIN(X),X,0,10,5716/100)            %
%     (this particular example also requires               %
%     the trigenometric packages to be loaded)             %
%                                                          %
STOP () $
RDS () $
```

```
FUNCTION PI(N,A,ACC,TERM,PI)
  PI:4  ACC: 1/RADIX()[N  A:1
  LOOP
    TERM: 8/(16*A[2-1)
    PI: PI-TERM
    WHEN TERM<ACC, PRINT("ANSWER IS ") PI EXIT
    PRINT("ITERATION #") PRTMATH(I)
    PRINT("  VALUE =") PRTMATH(PI) NEWLINE()
    A: A+1
  ENDLOOP
ENDFUN $
```

Program Listing 7. Pi

```
%    Hexidecimal to deciaml converter routine     %
%        to quit, type in the word DONE           %
%                                                 %
FUNCTION HEX#TO#DEC (ORI,NUM),
  ORI:RADIX(), % SAVE CURRENT RADIX VALUE %
  LOOP
    RADIX(16),
    PRINT("   HEX NUMBER:  "),
    NUM:SCAN(),
    WHEN NUM EQ DONE EXIT,
    RADIX(10),
    PRINT("DECIMAL EQUIVALENT:  "),
    PRINTLINE(NUM),
  ENDLOOP
  RADIX(ORI),  % RESTORE ORIGINAL RADIX VALUE %
"",
ENDFUN $
```

Program Listing 8. Base Conversions

Program Listing 9. Fruit

```
%        Welcome to FRUIT_WORLD ala muMATH!!            %
%         adapted from a similar program                %
%              written in RLISP by                      %
%              Dr. Jed Marti of the                     %
%              University of Oregon                     %
% ----------------------------------------------------- %
%      SUBJECT returns a non-nil value if its           %
%      argument can be the subject of a Q or A          %
%      If 'it' is used in reference to a previous       %
%      subject, then it's value (stored in the          %
%      global variable 'IT') is substituted back        %
%      in for the subject of the sentence.              %
%      If the 'it' is unknown, then it will be          %
%      treated as an unknown word, and the error        %
%      message will be displayed.                       %
%                                                       %
FUNCTION SUBJECT(EXP)
```

Program Listing 9 Continues

Program Listing 9 Continued

```
  BLOCK
    WHEN EQ(EXP,'IT), EXP:IT EXIT
  ENDBLOCK
  WHEN MEMBER(EXP,'(APPLE ORANGE PEAR BANANNA PLUM)),
    IT:EXP, TRUE EXIT
  FALSE
ENDFUN $
%                                                       %
%       OBJECT returns a non-nil value if its           %
%       argument can be the object of a Q or A          %
%                                                       %
FUNCTION OBJECT(EXP)
  MEMBER(EXP, '(HOLE RED ORANGE YELLOW RIPE STEM))
ENDFUN $
%                                                       %
%         VERB returns a non-nil value if its           %
%       argument indicates a connection between         %
%              a subject and an object                  %
%                                                       %
FUNCTION VERB(EXP)
  MEMBER(EXP, '(IS HAS POSSESSES))
ENDFUN $
%                                                       %
%        NOISE returns a non-nil value if its           %
%       argument is an article that can be ignored      %
%                                                       %
FUNCTION NOISE(EXP)
  MEMBER(EXP, '(A AN THE))
ENDFUN $
%                                                       %
%    The PRSE function determines if the sentence       %
%    is a statement or a question. If it is a state-    %
%       ment that cannot be parsed, then an error       %
%             message will be displayed                 %
%                                                       %
FUNCTION PRSE(SENTENCE)
  SENTENCE: REMOVE(SENTENCE),
  WHEN QUESTION(SENTENCE), PRINTL2 (ANSWER(SENTENCE)) EXIT,
  WHEN STATEMENT(SENTENCE), PRINTL2 (DOIT(SENTENCE)) EXIT,
  PRINT("I CANNOT UNDERSTAND THE SENTENCE") NEWLINE()
ENDFUN $
%                                                       %
%  The REMOVE function removes the noise words from     %
%                 the sentence.                         %
%                                                       %
FUNCTION REMOVE(X,Y)
  LOOP
    WHEN EMPTY(X), X EXIT
    WHEN NOT(NOISE(FIRST(X))), Y: LIST(FIRST(X)) EXIT,
    X: REST(X)
  ENDLOOP
  LOOP
    LOOP
      WHEN NOT(NOISE(FIRST(X))) EXIT,
      X: REST(X)
    ENDLOOP
    WHEN EMPTY(X), REST(REVERSE(Y)) EXIT
    Y: ADJOIN(FIRST(X), Y)
    X: REST(X)
  ENDLOOP
ENDFUN $
%                                                       %
%      QUESTION returns a TRUE if the sentence          %
%         (sans NOISE words) is of the form             %
%              VERB - SUBJECT - OBJECT                  %
%                                                       %
FUNCTION QUESTION(EXP),
  WHEN VERB(FIRST(EXP)) AND SUBJECT(SECOND(EXP))
    AND OBJECT(THIRD(EXP)), TRUE EXIT
FALSE
ENDFUN $
%                                                       %
%       STATEMENT returns a TRUE if the sentence        %
%          (sans NOISE words) is of the form            %
%             SUBJECT - VERB - OBJECT                   %
%                                                       %
FUNCTION STATEMENT(EXP),
  WHEN SUBJECT(FIRST(EXP)) AND VERB(SECOND(EXP))
    AND OBJECT(THIRD(EXP)), TRUE EXIT
FALSE
ENDFUN $
%                                                       %
%    Answering a question involves looking up the       %
%  verb for the subject and seeing if the attached      %
%  word matches the object of the question. If not,     %
%  the answer is 'no', and the real answer is dis-      %
%  displayed . If there is no word for the verb,        %
%  the answer is 'I don't know'. If the words match     %
%               the answer is 'yes'.                    %
%                                                       %
FUNCTION ANSWER(EXP, QTY)
  QTY: GET(IT, FIRST(EXP))
    WHEN EQ (QTY,THIRD(EXP)) 'YUP! EXIT
    WHEN EMPTY (QTY) "I DON'T KNOW!" EXIT
  LIST('NO!, IT, FIRST(EXP), QTY)
ENDFUN$
%                                                       %
%     DOIT updates the programs view of the world       %
```

Program Listing 9 Continues

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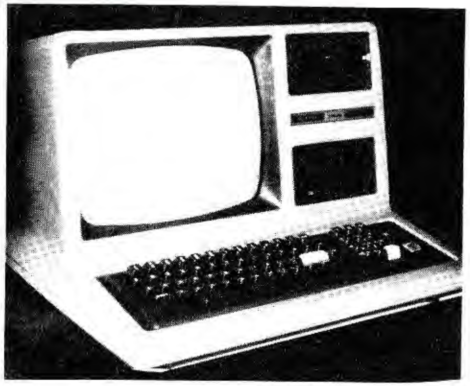

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Program Listing 9 Continued

```
% It does this by putting on the property list of the %
%  subject of the verb, an assertion with a value     %
%  of the object. If an object already exists for the %
%          verb, a new one will not be added.          %
%                                                      %
FUNCTION DOIT(L, QTY),
  QTY: GET(IT, SECOND(L))
  WHEN EMPTY(QTY),
    PUT(IT, SECOND(L), THIRD(L)), "OK" EXIT
  LIST("BUT", IT, SECOND(L), QTY)
ENDFUN $
%                                                      %
%         PRINTL2 prints out the sentences.            %
%                                                      %
FUNCTION PRINTL2(EXP),
  PRINT("===>  ") PRINT(EXP) NEWLINE()
ENDFUN $
%                                                      %
%     DIALOG accepts and determines the meanings       %
%     of the sentences. A number of words will exit    %
%                                                      %
FUNCTION DIALOG(X),
  PRINT("-- WELCOME TO FRUIT WORLD --") NEWLINE()
  LOOP
      X: SCANLINE()
      WHEN MEMBER(FIRST(X), '(END QUIT ADIOS BYE DONE EXIT)),
           PRINT("GOODBYE!!"), EXIT
    PRSE(X) NEWLINE()
  ENDLOOP
ENDFUN $
%                                                      %
%       now define the scan_a_line function            %
FUNCTION SCANLINE(EX,A)
  EX:LIST()
  LOOP
    A:SCAN()
    WHEN TERMINATOR(A), REVERSE(EX) EXIT
    EX:ADJOIN(A,EX)
  ENDLOOP
ENDFUN $
%                                                      %
%                                                      %
%     now a sample conversion with FRUIT WORLD         %
%     the user enteries are prefaced with a "@"        %
%     for ease of recognition only! Don't enter them   %
%
@ DIALOG();
  -- WELCOME TO FRUIT WORLD --
@ THE APPLE IS RED <ENTER>
  ==> OK
@ IS IT RED <ENTER>
  ==> YES
@ HAS IT A HOLE <ENTER>
 ==> I DON'T KNOW!
@ IT HAS A HOLE  <ENTER>
 ==> OK
@ THE ORANGE HAS A STEM <ENTER>
 ==> OK
@ THE ORANGE HAS A HOLE <ENTER>
 ==> BUT THE ORANGE HAS STEM
@ HAS THE ORANGE A HOLE <ENTER>
 ==> NO THE ORANGE HAS STEM
@ ADIOS <ENTER>
GOODBYE       %
STOP () $
RDS () $
```

Program Listing 10 Continued

```
  WHEN INTEGER(N)=FALSE, EXIT
  WHEN PRIME(N), ANS:LIST(1,N) EXIT
  J:N, ANS:LIST(), B:2
  LOOP
    D:N/B
    BLOCK
    WHEN INTEGER(D)=FALSE OR PRIME(B)=FALSE, EXIT
    WHEN INTEGER(D/B), N:D
      LOOP
        ANS: ADJOIN(B,ANS)
        WHEN INTEGER(N/B)=FALSE, EXIT
        N: N/B,
      ENDLOOP, EXIT
    ANS: ADJOIN(B, ANS)
  ENDBLOCK
  B: B+1
  WHEN B>J/2, ANS EXIT
  ENDLOOP
ENDFUN $
%                                                      %
%     CUBIC, solves cubic equations for roots          %
%                                                      %
%                                                      %
FUNCTION CUBIC(EXPR, Y, X, A, B, A1, B1, P, Q, Z)
  R: EVSUB(EXPR, Y, Ø)
  Q: EVSUB(DIF(EXPR,Y), Y, Ø)
  P: EVSUB(DIF(DIF(EXPR,Y), Y), Y, Ø)
  Z: DIF(DIF(DIF(EXPR,Y),Y),Y)/6
  WHEN  PRODUCT(Z)
     CUBIC(EXPR/Z, Y) EXIT
  A: (3*Q - P[2)/3     B: (2*P[3 - 9*Q*P+27*R)/27
  A1: CUB(-B/2 + SQR(B[2/4 + A[3/27))
  B1: CUB(-B/2 - SQR(B[2/4 + A[3/27))
  PRINT("ROOT 1=") PRTMATH(A1+B1), NEWLINE(),
  PRINT("ROOT 2=")
     PRTMATH(-(A1+B1)/2+(A1-B1)/2*SQR(-3)), NEWLINE()
  PRINT("ROOT 3=")
     PRTMATH(-(A1+B1)/2-(A1-B1)/2*SQR(-3)), NEWLINE()
ENDFUN $
%                                                      %
%        SQR(X) finds the square root of X             %
%                                                      %
FUNCTION SQR(X),
  X[(1/2)
ENDFUN $
%                                                      %
%        CUB(X) finds the cube root of X               %
%                                                      %
FUNCTION CUB(X)
  X[(1/3)
ENDFUN $
%                                                      %
%                                                      %
%        PI to infinite precision with FLOAT/MU        %
%                                                      %
FUNCTION PI(N,A,ACC,TERN,PI)
  PI:4 ACC: 1/RADIX()[N  A:1
  LOOP
     TERM: 8/(16*A[2-1)
     PI: PI-TERM
     WHEN TERM < ACC, PRINT ("ANSWER IS"), PRTMATH(PI) EXIT,
     PRINT ("ITERATION #") PRTMATH(I)
     PRINT("VALUE =") PRTMATH(PI) NEWLINE()
     A: A+1
  ENDLOOP
ENDFUN $
%                                                      %
%        end the file with proper file-enders          %
%                                                      %
STOP() $
RDS() $
```

Program Listing 10

```
%   All programs written by Bruce Powel Douglass   %
%   presented here are submitted to the public     %
%   domain and free use and distribution is        %
%   granted by the author. These routines include  %
%   PLOT/MU, FLOATTAY/MU, CUBIC/MU, PRIME/MU       %
%                    and FRUIT/MU.                 %
%                                                  %
%   =============================================  %
%                   PRIMES/MU                      %
FUNCTION PRIME (N,A,B)
  WHEN N=2 OR N=3, TRUE EXIT
  WHEN INTEGER(N)=FALSE OR INTEGER(N/2), FALSE EXIT
  A:3, B:N[(1/2)    % B=SQR(N) %
  LOOP
    WHEN INTEGER(N/A), FALSE EXIT
    WHEN A>B, TRUE EXIT
    A:A+2
  ENDLOOP
ENDFUN $
%                                                  %
%          now the main function                   %
%                                                  %
FUNCTION FACTORS(N,J,ANS,B,D)
```

Program Listing 10 Continues

maturely terminate. The same argument holds for comparing the value of the term with the accuracy criterion.

The solution was to check for convergence every four terms. If the terms have not gotten smaller there is a good chance that the series has converged or is non-analytical at that point. That is performed in the block in FLTTAY. When the looping variable is divisible by four, RES1 is assigned the current value of the result. When it is not divisible by four, but it is by two (once every four times), the comparison with RES1 and the current value of the result is made. The comparison with the accuracy criterion is made here as well.

With this function, you can generate

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Winter/Spring 1982

Dear *80 Microcomputing* Subscriber:

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

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

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

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

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

Sincerely,

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Taylor series approximations to any accuracy desired, provided that muMATH knows the value of the function at some point. FLTTAY works with SIN(X) if it is expanded about the point A equals zero, since muMATH knows (if TRGPOS/ALG is loaded) that SIN(0) is zero.

Along the same lines, Program Listing 7 generates an infinite series of approximations for Pi, each better than the last. While the algorithm converges quite slowly, it will eventually get as close as you wish to come (with 611 digits of accuracy, if you are sufficiently patient).

The next program (see Listing 8) is useful for changing numbers from one base to another (in this case, from hexadecimal to decimal). You may find this helpful, for example, if you have a short machine language program you wish to put into Basic Data statements.

Parting Shot

I'd like to present one last muMATH package, called FRUIT/MU (see Listing 9). A simple experiment in artificial intelligence, it maintains a knowledge base about the world it knows—the world of apples and pears. Inform it about various characteristics of the fruit and it will incorporate this information into its knowledge of the world. The driver program for this is DIALOG( ), and it requires no parameters passed.

I like to think of a computer as a super pencil; it aids the user's ability to abstractly deal with the world by freeing the mind from drudgery and allowing the time and effort necessary to reach new intellectual heights. muMATH is a much greater tool for the manipulation of abstract mathematical symbols than conventional Basic or Fortran programs.

All programs in this month's column are available from me on a 35-track disk for the marginal cost of $15—to cover disk, mailing, and gas to the Post Office. With that, you also get a text editor in both Basic and compiled forms. These editors have macro key definitions, options for inserting and deleting text, and writing to a file readable by muMATH. If you have a single drive system without a single drive copy in your DOS, send along a minimal System disk. If you can take a 40-track single density disk, let me know.

Bruce Powel Douglass
1005 West Main
Vermillion, SD 57069

My April column incorrectly states that in the nerve cell, two sodiums are exchanged for three potassiums. It should read three sodiums are exchanged for two potassiums.

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EDUCATION 80

by Earl R. Savage

"If you let an art teacher experiment with it, you may never see your computer again!"

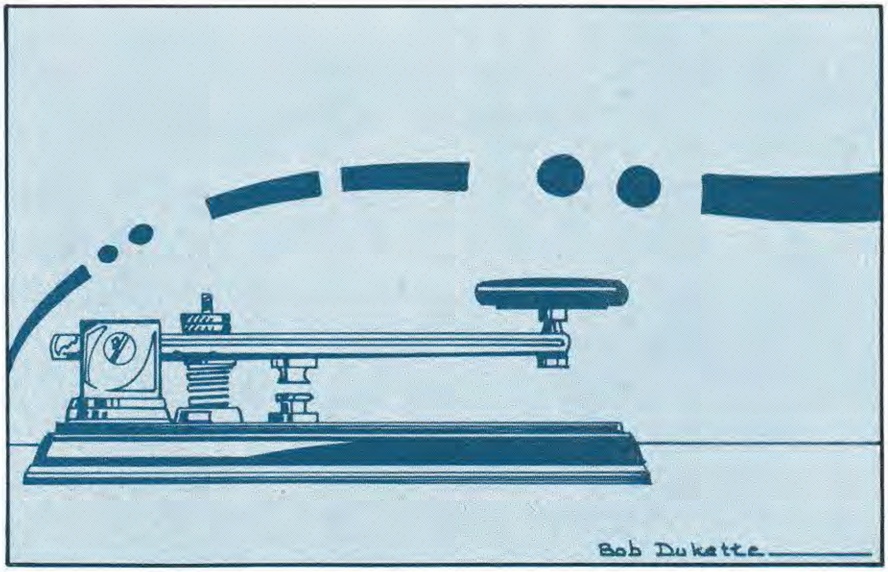
Let me tell you about a couple of programs which may interest other teachers and students in the microcomputer.

Do you have a science-teaching colleague with a tentative interest in the computer? Perhaps you can "push him over the edge" with one of the interesting and useful programs from Becker Electronics, 108 W. Franklin St., Chapel Hill, NC 27514.

Sidereal Time is not designed as a tutorial on the subject. Rather, it is a quick and efficient means of computing the sidereal time and the Julian date for any local time and place. New astronomy students can determine where to point the telescope for a celestial object without all the laborious manual computations otherwise required.

The manual is built into the program and can be called at any time. One section explains in detail how each required input can be determined and what it means.

Other related programs are Cloud, a tutorial on cloud formation and altitude determination, and Relativity, an interesting treatment of time, energy, mass and so on. Perhaps one of your colleagues is looking for such an educational tool.



Morse Code?

Scout leaders and Radio Clubs have always been interested in methods of teaching Morse code. Various means of learning the code have been around for years. First, there was an instrument which used punched paper tape and later, the inked tape reader. Those devices keyed audio oscillators to produce the dits and dahs to be decoded by the students. Later, recorded audio code was available for study on disk and tape.

The problem with these methods is that the coded material is canned—it does not change from one presentation to the next. The student learns, after several runs, the order of the characters.

This is a problem of the past with presently available Morse code programs. Current programs produce characters randomly, or pre-determined characters are easily changed from one presentation to the next.

If you are considering acquiring such a program, take a look at Morse Code Communications from Rogo Computer Products, 4752 DeBeers Drive, El Paso, TX 79924. This one does more than send code directly through an audio oscillator; it also copies code from any audio source.

Your TRS-80 can be connected directly to the audio output of a communications receiver (via the cassette port). The incoming code is decoded and the characters are displayed on the screen as they are received. Once the student has his operating license, the same program enables keying his transmitter from the keyboard, or with messages he has stored in computer memory. All these features, in addition to code practice, cost around $20.

For the Math/Art Drafting/Science Teacher

We have all heard complaints about the poor resolution of Model I and III graphics. Although elaborate and expensive hardware fixes increase the resolution, I feel they are of limited value. Programs written for such accessories can be used only on machines which are similarly equipped.

If the lack of high resolution is a problem for you, why not strike a compromise and use a relatively inexpensive approach? Dotplot-80 makes possible bar graphs, pie graphs, line drawings and computer art with a respectable 60 by 63 dots per inch.

Dotplot-80, Workbench Software, Box 24497, Dayton, OH 45424, permits high resolution graphics with a Line Printer VII or VIII (or an equivalent). The maximum allowable plot/drawing dimensions are eight inches by over 500 inches.

The program is quite versatile. In addition to the fine resolution of the output, a number of built-in functions and subroutines make life easier for the user. Reference points can be changed with little difficulty and scales for input values can be set up by the operator or computed by the program. Grids can be drawn automatically on command. Also, labels can be placed where needed and printed in any of four orientations: right, left, up, down.

Built-in commands make simple or complex line drawings a very straightforward procedure.

There is only one problem with this program: If you let an art teacher experiment with it you may never see your computer again!

Coming Up

The next *80 Micro* is the annual games issue. I'll include my opinion about the place of games in Computer-Assisted Instruction. Tune in—you may be surprised. ■

✓See List of Advertisers on page 386

80 Medical Opinion

by Philip R. Mills, M.D.

"This program is a brave attempt to overcome the Model I's greatest limitation—35-track single-density disk drives."

If you are just beginning the computerization of your clinic, "Roll Call!" in the February issue of *80 Micro* is must reading. The last sentence of the article should be underlined: "Somebody has to enjoy playing with the computer, or the whole project will end with the hardware gathering dust in a storeroom." The experience the author describes is similar to our clinic's efforts to automate.

Although every clinic is different, our clinic is probably representative of many small medical clinics. We have four physicians. One physician has computer narcolepsy (yawns and falls asleep whenever the topic is mentioned), another has an incurable case of computer hysteria (I will let you guess which one of our group has this), the other two partners lie somewhere in between.

From the time we purchased a computer until it was up and running for word processing, three months elapsed. Our first use of the computer for patient billing was disastrous. It left our billing clerk hesitant to ever try a computer program again. Like over 2,000 other clinics in North America, we began with Radio Shack's Medical Office System for the Model I.

The catalog describes this program as "ideal for the doctor's office or small clinic." The response by physicians has been overwhelming, revealing the tremendous software market for our profession. Although the software package itself is modestly priced at $300, it is not inexpensive, however, when one considers the four disk drives required. Disk back-ups are also a significant expense with a minimum of 50 per year.

Our clinic purchased one of the first releases. At first, our receptionist was eager to use the computer since she was very tired of the manual peg-board system with its time-consuming daily balances, obscure errors, and tedious aging of accounts. We drove 110 miles to pick the package up when availability was delayed at our local Radio Shack store.

The program itself was originally written for a minicomputer, the IBM 5100, back in 1978 by an internist, Dr. John Hayes. It was upgraded (did you hear that IBM—upgraded!) to the Model I. Dr. Hayes read his first paper describing and demonstrating his system at the "Third Symposium on Computers in Medical Care," October 1979.

This program is a brave attempt to overcome the Model I's greatest limitation—35-track, single-density disk drives. Despite advertisement hype, the system is definitely *not* ideal for the clinic. In our clinic situation it was not even workable. It might be useable in a one-doctor clinic with a stable, small patient base, however. If no better equipment was available at a reasonable price, this package would be more of a consideration. At present, however, I do not feel that most clinics should be willing to put up with the inconveniences of 5¼-inch drives when hard disk and eight-inch drives are so superior and affordable for business use.

"My greatest criticism of the program is in its editing functions."

Of course, it uses many disks. Without counting back-ups, records for one year require 48 transaction disks. Daily operation requires a minimum of eight disks and may require as many as 13, again exclusive of back-ups. So many daily back-ups are required that our computer operator refused to back-up more than the two most important disks per day!

As written, the program works with one 40-track and three 80-track drives, but this provides no significant advantage. It will not work with two 40-track drives and two 80-track drives because of the required disk swapping. The disk swapping necessitates absolutely perfectly aligned disk drives.

The program prints a daily journal and health insurance claim forms very easily. It does not print a superbill. Monthly summaries are provided both for the individual physician and all the physicians. Aged accounts are available as necessary. Limited monthly statistics for procedures and diagnoses are provided. Limited password protection is optional.

The program is written in Basic and runs smoothly, but slowly. Alphabetic sorting and printing of 709 patients took us 43 minutes. This presents a major problem since sorting must be done weekly. Unfortunately, sorting cannot be done during lunch hour if the clinic has more than 699 patients since operator intervention is required for disk changing. Overall, the system is not time efficient. After one month's use, our office testing revealed that the old, manual pegboard system was faster.

Record keeping is limited to one-month summaries. There are no provisions for yearly summaries. This is a stand-alone program and does not interface with the Radio Shack Model I/III General Ledger or other accounting programs.

Day-to-day routines are not difficult. A program entitled Run automatically brings up the menu from a boot. A minor irritation for the billing clerk was the inconsistency of the INKEY$ function. For some entries Enter is required, for other entries it is not.

Old patients are handled simply. The account number is found in a printed listing. When you enter the number, the patient's name appears with a prompt to double check that this is the correct patient. It is impossible to perform a computer search for a patient's account number if the account number is unknown, necessitating the frequent and time-consuming alphabetical sorting discussed above. Patient lists are printed alphabetically and inelegantly across three columns allowing less than 200 patients per page. The printout is time consuming. A practice of 3,000 patients would require 15 pages and 12 minutes using our MX-100. There are no provisions to pause between pages, so a tractor or other similar printer drive is necessary.

Processing new patients is awkward, time consuming, and requires three disk

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changes. It was designed to be done at the end of every day. In our clinic this was an unreasonable restriction. Much of our work is emergency and referral. Throughout the day we see new patient work-ins. We cannot use a program that does not allow us to easily add new patients. I suspect that few clinics will be able to tolerate the system's patient entry. There are no provisions for making the patient's account number correspond with his clinic number. New patient accounts are entered sequentially. The program fails to prompt for the first available account number, so this number must be recorded manually (usually on scraps of paper that will clutter the desk and be frequently misplaced). This number must then be entered manually at the start of any new patient account processing. Our billing clerk found this to be a great irritation. The amount of space for the patient's street address is limited, and abbreviations are almost always necessary. Only one phone number can be entered.

Standard patient visit charges are entered easily. Two hundred standard diagnostic and therapeutic procedures are available by number. This is far too few for an orthopedic or similar type of practice which has many different x-rays, casts, and so on for office procedures. It may be a reasonable number for other types of practices, but it is amazing how quickly lab, x-rays and supplies surpass the 200 limit. No provision has been made to allow modification to standard charges unless the charge is entered as a non-standard procedure. Non-standard procedures can be entered, but no record of the actual procedure is saved on disk.

A sequential list of procedures may be printed at any time. There are no provisions for printing this list in alphabetical order. There are no provisions to separate the procedures into natural divisions such as P.T., x-ray and lab. The entry of any new procedure suffers from the lack of prompting for the first available procedure number. Like patient account numbers, this must be recorded manually.

Two hundred of the more common diagnoses of a clinic can be coded for fast entry. This feature was too limited to be of great value in our practice and generally the diagnosis was entered manually. In time we may have used it more had we continued using the package.

My greatest criticism of the program is in its editing functions. It is time consuming and awkward. A very simple editing change may take four minutes. More complicated editing may take far longer. Some changes necessitate rebooting.

The cleverest part of the program is its date entry. After using it, every other date entry method seems archaic. To appreciate it you must try it on the Model I. May 6, 1982 would be entered as 050682. While the numbers are being entered the program supplies the slashes to read on the screen 05/06/82. Error trapping is provided. Should you enter 05/32/82, the screen will show 06/01/82.

Limited month-end statistics are provided for examining which procedure and diagnosis was most commonly performed. Printouts for each physician's charges are available by day or summarized. One cannot obtain categorical statistics for P.T., x-ray, and so forth. There are no options to evaluate the average cost per diagnosis, cost per patient, or average number of patients per day.

Billing is done monthly. The program provides for the option to print the clinic's name and address if these are not preprinted on the statements. The clinic or practice name is limited to 20 characters, so for many practices abbreviations will be necessary.

We found one bug in the program. The transaction list would not update the date when all transactions were printed. Radio Shack is aware of the problem and by the time this is published a correction patch will probably be available.

The Medical Office System comes with nine disks. Two were confusingly mislabeled as "Stored Transaction" rather than the correct "Sorted Transaction." I assumed incorrectly from the labels that these were back-ups. Despite the large number of disks required, there is no automatic format or back-up function. The set-up routine also failed to provide a formatting routine.

The documentation is adequate but not excellent, failing to meet the special needs of either the nervous, beginning secretary or the advanced programmer. Although there is no index, the table of contents is sufficient.

For the beginner the documentation fails to emphasize the importance of disk back-ups. Nowhere does the documentation make clear which disks need this back-up and how often. We learned only by experience that the verify disk does not need a back-up, for example.

The documentation also refers the user to the computer manual for disk back-up and formatting instruction. Do not try handing the computer manual to the secretary for these instructions. We photocopied the appropriate pages and placed them in the manual for ease of reference.

For the advanced user the manual fails to include suggestions for program modification. For example, it should state where the printer modules are located so any special printer features can be easily used if desired.

An oversight which should be corrected is the failure to provide a utility for transferring your patient files to the Model II should you desire to upgrade. It will be necessary to reenter all our patient data. Windham Software's Medical Office System for the Model II reportedly will provide such a utility. A full review of this package will be given in a few months.

A final flaw in the program is the nightmare necessary to install the system in the clinic. It took us a month, and *much* overtime. The patient entry does not lend itself to gradual changeover.

I dislike having to write unfavorable reviews of software. I do not wish to discredit Radio Shack or Dr. Hayes. I am pleased that efforts are being made to address the needs of physicians. Unfortunately, the present package cannot surmount the 5¼-inch disk drive limitation.

Next month we will look at Charles Mann's patient billing program for the Model I/III. Until then...■

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17. NEWDOS 80 2.0 USERS can use the CMD "dos command" function!
18. NEW and EASIER to use USR COMMANDS.
19. New math functions to calculate XOR and INTEGER REMAINDERS
20. Logical STRING COMPARISONS are now supported.
21. The disk commands INSTR, MID$ ASSIGNMENT are now supported on both DISK AND TAPE ZBASIC.
22. DEFSTR is now supported.
23. Eight disk files may be opened simultaneously; random, sequential or mixed.
24. LINE INPUT#, is now supported.
25. Invoke the compiler by simply hitting these two keys:
26. NEW 100+ PAGE MANUAL WITH DESCRIPTIONS AND EXAMPLE.
27. ZBASIC 2.2 Comes with CMDFILE/CMD program from MISOSYS, to allow appending or merging compiled programs and machine language programs from tape or disk.

ZBASIC 2.2 DOES NOT SUPPORT THESE BASIC COMMANDS:

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

ZBASIC 2.2 SPEED COMPARISON DEMO

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

ZBASIC 2.2 DEMO PROGRAM

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

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

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

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RELOAD 80

by Art Huston

Coming soon—games, games, games!

In August we will publish our largest annual games issue yet! This issue will have everything—adventures, real-time space games, card games and much more. In short, August will be a blockbuster.

To make room for all this excitement, we are expanding the August Load 80 to two tapes and two disks. So ordering Load 80 for August will bring you twice the fun and excitement of any other month.

Of course, we have to change prices to provide all this. The cassettes will cost $17.97 and the disks $29.97, still outstanding deals. These price changes are for August only.

All Load 80 subscribers will receive the first tape or disk, along with a special coupon. Send us the coupon along with $5.97 (cassette) or $8.97 (disk) and we will ship the second Load 80 recording immediately.

Your chance to get in on the fun is coming up soon—don't miss it!

Color Computer users stay tuned. We will have the first Color Load 80 before the year is out.

June/July Load 80 Directory

Program	Title	Page	Comments
1	SMPLZAP1	232	Needs EDTASM
2	SMPLZAP2	232	Needs EDTASM
3	SMPLZAP3	232	Needs EDTASM
4	SURVEY	248	None
5	QUESTION	248	None
6	LOADFILE	248	None
7	PPREDICT	272	None
8	DIRECTRY	288	None
9	AIRTRAVL	300	None
10	LEARNA	326	None
11	MERLIN	330	None
12	PROJCAL	348	None

Compatibility

From time to time we all come across a program that will not work. A bug may be the problem, but it is very likely that the program is not compatible with your machine.

There are two types of incompatibility. Loading incompatability simply means that the data on the tape or disk was not designed to load into your machine. The Models I and III will read Load 80 tape and disk files—the Color Computer will not. Running incompatability means that the program will not execute correctly in your machine.

Here are some things which can cause a program to work in one machine and not another:

- The program uses a machine-language routine which calls ROM routines. If the program was written on a Model I it may not work on a Model III, and vice versa.
- The program uses a lot of memory and will not run on 16K cassette systems, or on 32K disk systems.
- The program uses disk commands which are not available under cassette Basic.

When you are having trouble with a program, first decide if it was meant to run on your system. If you get into trouble, read the Key Box. If that doesn't work, read the article carefully and scan the listing. You may find that the program simply wasn't meant to run in your machine.

Errata

The programs PERSPECT, FORE and TESTFILE were left off the May Load 80 cassette because of space limitations. They will not be included on any future Load 80.

The program "Financial Wizard" from page 326 of the May issue accidentally appeared with the Load 80 logo. It cannot be included because it is written to the Model II. ■

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NEW PRODUCTS

Edited by Steven Frann

"A.C.E. Smartmodem software features the ability to write your messages during the day and send them at night."

A.C.E. Smartmodem Software

You can receive and transmit ASCII files from your completely unattended computer system with the Automated Communication Exchange Smartmodem software. This software features the ability to write your messages during the day and send them at night when the telephone rates are lowest and computer systems are least busy. You can set the A.C.E. software to communicate with many different types of computer systems.

The A.C.E. software has host and terminal capabilities to support the auto dial and auto answer features of the Hayes Stack Smartmodem. The software supports uploading and downloading from host and terminal modes. This eliminates the need for any alien terminal programs and makes the A.C.E. program a standalone datacomm system.

The software is written exclusively for the Hayes Stack Smartmodem and 48K Models I and III with disk. The A.C.E. Smartmodem software retails for $79. For additional information contact A.C.E. Computer Products, 1640 N.W. 3rd St., Deerfield Beach, FL 33441, (305) 427-1257. For orders only call 1-(800)-327-2283.

Reader Service ✓550

A.C.E. Smartmodem software

Goodies for Your Cassette System

LIICOS, Level II Cassette Operating System ($34.95), provides up to 17 times faster operating throughput for Basic data files. It adds new and modified commands to Level II Basic (DEFM OPEN# PRINT# CLOSE).

Text1, a 16K Level II word processor ($44.95), provides 192 lines (4–8) pages of in-memory text editing. It features full cursor control, imbedded printer control, compressed data storage, insert, delete and move lines, insert and delete characters, restart procedure, variable line size, and more.

BAUD20 is a set of high speed (2000 baud) tape routines for the Model I Level II computer. These routines are RAM resident and require no modification or addition to the hardware. Memory requirement is about 130 bytes. They are an optional part of the LIICOS and Text1 systems for $10 or you may purchase them as a standalone system for use in Assembly language programs or in standard Basic programs via USR calls. Price for the standalone package is $19.95.

For additional information contact Canty and Associates, 8909 Bellington Road, Pensacola, FL 32504.

Reader Service ✓579

CP/M 2.2 Technical Support

Digital Research's Technical Support group has compiled a set of CP/M 2.2 patches and application notes. The notes include information on "using PIP with XSUB," "auto loading programs," "making delete (rubout) work like backspace," "improving the Control-S function," and "nested submit files."

Copies of the notes are available to registered CP/M users who write to CP/M 2.2 Application Notes, Technical Support, Digital Research, P.O. Box 579, Pacific Grove, CA 93950. Requests must be written and include the user's CP/M License Number. CP/M users who have not sent in their registration cards can include them.

Reader Service ✓566

Circus Adventure

Circus Adventure is a game written especially for children. The player moves through various locations at the circus to find the popcorn stand. On the way he meets many characters or gets to special places. Surprises are scattered along the route. The game includes graphics and songs throughout. The average playing time is 10 minutes and every player eventually wins.

Circus Adventure provides a positive approach to introducing children to computers. No "instant death" or horrible happenings are in the game.

Priced at $10, Circus Adventure is available for 16K Color Computers from Computer Island, 227 Hampton Green, Staten Island, NY 10312.

Reader Service ✓591

Disk Fixer

Disk is a disk examination and modification utility program for the Model I. This program allows access to any data on a TRSDOS compatible disk by either the filespec or track and sector access methods. A full screen editor allows you to display and edit the disk data in either ASCII or hex formats. The program is completely menu driven. It is written in Z80 Assembly language for the fastest possible execution.

The program lets you build and maintain test files during the debugging phase of program development, examine damaged disk files, and even make repairs to damaged disk directories.

Disk is available from Clockwork Software, P.O. Box 704, Colorado Springs, CO 80901, for $25, shipping and handling included.

Reader Service ✓583

Computerized Encyclopedia

Moses Engineering's 48 cassette Computerized Encyclopedia for TRS-80 Color Computers (16K) actively involve you in the learning process. Sight, sound, the written word and your responses increase learning rates over conventional encyclopedias. The computer checks if you have learned the message and lets you know if you have it right.

Each cassette is an 8K computer program written in Basic so that most users can apply them to classroom as well as home uses.

The encyclopedia cover more than 500 topics including aardvark, abacus, accounting, algebra, biology, physics, optics, and states.

The encyclopedia is $200 postpaid. For a sample send $4 for cassette 1 to Moses Engineering, Rt. 7, Greenville, SC 29609.

Reader Service ✓578

Echo-80 Speech Synthesizer

The Echo-80 speech synthesizer for the Models I and III uses a combination of phoneme synthesis and LPC technology, pioneered by Texas Instruments. It offers an unlimited vocabulary.

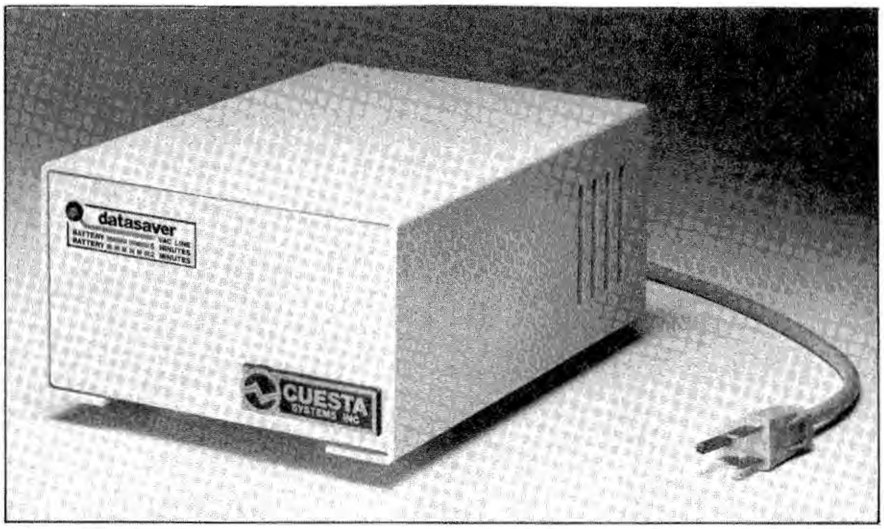
The Textalker speech generator, standard with the Echo-80 speech synthesizer, translates normal English text to speech automatically; the speakeasy phoneme generator, also supplied, allows the user to code words phonetically.

Priced at $295, it is available from Street Electronics Corporation, 3152 E. La Palma Ave., Suite D, Anaheim, CA 92806, (714) 632-9950.

Reader Service ✓577

Datasaver Provides Backup Power

Datasaver protects against unexpected power failures or surges that can cause many systems to fail.



Cuesta Systems' Datasaver

The 200-Watt Datasaver provides continuously filtered ac power from a single US standard (NEMA 5-15R) output receptacle located on its rear panel. At full power, the unit supports most systems for 2-5 minutes, with a range of 15-30 minutes at half-power in blackout or brownout conditions.

It can power any load up to 200 Watts, including units with switching, linear or ferroresonant power supplies. Its precision 0.1 percent crystal frequency standard allows real-time power sensing and prevents video jitter.

The Datasaver includes a rechargeable sealed battery, automatic battery charger, solid state power inverter, AC line voltage monitor and cutout switch, front panel power status LED and an alarm buzzer to warn of line power losses.

Datasaver is offered in two different models, for domestic ($695) and international ($730) use. For more information, contact Dave Dickey, President, Cuesta Systems Inc., 3440 Roberto Court, San Luis Obispo, CA 93401, (805) 541-4160.

Reader Service ✓572

Bulk Disk Eraser

The National Institute for Rehabilitation Engineering is offering a compact, reliable,

Echo-80

Dynabyte Model 5605

non-electric bulk disk eraser for 5¼-inch and 8-inch disks. The non-breakable, long-lasting eraser consists of a wooden handle with an attached permanent magnet also of unbreakable material. Handicapped workers make the erasers in two sizes, one for 5¼-inch disks and the other for 8-inch disks.

To obtain your non-electric disk eraser, send a tax-deductible $5 donation to NIRE, 97 Decker Road, Butler, NJ 07405. Include your name and address and a note indicating the correct eraser size.

Reader Service ✓571

Model III Programming and Applications

TRS-80 Model III: Programming and Applications provides beginners with all the information they need to know about the Model III, from turning it on to programming. It offers a complete introduction to Basic, Level II Basic, and Disk Basic, plus a comprehensive range of practical applications for a totally hands-on approach ideal for high school and college computer literacy courses.

In addition the book offers extensive, practical real-life applications and demonstrates how to program for mailing and telephone lists, data filing, inventory, payroll, word processing and graphics. It also includes tutorial style questions in each section and surveys state-of-the-art software and peripheral devices.

Priced at $12.95, it is available from Robert J. Brady Co., Bowie, MD 20715, 1-(800)-638-0220.

Reader Service ✓585

Multiuser Micro

The 5605 multiuser microcomputer from Dynabyte is aimed at the small business marketplace. It supports up to eight users and 16 printers, and provides up to 19MB of on-line storage integrated with an eight-inch disk drive (IBM-compatible).

The 5605 combines the highest capacity 5¼-inch Winchester disk drive available today in capacities of either 6, 12 or 19MB, with eight-inch disk storage of .8 or 1.6MB, depending on the single or double-sided version.

The 5605 runs under CP/M, MP/M or the OASIS operating system. Languages include Basic, Cobol, Fortran, Pascal and PL/I. A wide variety of applications programs are also available.

The 5605-A1 with 6MB of hard disk capacity has a domestic list price of $7295, while the 5605-B2 12MB version sells for $7995 and the 5605-C2 19MB for $8995. For more information contact Dynabyte, 521 Cottonwood Drive, Milpitas, CA 95035.

Reader Service ✓565

I Speak Basic

I Speak Basic is a field-tested computer literacy course that requires no previous computer experience on the teacher's part. This machine-specific text introduces students to Basic language programming and the operation of a TRS-80 microcomputer.

I Speak Basic has been designed to meet students' needs. The program's core is the Student Text which features learning objectives for each unit, definitions and examples of key terms and assignments. The Teacher's Manual contains suggestions for implementing the course and annotations to aid the teacher in lesson planning. Answers to all exercises and quizzes are provided. The Exam Set on spirit duplicating masters checks student understanding and reinforces key concepts.

The classroom version of *I Speak Basic* contains a Teacher's Manual, 20 Student Texts and one exam set and sells for $156.25. For more information and prices for individual texts contact Hayden Book Company Inc., 50 Essex St., Rochelle Park, NJ 07662, (800) 631-0856.

Reader Service ✓552

Your Family Tree

Your Family Tree is a genealogy program for the Models I and III microcomputers.

It quickly and easily sets up a data base to hold pertinent information about each ancestor, including name, date and place of birth, marriage and death information, plus a comment line. Access to information in Your Family Tree is virtually unlimited, with full search capabilities on any key field using full or partial information.

Your Family Tree is available on cassette (16K) or disk (32K) for $29.95. For more information contact Acorn Software Products Inc., 634 North Carolina Ave., S.E., Washington, DC 20003, (202) 544-4259.

Reader Service ✓587

We're not soft on software

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

New from Data Resources

On-Line ordering System

Data Resources Corporation now sponsors an electronic message system with on-line electronic ordering. Forum - 80 #2™ of Denver, Colorado is available 24 hours daily at 303/399-8858 providing access to latest information concerning specials, prices, and products for the TRS-80 disk user.

Enter the (L)OCAL features list to place orders, ask questions, give feedback about products and services. In addition, you will find some great entertainment, downloading and information files.

ANSWER $249.00
By NABS

Answer. . .a new type of information organizer. Utilizing the directory principle, Answer solves information problems by creating simple forms enabling you to put information where it should be or in many different places at the same time.

Answer. . .lets you organize almost any type of information in many different sequences and lets each information group grow to almost any size. It is able to connect the information on hundreds of diskettes. You can solve many problems yourself. . .without programming skills.

- Split screen design
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- 25 Key fields plus. . .
- Supports 1-4 diskette drives
- Interactive editing
- Record lock-out
- All keys equal.

INTERACTIVE BUSINESS SYSTEM INVENTORY CONTROL
By Tom Williams

The interactive system for inventory control offers the small manufacturing business savings in the thousands of dollars in reduced staff and accounting costs. Here's how it works. . .

When an invoice is typed:

- the customer's name and both addresses are obtained from the CUSTOMER LIST file.
- the company data is obtained from the COMPANY DATA file.
- the product data is retrieved from the INVENTORY CONTROL file.
- the INVENTORY CONTROL DATA file is updated by the invoice.
- the SALES DATA file is updated by the invoice.
- the invoice is automatically entered in the ACCOUNTS RECEIVABLE file.

The results are: the invoice is typed, customer data is gathered, items purchased are listed, multiples extended, invoice totalled, discounts computed, shipping costs added, interest added for late payers and data is entered in inventory control, sales data file and in accounts receivable. . .in about 50 seconds without mathematical or posting error.
For Model I or III. $500.00

B.T. ENTERPRISES
UNITERM/80
By Pete Roberts

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

THE FLOPPY DOCTOR
By Dave Stambaugh

FLOPPY DISK/MEMORY DIAGNOSTIC programs are designed to thoroughly check out the two most trouble prone sections of the TRS-80, the disk system (controller and drives) and the memory arrays.
MODEL I. $24.95
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Newdos/80 Version 2.0
with the LNDOUBLER $219.95
with the LNDOUBLER **5/8** $249.95
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with LNDOUBLER $169.95
with LNDOUBLER **5/8** $199.95

Everything you need to convert your TRS-80 Model 1, to run double density. Complete with software, hardware, and instructions, installs in minutes with no soldering, wiring or cutting.

LNDOUBLER alone $139.95
LNDOUBLER **5/8** $169.95

The LNDOUBLER is the most reliable double density modification known to Data Resources for the Model 1. The 5/8 version allows mixing and matching 5¼" drives and 8" drives.

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

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DOSPLUS gives you more of what you buy an operating system for. Speed and reliability without sacrificing simplicity and power. If you need extra power without extra wait, then you need DOSPLUS!

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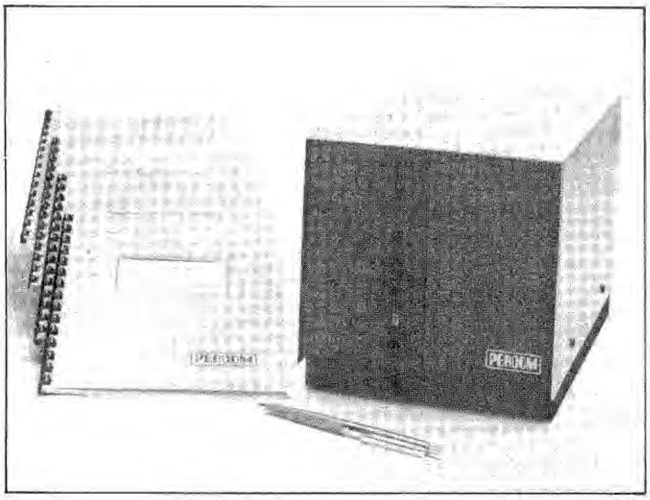
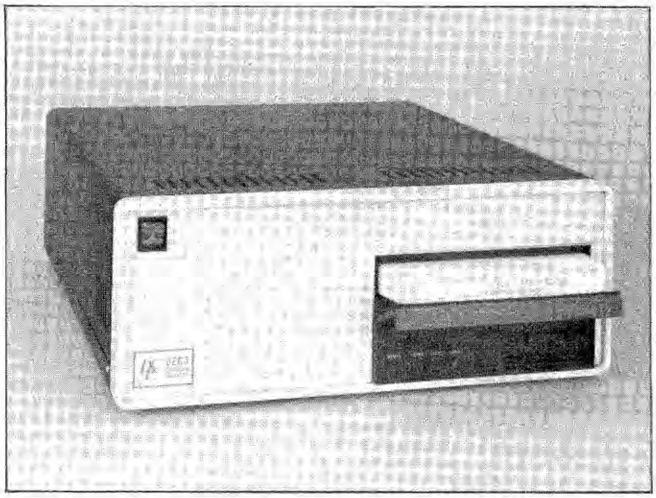
NEW PRODUCTS



Percom Hard Disk System



DECO Winchester Disk Sub-System

Percom Hard Disk System

Percom Data Company is now offering a 5¼-inch Winchester disk system that may be interfaced directly to the Model III.

The system—dubbed the PHD because of its smart controller—is ready now in 5 and 10-megabyte versions.

Prices start at $2495 for a complete system which includes one Winchester drive, the smart microprocessor controller, the system power supply and an enclosure.

An optional double-density floppy disk controller is available for floppy disk backup.

For more information contact Percom Data Company Inc., 11220 Pagemill Road, Dallas, TX 75243, (214) 340-7081.

Reader Service ✓563

Business Manager's Guide to Successful Computers

The non-technical business manager can learn about computers with *The Business Guide to Successful and Profitable Computers*, a three-volume reference set written in layman's terms. It provides business managers with the tools for successfully selecting, implementing and managing a computer. All three volumes, priced at $49.95, provide managers with a low risk, objective learning environment.

This Guide presents a comprehensive view of computers, complete from a basic introduction to computer concepts, all the way to managing the computer after installation. Secondly, a case study is used throughout so the business manager can see the techniques and concepts discussed in action. He can then adapt them to his particular situation. Thirdly, the business user's viewpoint is maintained throughout the three volumes. The volumes describe the effect of each step, based on the potential benefit or risk it can bring to the business.

For more information, contact: ProComplt, 300 East Huntland Drive, Suite 116, Austin, TX 78752, (512) 451-5660.

Reader Service ✓560

C Compiler

Intersoft Unlimited's new small C Compiler (V2.5) features conditional compilation, assignment operators, conditional assignments, the comma operator, dynamic storage allocation, argv and argc, complete command line parsing, complete I/O redirection, and improved error messages. It produces Assembly code as output to allow for modifications (if required) to time critical processes.

The C Compiler is for use with 48K, one disk drive Model I or III computers. Priced at $100, it is available from Intersoft Unlimited, Box 383, Station C, Kitchener-Waterloo, Ontario, Canada N2G 3Y9.

Reader Service ✓553

Winchester Disk Sub-System

DECO Computer Products Inc. is making available a Winchester Disk Sub-System with removable cartridge and fixed media disks for the Models I, II and III. The sub-system integrates the Data Peripherals Lynx Drive, and eight-inch, 10.6 megabyte (formatted) ANSI accepted removable cartridge with Quantum's 2000 series of fixed media drives. This combination provides on-line storage capabilities with built-in, removable back-up. Storage capacities of 10.6–137.8 megabytes are available in various increments.

The basic sub-system provides a Shugart Associates Standard Interface. The sub-systems available for the TRS-80 computers include the necessary software and hardware interfaces.

Pricing for the sub-systems starts at $4,875 with OEM and dealer discounts available. For more information contact Jim Fluck, DECO Computer Products Inc., 780 Trimble Road, Suite 207, San Jose, CA 95131, (408) 262-1594.

Reader Service ✓576

Super Operating Systems

PENDOS and DOSMOD are TRSDOS 2.3 operating system enhancement programs. These programs virtually eliminate typing when working in the DOS environment. With these programs, you can copy, kill, list or print any non-passworded file in your system without typing a single command or filespec. However, you must type passwords to access passworded files.

With PENDOS you select the desired DOS commands or filespecs with a light pen by touching the spot of light on the display corresponding to the function desired. With DOSMOD you select the commands or filespecs by positioning a blinking cursor adjacent to the desired function and pressing the Enter key.

These programs were designed as new overlays to DOS as opposed to high memory resident routines. This avoids unwanted interaction with other programs. These programs will not conflict with any other programs that start at 5200H or higher. They will work with all memory sizes of TRS-80s.

These programs are available from Clockwork Software, P.O. Box 704, Colorado Springs, CO 80901, for $25 shipping and handling included. The light pen required for operation of PENDOS is also available for $25.

Reader Service ✓558

PocketInfo

PocketInfo Corp. is making available a catalog of pocket computer programs for the Radio Shack, Sharp PC-1211 and Casio FX-702P pocket computers. These programs are for a variety of applications including creative financing, investment guide for common stocks and options, small business sales and inventory control, decision making tools, game scoring, and copyfitting estimation.

The catalogued programs are professionally written and well documented. PocketInfo evaluates all programs prior to inclusion in the catalog. A telephone hot line for questions is available.

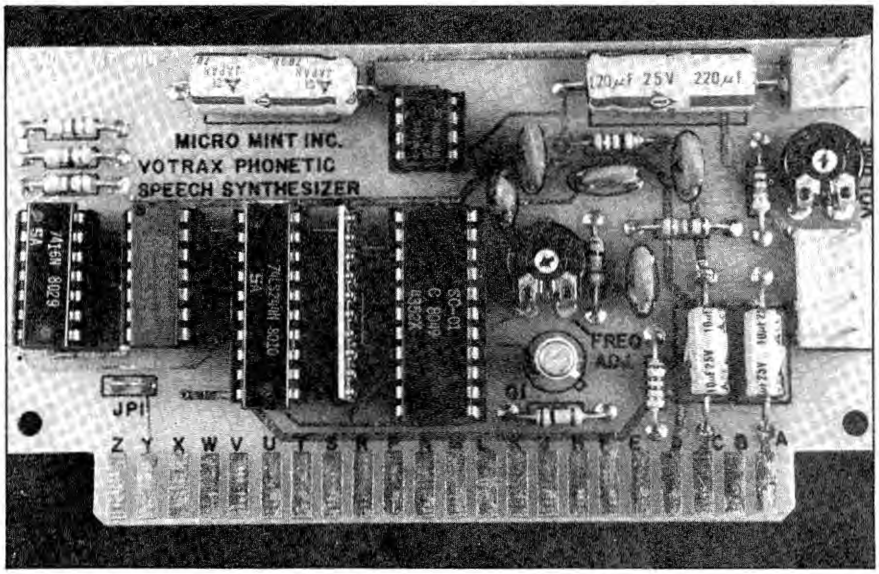
For additional information contact PocketInfo Corp., 7795 S.W. 184th St., Beaverton, OR 97007, (503) 649-8145.

Reader Service ✓575

Hi-Resolution Plotting

The Grafpac-80 brings high-resolution graphics to the Model I and III running under CP/M or TRSDOS. High level commands include: circle, ellipse, plot absolute and relative, move absolute and relative, pen up/down, character string plotting with rotation, size control, and left or right justification, grid drawing, as well as two and 3D line drawing modes to owners of x,y plotters or Epson MX-80s with Graftrax.

Grafpac-80 does not reside in memory with the user program, but instead, passes commands and data via disk files thereby giving all of memory to the user program. Ready to use programs are provided for pie and bar chart generation as well as standard graphs. These programs take their input from either disk data files or the system console. Programming examples are provided in Basic, Pascal, Fortran, and Assembly language. Several map, picture, and math-function files are also provided.



Sweet Talker

Grafpac-80 requires 48K and is priced at $29.95 for TRSDOS and $49.95 for CP/M. For details contact M.E.S.C., Parkhurst Drive, Salisbury, MD 21801, (301) 742-7333.

Reader Service ✓581

Super Color Writer

The Super Color Writer is a word processing system written in machine language for the Color Computer. The system works with any printer including the LP VII and VIII, and gives the user complete control of all print parameters and printer functions.

The Super Color Writer features a video text window, phosphor green screen appearance, choice of display colors, keybeep, 20 programmable keys, left and right justification, and the ability to embed control codes within justified text.

The Super Color Writer is available in three versions: tape for $49.95, ROMPAK for $74.95 and disk for $99.95. All versions work in 16K and 32K computers. The ROMPAK works in 4K computers as well.

The Super Color Writer is available through Nelson Software Systems, P.O. Box 19096, Minneapolis, MN 55419.

Reader Service ✓590

Sweet Talker

Sweet Talker provides a simple means of adding speech to a computer. It features the Votrax SC-01A phonetic speech synthesizer chip which requires less than 100 bits per second for continuous speech. The Sweet Talker speaks 64 phonemes with four levels of inflection and includes an onboard audio amplifier and volume control. An optional ($35) software package contains a 6502 based text-to-speech algorithm with patches to Basic or machine language programs, allowing any word or phrase that is printed to be spoken.

Model ST-01 ($139) interfaces to the TRS-80 computer. For more information and installation requirements contact Micromint Inc., 917 Midway, Woodmere, NY 11598, (516) 374-6793.

Reader Service ✓561

Fixed Assets System

Occupational Computing Company's Fixed Assets System for the Model II allows five methods of depreciation, including the new accelerated cost recovery system (ACRS) contained in the Economic Recovery Tax Act of 1981. It records and produces three sets of depreciation formats (federal tax, state tax, and financial statements purposes), handles 13 accounting periods, tracks investment tax credits and bonus depreciation.

OCC Fixed Assets System will prepare the following reports: asset file listing in three formats, fixed asset analysis by location, fixed asset analysis by type, fixed asset depreciation computation and trial update, lifetime depreciation calculations, type file listing, location code listing, override file listing.

OCC Fixed Assets System automatically interfaces to OCC General Ledger by creating necessary journal entries.

The system sells for $495. For more information contact Occupational Computing Company Inc., 22311 Ventura Blvd., Suite 123, Woodland Hills, CA 91364, (213) 999-1919.

Reader Service ✓557

Resume Referral Service Using Voice Synthesis

Softwork Voyce provides pushbutton telephone accessible placement, matching and forwarding of software professional's resumes using synthesized speech technology. The robot creates a prospective employee's resume according to his pushbutton responses to the robot's questions free of charge. Likewise, employers can specify their unique requirements for programmers, technical writers, computer operators, and DP managers for part time, full time, temporary, or freelance (consultants). Both employers and employees can call the robot at (617) 497-2323.

For more information contact Softwork Voyce, PO Box 800, Cambridge, MA 02139, (617) 497-2322.

Reader Service ✓562

Compu-Log

Compu-Log is a fully computerized logging system for the amateur radio operator. It provides a printed, scored and duped log, complete with dupe sheet. You can print confirmation of contacts on address labels in alphabetical order by call sign for attachment to your QSL cards. In addition, you can print many valuable contest and operator statistics including number of contacts each hour on each band, and total contacts for each country on each band. For multi-operator stations, Compu-Log gives you a breakdown of the total operating time, indicating number of contacts, duplicates and contact rate for each operator on each band, and it prints cumulative totals.

Compu-Log is available for the Model I with 48K, at least one disk drive, and the Epson MX-80 printer. Modified versions for other printers and the TRS-80 Model III can be created.

Versions of Compu-Log for the CQ World Wide DX Contest and ARRL DX contest are available now. Other versions for the CQ WPX and IARU Radiosport contests will follow shortly.

Compu-Log is available for $69.95 per package from Contest Software, Peter Chamalian, W1RM, Savarese Lane, Burlington, CT 06013.

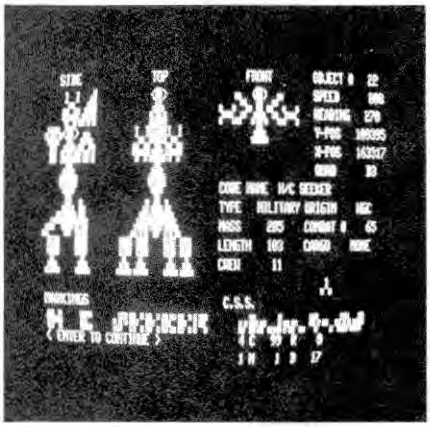
Reader Service ✓559

Windham Newsletter

Windham Software Inc., manufacturer of microcomputer software for the medical and dental fields, is issuing a monthly newsletter to keep system users up to date and answer their questions. It also provides information for potential buyers. The four page newsletter, edited by John R. Hayes, M.D., president of Windham, is routinely sent to purchasers of the MOS-2 medical system or the DOS-2 dental package, both designed to be used with Model II computers.

For more information write Windham Software, 29/31 Ivanhill St., Willimantic, CT.

Reader Service ✓569



Hypergate Centurion

Hypergate Centurion and Hypergate Patrol

Hypergate Centurion is a sophisticated, real-time simulation requiring learned mental skills of decision and judgement. It features fast real-time action with efficient machine code, a cast of 50 different objects, dazzling explosion scenes, action sounds and graphics, four skill levels, from trainee to master, five quarrelsome alliances and a detailed 32-page instruction manual.

Hypergate Patrol is a one player, stop action strategy simulation, written in Basic. It uses a machine language subroutine for the explosion scenes and sound effects. It features action sounds and graphics, four weapon types and numerous command options and many combat and navigational aids.

These games are compatible with 16K Model I and III microcomputers. Disk compatible versions are also available. Both games are sold as a set on one cassette tape for $39.95. They may be purchased at software retail stores or from Synergistic Solar Inc., P.O. Box 560595, Miami, FL 33156.

Hobbyist's Guide to Computer Speech Recognition and Synthesis

Any hobbyist or experimenter can give his personal computer a voice, teach it how to use it, and get it to recognize and act on voice commands. *Teaching Your Computer to Talk* gives you the information you need to know to do this. Readers need to know only how to operate and program a small computer. The manual begins with the very basics of speech fundamentals and follows with interfacing, talking data bases, suppliers and practical applications.

The book is priced at $15.95 for the hardbound edition and $8.95 for paperback. You can obtain more information by contacting TAB Books Inc., Blue Ridge Summit, PA 17214, (714) 794-2191.

Reader Service ✓588

Super Business Data Base

Super, a new business data base for CP/M and all TRS-80s, features fast setup, transaction posting, stored arithmetic, calculated fields, multi-disk operation, full disk sort on up to 40 fields, label printing, and user-defined reports. Also you can reformat and transfer data between data bases.

Production input eliminates repetitive keying. A universal selection routine compares fields, finds key words and selects ranges. Special features support inventory and complex accounting applications. Priced at $250 for the TRS-80 versions and $300 for the CP/M version, Super is available from the Institute for Scientific Analysis Inc., P.O. Box 7186, Wilmington, DE 19803, (215) 358-3735.

Reader Service ✓589

Basic/Z

Basic/Z is a hardware independent, native code compiler for the CP/M

WITH TaxPlan™

Your best clients count on you for their best tax alternatives.

Month in and month out, not just during tax season, our TAXPLAN software package for the TRS-80* makes those time-consuming, repetitive computations a snap. It's the most comprehensive and sophisticated tax estimator ever offered.

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You can enter or change one or more figures in seconds, literally. And your tax strategy for a full five years can include:

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- Income averaging
- Alternative tax
- Minimum/maximum tax
- Alternative minimum tax
- Self-employment tax

If you are an accountant, tax preparer, attorney, investor, loan specialist, or just a businessman who wants to see his tax options, your answer is TAXPLAN. From the company that has developed the only tax preparation software that really works: **Contract Services Associates**.

TAXPLAN is ready to run on your TRS-80 Models I, II, or III, for a modest $249.95. (Only $149.95 to registered users of our full tax system.)

Don't wait. Contact us today for the outstanding TAXPLAN software package.

Contract Services Associates
706 South Euclid, Anaheim, CA 92802,
Telephone: (714) 635-4055

*TRS-80 is a trademark of Tandy Corp.

CSA CONTRACT SERVICES ASSOCIATES

Improving The Bottom Line. 68

operating system. It features absolute cursor addressing (for the screen and printer), reverse video, blinking fields, erase to end-line and end-screen, clear screen, and more.

Basic/Z supports sequential files with read/write capability allowing you to extend or truncate the file without having to copy the entire file. It also provides two forms of random files for indexed or random access or both. This package also includes a full function program editor, with advanced features such as global search and change, 15 local edit commands, and complete syntax testing as you type.

Basic/Z requires CP/M Rev. 2.x and a console device with an addressable cursor. Price for the system including the Run/Z run-time package is $345. Price for the run-time package alone is $65. For more information contact System/Z Inc., P.O. Box 11, Richton Park, IL 60471, (312) 481-8085.

Reader Service ✓582

Video Text Editor

MR EDit, a video text editor for CP/M and MP/M users, offers many advanced features including: Cursor movement by character, word, line and screen; deletion by character, word or line in any direction; extensive search and replace capabilities; paste buffer manipulation commands; and user-defined command keys.

MR EDit will run on a 20K transient program area CP/M or MP/M system which has a CRT with at least 12 lines of 64 or more characters.

MR EDit is available on either 8-inch single density or popular 5¼-inch soft sectored floppy disks. The price is $90 including the user's manual. The manual alone is priced at $12.50 and is refundable upon order.

For more information contact Micro Resources Corporation, 6922 Harding Road, Suite 117B, Nashville, TN 37221.

Reader Service ✓592

Dairy Cattle Least-Cost Ration Program

With the Dairy Cattle Least-Cost Ration Program the dairyman can formulate least-cost rations for any type of dairy animal. A ration is selected based on weight (900–1550 lbs.) and milk production (18–78 lbs.), or on class of nonlactating animal. The program contains all 221 feeds, 26 nutrients, and nine rations listed in the 1978 "Nutrient Requirements of Dairy Cattle," and contains 84 blank places for adding feeds and 28 places for adding nutrients, at the user's discretion. The least-cost formulation is based on the ration and a feed list which may contain up to 50 feeds with their restrictions (maxima and minima) and can easily be changed to suit the user.

Dairy Cattle Least-Cost Ration Program comes with a 30-day money-back guarantee. It is priced at $249.95 for the Models I and III versions and $295.00 for the CP/M version, and is available from Agricultural Software Consultants, 1706 Santa Fe, Kingsville, TX, (512) 595-1937.

Reader Service ✓584

General Accounting Systems

Small Business Systems Group Inc. has completed a major new release (Version 5.0) of its General Accounting Package for TRS-80 Models I, II and III. The package includes general ledger, accounts payable, accounts receivable, payroll, order entry and inventory control.

Using some or all of these modules, the user may configure his own system. The SBSG CONFIG program supports any combination of disks in single or double density, including hard disks for up to eight drives (0–7). This feature is very useful on systems where the disk address is above 3 or when there are different drive sizes including double density. Additionally, the user may define the degree of coordination and control the number of records and file placement. Release 5.0 for floppy systems provides for up to 1500 records in any file with inventory sizes up to 32766 records.

The Model I and Model III versions are the same. If you buy a Model I version of the General Accounting system and later upgrade to a Model III, the same programs and data will work on your Model III.

Version 6.0 of the General Accounting system is for hard disk systems only. This version will support up to 10,000 records in all systems except Inventory, where you can have up to 32,766 records (about 8,000K bytes). It is available in compiled Microsoft Basic and you can purchase the source code separately from SBSG.

The Corvus Version 6.0-C supports up to eight users with file lock. Multiuser requires the Corvus Multiplexer (Constellation) and 2–8 Model I and III computers. TRS-80 Model II Multiuser versions will be available sometime late this summer.

All of the user-configurable modules are now available on the Model II as TRSDOS 2.0 data disks. Model I systems are distributed on 35-track TRSDOS 2.3 data disks. Model III systems are distributed on TRSDOS 1.2 data disks. Corvus hard disk versions are distributed on NEWDOS80 Version 2.0 data disks. MTI hard disk versions are distributed on DOSPLUS data disks.

Price for each module for the Model II floppy versions is $295. Model I/III floppy versions are $195 with Inventory priced at $225. Model I/III hard disk versions are priced at $325. For more information contact Small Business Systems Group, 6 Carlisle Road, Westford, MA 01886, (617) 692-3800.

Reader Service ✓593

MicroLib File Librarian

MicroLib, a CP/M and MP/M disk file librarian, allows the user to store many disk files into a single larger file. It reduces the amount of space required to hold disk-resident files, while still providing almost immediate access to the files.

The system provides users with two levels of security for files placed in the library: password protection and password plus data encryption.

MicroLib maintains a 50-character description with each file saved in the library. The library directory commands display this description and print it on the various reports.

Users can establish relationships between groups of files, then process an entire group with a single command. An optional feature date stamps entries as you add them to a library and each time you process them, thus providing even more user control.

MicroLib's comprehensive reports describe the contents of a library, displaying all information stored in the library directory in a professional format.

MicroLib retails for $295. For more information contact Advanced Micro Techniques, 1291 E. Hillsdale Blvd., Suite 209, Foster City, CA 94404, (415) 349-9336.

Reader Service ✓580

OmniForth for Model III

OmniForth, a high-level computer language based on fig-Forth and the 79 Standards, is now available to run on the TRS-80 Model III.

OmniForth is a flexible tool that gives the user total control of his computer, enabling rapid system design and application development. It combines structured programming, 31 character names, virtual memory, stack organization, compiler, assembler and file system into an extensible macro-like language.

OmniForth contains the interactive OmniForth compiler, Z80 assembler, file system and full screen video editor, and requires 32K and one disk drive.

The package comes on disk for $130. For more information contact Interactive Computer Systems Inc., 6403 DiMarco Road, Tampa, FL 33614, (813) 884-5270.

Reader Service ✓594

Depreciation Analysis

Realty Software's enhanced version of the disk based Depreciation Analysis now includes an Accelerated Recovery System (ACRS). It will handle 3, 5, 10 and 15 year ACRS property types and compare the ACRS deductions to the alternative straight line depreciation.

The printed output shows each year's deduction for the ACRS method and the straight line method with the accumulated totals from previous years for each method. This allows a complete analysis of both choices.

Priced at $75, this system is available for 48K Model I and IIIs from Realty Software Company, 1116 E 8th St., Manhattan Beach, CA 90266, (213) 372-9419.

Reader Service ✓573

Microcomputer Programming for Everyone

Personal Pearl makes microcomputer programming available to almost everyone. It enables users with no technical training or computer experience to describe their requirements visually and in English to the computer. Personal Pearl then automatically generates applications according to end user requirements.

With this product users can generate their own library of horizontal and personal applications, no longer dependent on computer software technicians or on standard packaged programs.

Personal Pearl retails for $295 and will be used interchangeably on all microcomputers. For additional information contact Rita Miles, Relational Systems International Corp., P.O. Box 13850, Salem, OR 97309, (503) 363-8929.

Reader Service ✓586

Office Manager

Dental Office Management I for the Models I and III is designed for the single practitioner or small group dental office practice. The system prepares daily appointment logs, daily cash journals, monthly patient bills, ADA claim forms, accounts receivable reporting and account collections activity. Practitioners can designate their own recall schedule for automatic notices to patients or suggested checkup schedules.

The system requires 48K RAM with 2–4 disk drives and a 130-column printer. The system is available from more than 850 Charles Mann and Associates dealers worldwide for $859.95. Preview documentation is available separately for $50.

For additional information and dealer location information contact Charles Mann and Associates, Microcomputer Division, 55722 Santa Fe Trail, Yucca Valley, CA 92284, (714) 365-9718.

Reader Service ✓564

Automatic Graphing of Functions

Automatic Graphing of Functions is a software package which graphs equations used in math, science, and business. It plots formulas in the form Y = f(X) or Y = Y + f(X). It graphs discontinuous functions and plots simultaneous equations on one graph.

Key in your formula and the graph appears quickly on the screen display, with X and Y axis positioned automatically for the highest resolution. You can send the graph to a printer with the push of a key, if you desire.

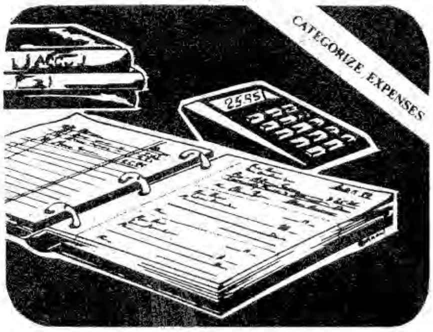
The program is for use on a 16K Level II Model I or III. Cassette tape and operator's manual sell for $19.95 (add $2 for postage and handling). You can transfer the program to disk. For more information contact David Modny, 4144 N. Via Villas, Tucson, AZ 85719.

Five-Year Tax Planning Software Package

Taxplan!, an income tax computation program, is available for the Models I, II and III. This package makes tax computations for any or all of the five years, 1981–1985. You can use it not only to compute the basic income tax from income, adjustments, filing status, and so on, but you can also explore such options as income averaging, the maximum tax on personal service income, and the computation of minimum tax for individuals.

The price for the package, including instructions, is $249.95. Registered users of Contract Services' Professional Income Tax System may buy this supplemental program for $149.95. For more information contact Contract Services Associates, 706 S. Euclid, Anaheim, CA 92802, (714) 635-4055.

Reader Service ✓568



Money Manager

Money Manager is a menu-driven personal finance management program for the Model I and III with at least 32K and one disk drive. It helps keep track of your income and expenditures and provides an easy method of budget allocation.

Money Manager can store information for up to 100 checkbook entries for a given month; with 48K and more than one disk drive, it can accommodate up to 250 entries per month. Each check writing year has its own disk.

You can create as many as 99 expense categories, reconcile the checkbook with the bank statement, and keep track of tax deductible and non-tax deductible expenses. Checks payable to charge card companies and other lump payments may be broken up and placed into the proper individual categories. Program options are implemented with full 80-column printer capabilities.

Money Manager is available on a Model I disk for $39.95. For more information contact Acorn Software Products Inc., 634 North Carolina Ave., S.E., Washington, DC 20003, (202) 544-4259.

Reader Service ✓555

Personal Computer and Peripheral Switching

The EIA 2 to 1 manual switch box is used with nine-line RS-232 devices. It can connect two Model IIs or IIIs to a single serial printer, modem, plotter, or system or two peripherals to a single terminal. This model has two 25 pin D style female

NEW PRODUCTS

connectors and one male which is the common. Price is $145.

The EIA 5 to 1 is similar to the 2 to 1. It can connect five terminals to a single serial peripheral using nine-line RS-232 signals. It also uses five 25 pin D style female connectors and one male which is the common. Price is $225.

The Color 2 to 1 is a manual switch box for use with the Model I and the Color Computer. Its connectors are compatible with the Model I's and Color Computer's serial port. The Color 2 to 1 can connect two Model Is or Color Computers to a single serial device, such as a modem or printer. Price is $69.95.

The Parallel 2 to 1 model is for use with parallel printers and can connect two TRS-80 Model IIs or IIIs to a single printer. The Parallel 2 to 1 is a manual switch box which uses two 36-pin female cinch style connectors and one male as the common. You can use it with the Epson, Okidata, Centronics, and many other printers which use the Centronics standard. Price is $185.

The System Expander, an automatic multiplexer, is for use with nine-line RS-232 devices. It can automatically connect eight Model IIs or IIIs, one at a time, to a single serial modem or system having an RS-232 port. The System Expander has a unique printer option, which allows the terminals to drive a serial printer during the transmission or reception of data. Price is $1795.

For more information contact Switch and Mux Inc., 10 Oakridge Ave., Merrimack, NH 03054, (603) 424-4161.

Reader Service ✓574

WordStar Training Guide

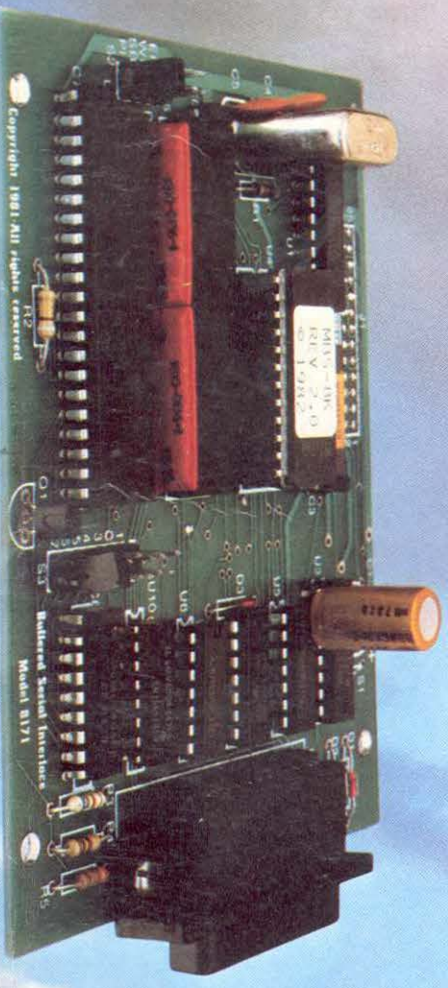
The WordStar Training Guide provides step-by-step instructions for using WordStar and its optional companion programs MailMerge and SpellStar. It is divided into three tabbed sections: a three-hour Short Course, a 4-5 hour Intermediate Course, and an eight-hour Extended Course. Like the previous manual, it is intended for first-time as well as veteran WordStar users.

The 50-page 8½ by 12 inch typeset spiral-bound book has a self-supported easel backing for stand-up use at the computer operator's terminal.

The guide is included in WordStar product packages at no additional charge. Individual copies have a suggested retail price of $20. Contact Micropro International Corporation, 1299 4th St., San Rafael, CA 94901, (415) 499-0919, for additional information.

Reader Service ✓570

HOW TO USE YOUR EPSON WITHOUT WASTING COMPUTER TIME:



Your computer is capable of sending data at thousands of characters per second but the Epson can only print 80 characters per second.

This means your computer is forced to wait for the printer to finish one line before it can send the next. A waste of valuable time.

THE NEW MICROBUFFER™ ACCEPTS DATA AS FAST AS YOUR COMPUTER CAN SEND IT.

Microbuffer stores the data in its own memory buffer and then takes control of the printer. This frees your computer for more productive functions.

PARALLEL OR SERIAL.

Microbuffer model MBP-16K is a Centronics-compatible parallel interface with 16,384 bytes of on-board RAM for data buffering.

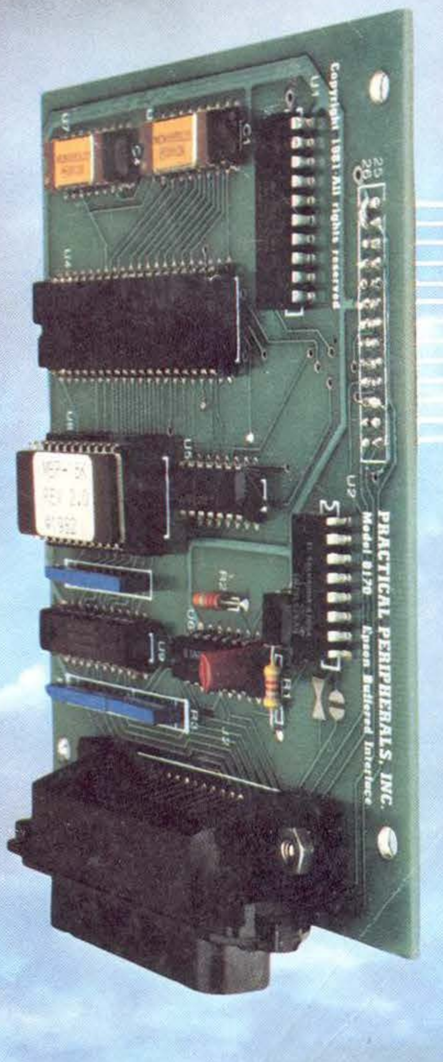
The MBS-8K is a full-featured RS-232C serial interface with both hardware and software (X-On/X-Off) handshaking, baud rates from 300 to 19,000 and an 8,192 byte RAM buffer.

SIMPLY PLUG IT IN.

Either model fits the existing auxiliary interface connector inside the Epson MX-80, MX-80 F/T or MX-100 without modification, and is compatible with standard Epson cables and printer control software, including GRAFTRAX-80.

JUST $159.00*

When you think how much time Microbuffer will save, can you afford *not* to have one? Call us for your nearest dealer.



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TIRED OF WAITING?

Frustrating isn't it! No matter how much you speed up your program it still seems to take forever to save data onto a cassette. Wouldn't it be great if someone could design a mass storage system with the speed of a disk, but at half the cost? *Exatron* did, the *Exatron Stringy Floppy (ESF)* .

Totally self-contained, the ESF is an extremely fast, reliable, and economical alternative to cassette or disk storage of programs or data. All of the ESF's operations are under the computer's control, with no buttons, switches, knobs or levers to adjust or forget.

The ESF uses a miniature tape cartridge, about the size of a business card, called a wafer. The transport mechanism uses a direct drive motor with only one moving part. Designed to read and write digital data only, the ESF suffers from none of the drawbacks of cassettes - without the expense of disks.

Several versions of the ESF are available, for the *TRS-80, Apple, PET, OSI* and an *RS 232* unit. Even the slowest of the units is 15 times faster than a cassette, and all are as reliable as disk drives - in fact a lot of users say they are *more* reliable!

excellence in electronics

exatron

To get further information about the ESF give Exatron a call on their Hot Line *800-538 8559* (inside California 408-737 7111).

If you can't wait any longer then take advantage of their 30 day money-back guarantee, you've nothing to lose but time!

181 Commercial Street
Sunnyvale, CA 94086

✓93

TRS-80. Apple and PET are trademarks of Tandy, Apple and Commodore respectively.